NOAA Technical Memorandum NWS WR-213

IDAHO ZONE PREFORMAT, TEMPERATURE GUIDANCE, AND VERIFICATION

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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:

Caldwell=BOI + (3 x T) + (2 x W) - (3 x C x T)
1 2 3 4

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
)00 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-
'AGIC VALLEY
 )0 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<
<ZCZC ZONETEMPS
ETTAA00 KBOI 271547

          IDAHO ZONE TEMP FORECASTS   2/27/1991  15Z

     S06      22   37   21
     SPT      25   36   25
     LWS      32   50   28   46
     S80      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

     ONO      20   45   29
     WEI      18   45   27
     EMT      28   49   35
     PAR      18   45   27
     CAL      26   45   34
     BOI      29   47   36
     MUO      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
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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

	ALL ZONE SPOTS								PERENNIAL TEN						THE OTHER NINETEEN					
MET	1ST PD		2ND PD		3RD PD		ALL PDS		1ST PD		2ND PD		3RD PD		1ST PD		2ND PD		3RD PD	
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.	*MLD	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.
*S80	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.
*LWS	2.61	62.	2.73	62.	3.08	62.	2.81	186.	MOS	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.

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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)

APCPMNTH
355 538 120

WSFO BOISE ZONE PRECIPITATION VERIFICATION

MARCH 1991 INDIVIDUAL FORECASTERS

ALL ZONE SPOTS

	1ST PERIOD						2ND PERIOD						3RD PERIOD						
MET	FQCY	POD	THRT	FALM	% COR	BIAS	FQCY	POD	THRT	FALM	% COR	BIAS	FQCY	POD	THRT	FALM	% COR	BIAS	NO. FCSTS
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.
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	78.75	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

	1ST PERIOD						2ND PERIOD						3RD PERIOD						
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.
S06	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.

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

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<ZCZC BOIWRKVER
ETTAA00 KBOI 071911

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

SITE	00Z CYCLE 1ST PD MAX		00Z CYCLE 2ND PD MIN		00Z CYCLE 3RD PD MAX		12Z CYCLE 1ST PD MIN		12Z CYCLE 2ND PD MAX		12Z CYCLE 3RD PD MIN	
*BOI	2.20	5.	6.00	5.	5.60	5.	3.83	6.	4.50	6.	4.67	6.
EMM	1.20	5.	5.60	5.	4.80	5.	1.33	6.	4.33	6.	4.17	6.
CAL	2.80	5.	5.20	5.	3.60	5.	2.33	6.	3.50	6.	4.00	6.
ONO	3.20	5.	4.60	5.	2.80	5.	2.83	6.	2.83	6.	3.00	6.
PAR	2.00	5.	4.80	5.	3.60	5.	2.33	6.	2.50	6.	3.33	6.
MUO	2.00	5.	4.80	5.	5.40	5.	3.83	6.	2.20	5.	4.80	5.
TWF	2.00	4.	7.40	5.	4.00	4.	3.33	6.	2.50	6.	6.33	6.
JER	1.00	5.	3.60	5.	1.40	5.	2.50	6.	2.50	6.	5.83	6.
*BYI	1.20	5.	6.00	5.	2.40	5.	5.33	6.	3.17	6.	6.50	6.
RUP	2.60	5.	5.00	5.	1.20	5.	3.67	6.	3.67	6.	6.50	6.
IDC	3.80	5.	3.80	5.	7.40	5.	5.50	6.	4.33	6.	10.00	6.
MYL	2.40	5.	5.60	5.	2.40	5.	5.00	6.	3.83	6.	6.50	6.
FAI	4.40	5.	6.60	5.	3.80	5.	7.17	6.	4.67	6.	9.67	6.
SUN	1.80	5.	4.80	5.	2.20	5.	5.33	6.	2.20	5.	10.60	5.
*IDA	1.60	5.	5.20	5.	3.00	5.	6.00	6.	2.67	6.	9.50	6.
REX	3.00	5.	7.00	4.	1.80	5.	4.83	6.	5.33	6.	8.83	6.
*PIH	1.20	5.	4.20	5.	2.60	5.	4.33	6.	3.83	6.	10.00	6.
*MLD	3.40	5.	7.60	5.	3.20	5.	3.00	6.	3.67	6.	9.17	6.
SDA	4.75	4.	5.00	4.	6.25	4.	4.67	6.	4.00	5.	5.00	4.
*SMN	2.00	5.	5.20	5.	2.40	5.	4.67	6.	3.17	6.	8.00	6.
CHA	3.00	5.	5.80	5.	2.40	5.	5.33	6.	4.17	6.	8.33	6.
STN	7.00	4.	5.40	5.	6.75	4.	6.33	6.	5.83	6.	8.00	6.
*S80	3.60	5.	3.60	5.	4.80	5.	5.67	6.	2.67	6.	4.00	6.
*LOW	3.80	5.	2.60	5.	6.40	5.	2.00	6.	2.33	6.	3.17	6.
*LWS	2.40	5.	2.00	5.	2.60	5.	2.00	6.	2.17	6.	2.00	6.
MOS	2.40	5.	3.75	4.	2.80	5.	3.50	6.	3.00	6.	1.33	6.
S86	0.80	5.	3.20	5.	2.20	5.	4.33	6.	2.17	6.	2.33	6.
*S06	4.00	4.	2.20	5.	7.50	4.	2.67	6.	1.50	6.	4.00	6.
COE	1.67	3.	4.33	3.	1.67	3.	5.00	2.	3.50	2.	2.50	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).

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NNNN>##<A<
<ZCZC BOIWRKVER
ETTAA00 KBOI 060027
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WSFO BOISE ZONE PRECIPITATION VERIFICATION
FORECASTER NO. 18
FROM: 11/ 1/90 TO: 11/30/90

		BOI	BYI	IDA	MLD	SMN	S80	P69	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
3	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	S80	P69	LWS	S06	PIH

NO. OF FORECAST CYCLES VERIFIED: 12.00

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END
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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
S06	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
S80	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
ONO	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
MUO	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
STN	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
MUO	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	[illegible]	[illegible]	.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	3.7
	.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
ONO	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
MUO	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
SIA	.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
STN	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
ONO	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
MUO	4.43	3.67	3.24	3.35	4.09	4.29	4.77	3.67	3.22	3.33	4.26	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
MLD	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
SDA	.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 1989

MAX TEMPERATURES

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
S06	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
S80	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
ONO	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
MUO	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	9.52
	.70	.52	.04	.21	.54	.63	.43	.41	.36	.14	.46	.93

PIH	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
SBA	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

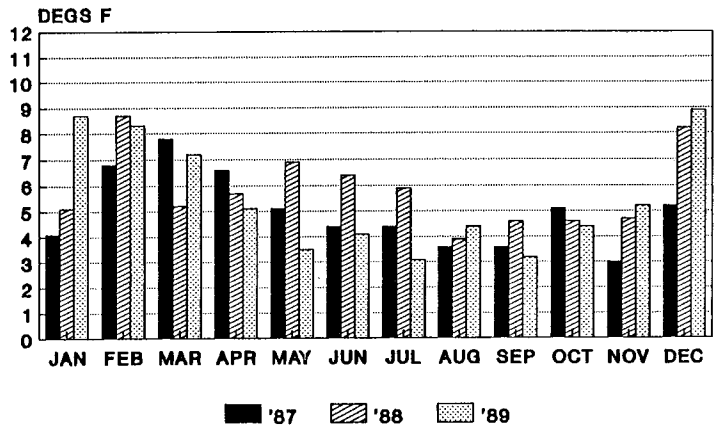
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SO6	7.37	7.25	4.18	5.50	4.50	3.67	4.04	4.59	2.96	3.07	4.24	7.46
	.77	.61	.18	.13	.13	.08	.04	.05	.15	.48	.45	.85
SPT	4.53	6.00	3.22	4.70	2.42	3.63	3.61	3.00	4.19	4.05	3.21	3.95
	.41	.47	.39	.30	.50	.53	.44	.37	.25	.36	.63	.65
LWS	2.80	3.36	2.81	2.88	3.20	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
MOS	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
CHA	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
ONO	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
MUO	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	3.3
	.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

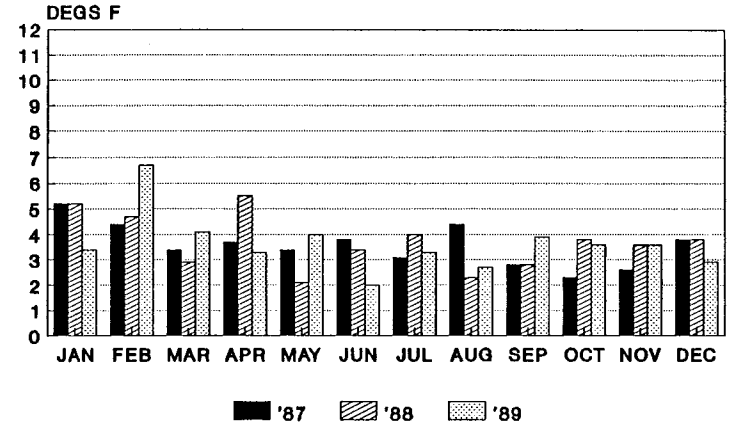
APPENDIX II

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

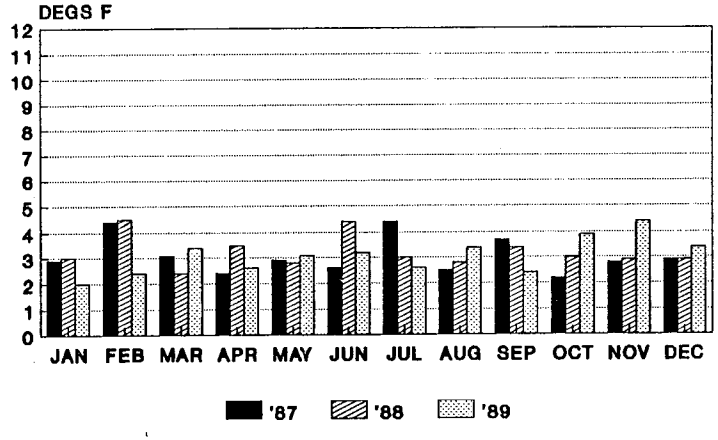
MULLAN
MAE -- MAX TEMPS



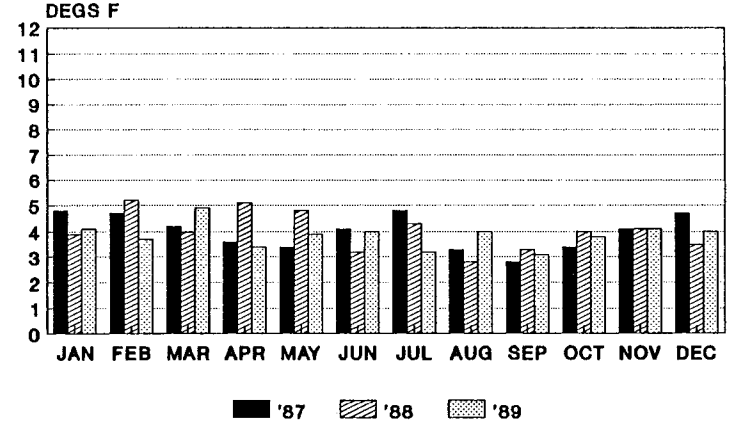
SANDPOINT
MAE -- MAX TEMPS



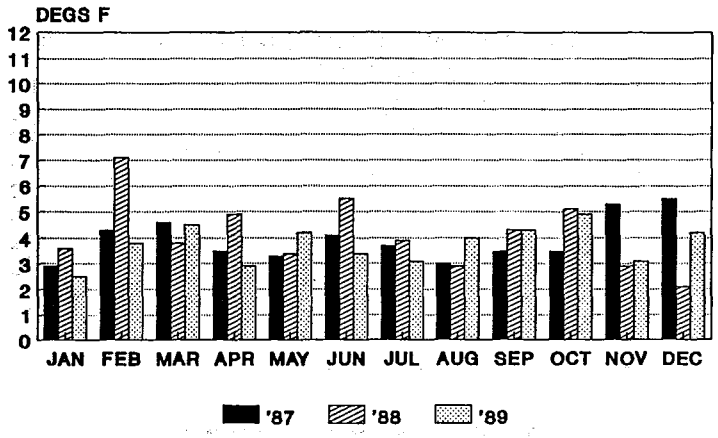
LEWISTON
MAE -- MAX TEMPS



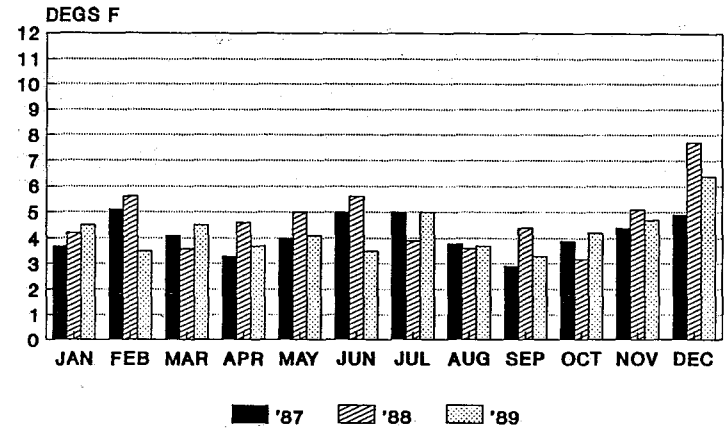
GRANGEVILLE
MAE -- MAX TEMPS



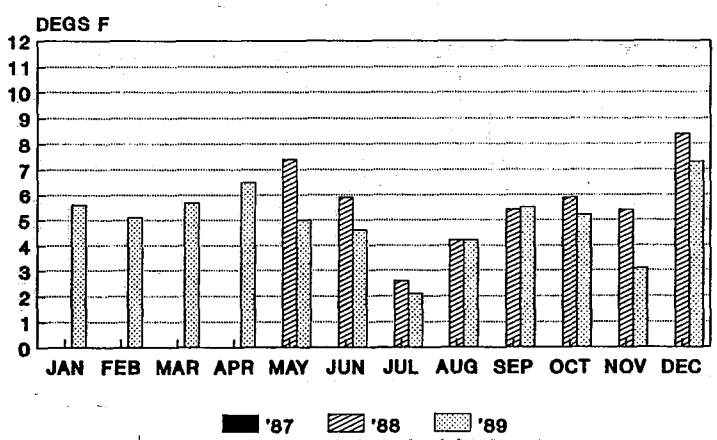
MOSCOW
MAE -- MAX TEMPS



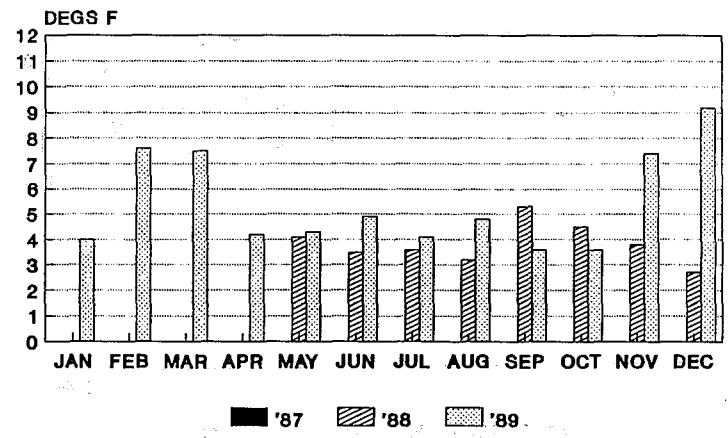
SALMON
MAE -- MAX TEMPS



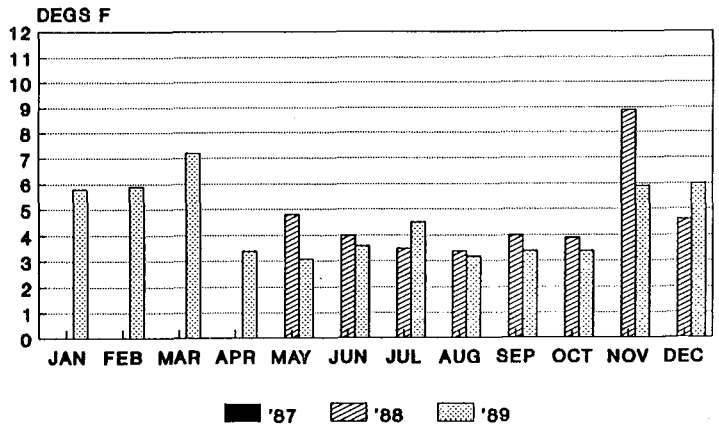
CHALLIS
MAE -- MAX TEMPS



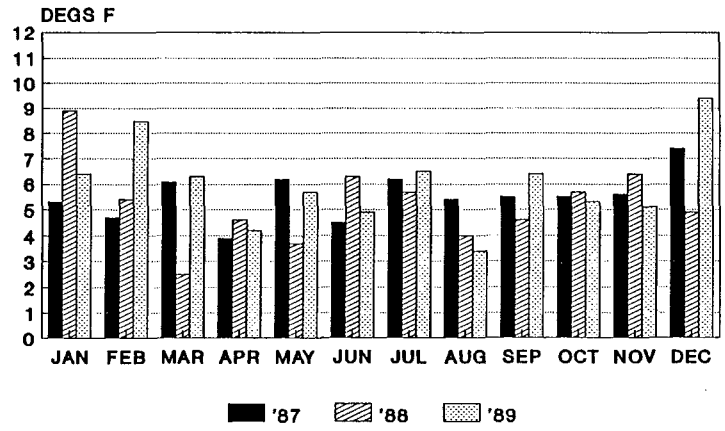
LOWELL
MAE -- MAX TEMPS



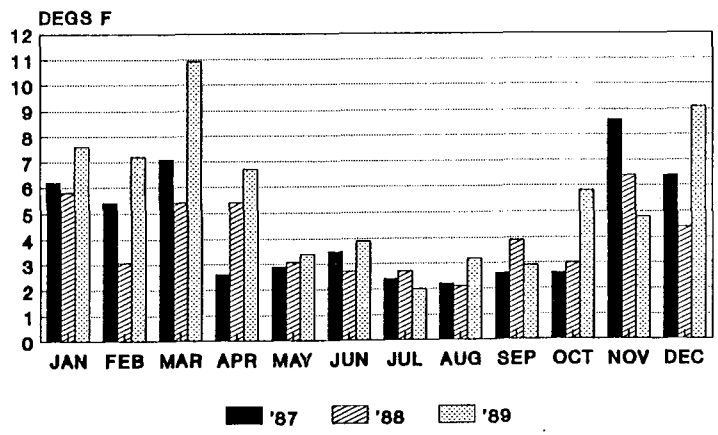
IDAHO CITY
MAE -- MAX TEMPS



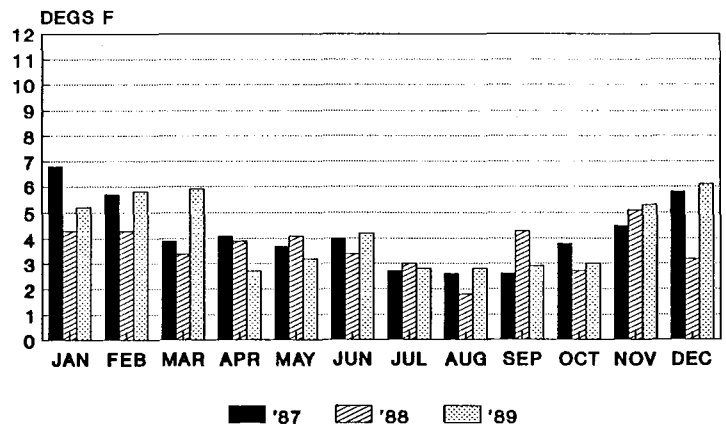
STANLEY
MAE -- MAX TEMPS



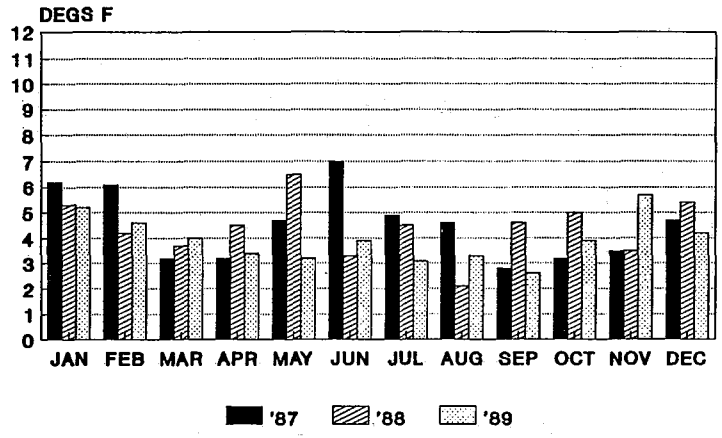
MCCALL
MAE -- MAX TEMPS



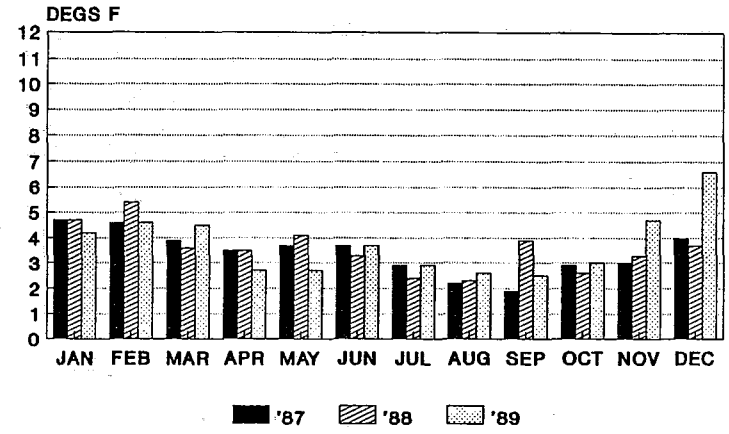
ONTARIO
MAE -- MAX TEMPS



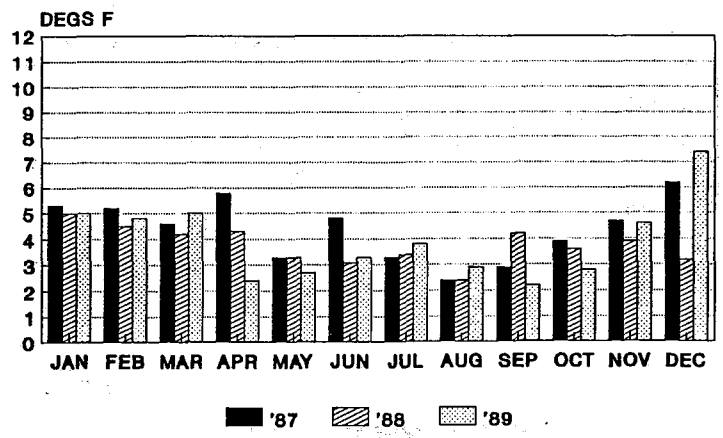
WEISER
MAE -- MAX TEMPS



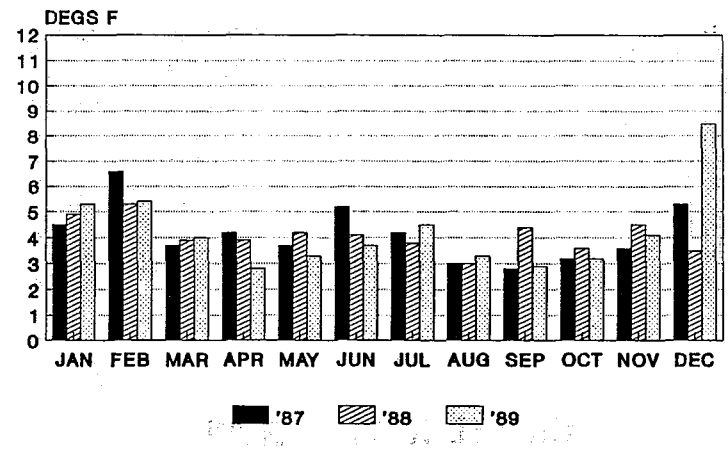
EMMETT
MAE -- MAX TEMPS



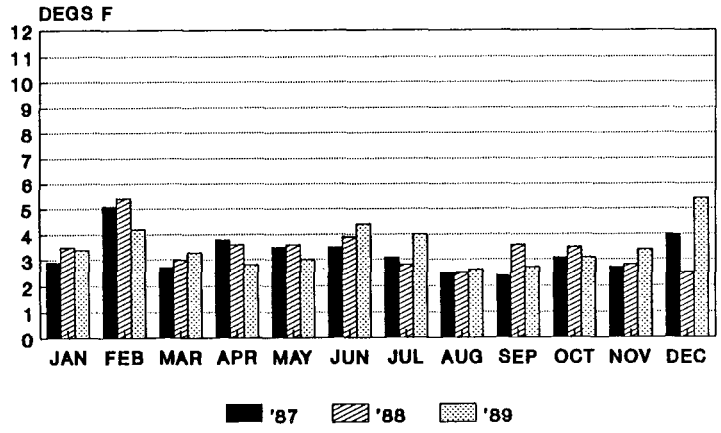
PARMA
MAE -- MAX TEMPS



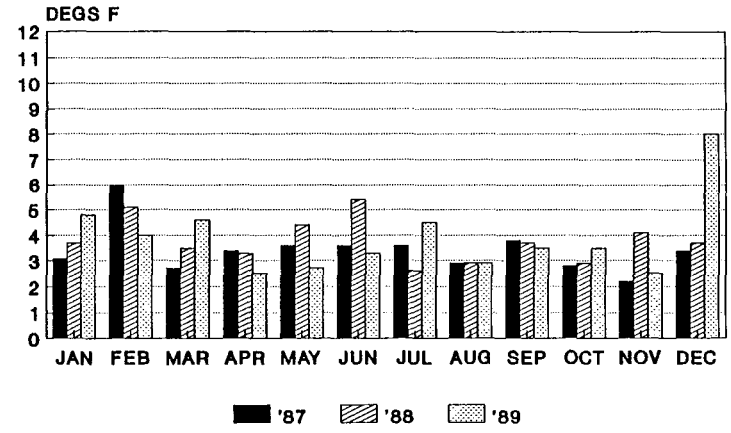
CALDWELL
MAE -- MAX TEMPS



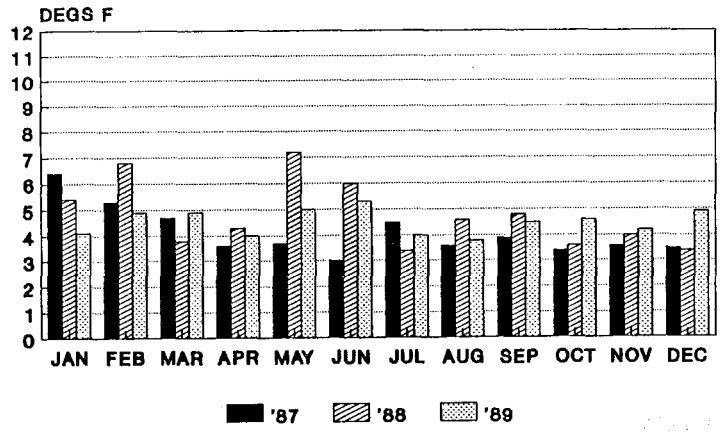
BOISE
MAE -- MAX TEMPS



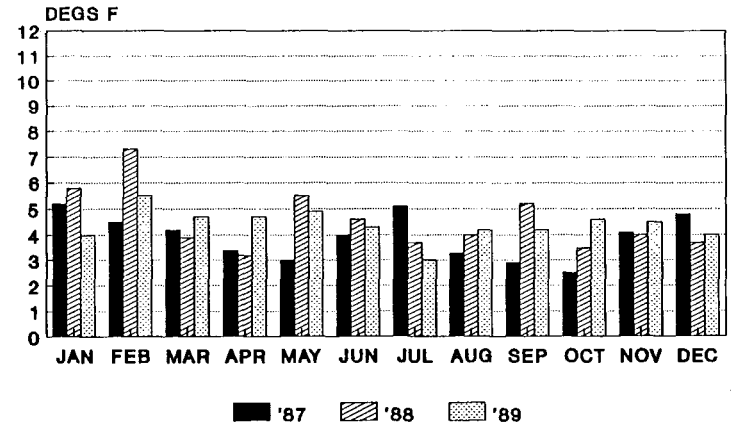
MOUNTAIN HOME
MAE -- MAX TEMPS



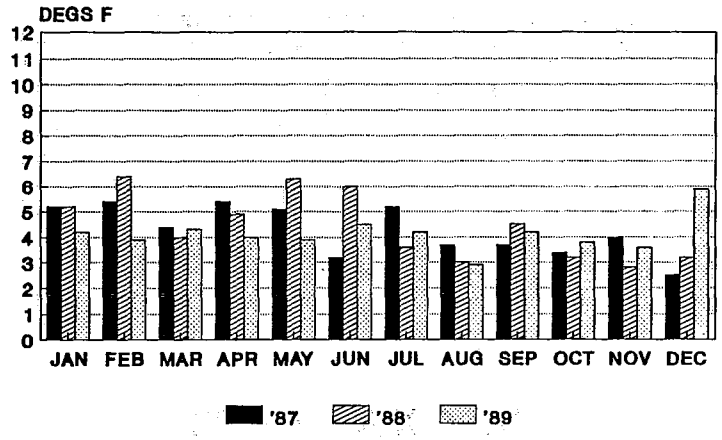
JEROME
MAE -- MAX TEMPS



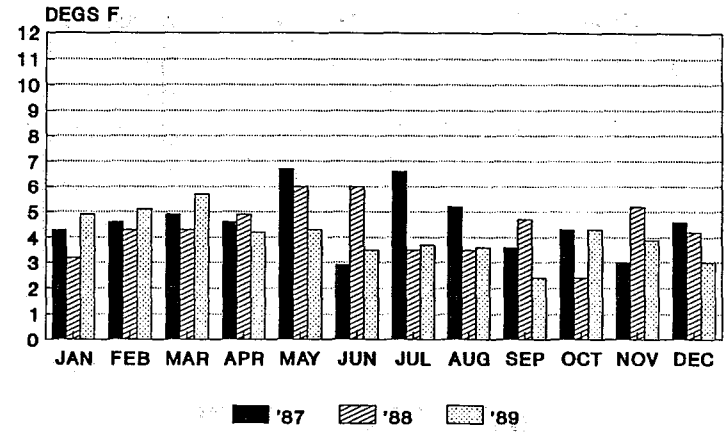
TWIN FALLS
MAE -- MAX TEMPS



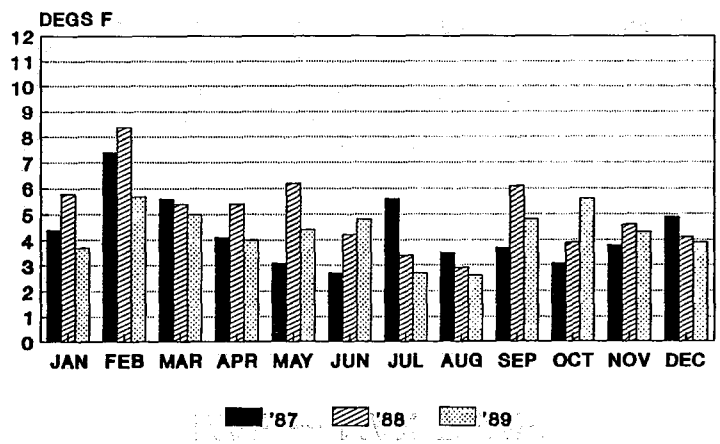
BURLEY
MAE -- MAX TEMPS



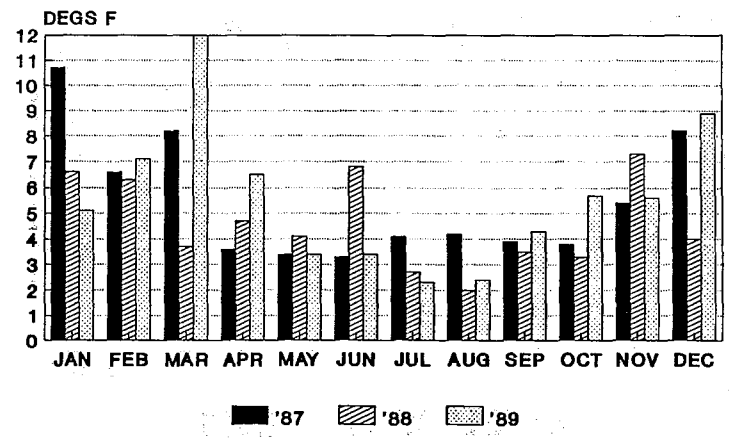
RUPERT
MAE -- MAX TEMPS



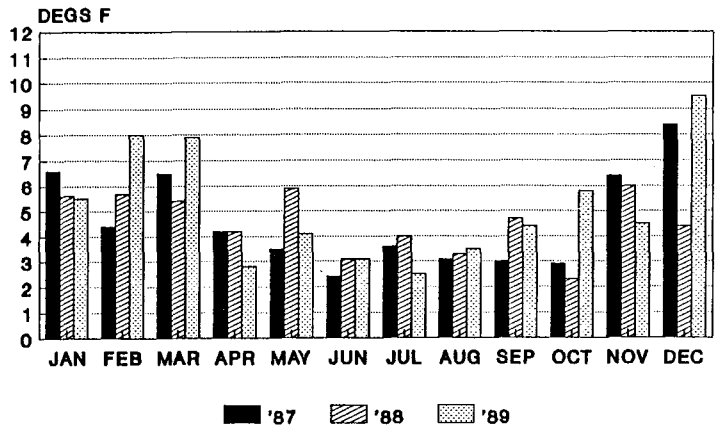
HAGERMAN
MAE -- MAX TEMPS



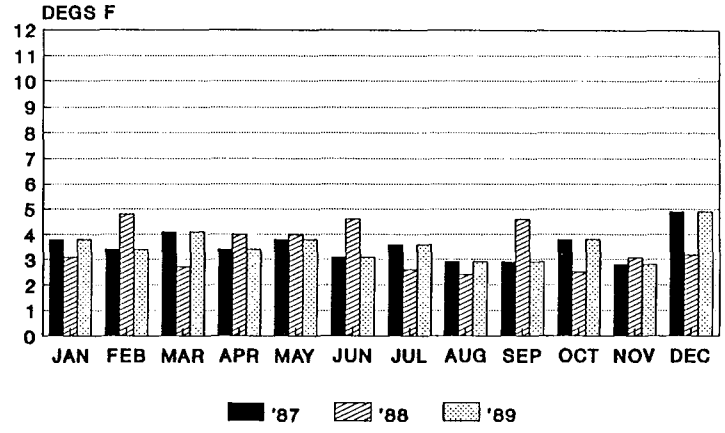
FAIRFIELD
MAE -- MAX TEMPS



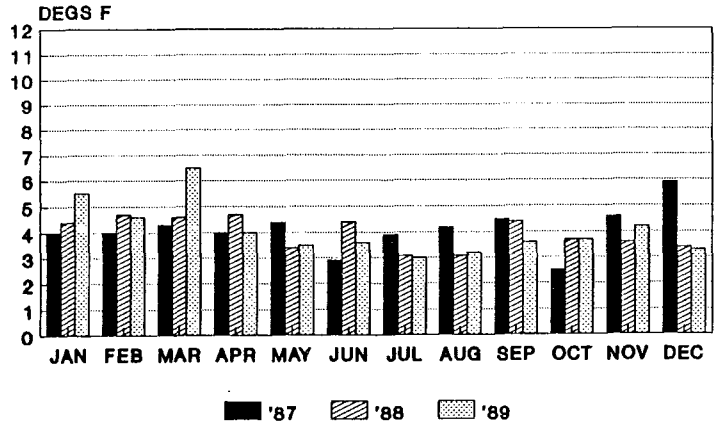
SUN VALLEY
MAE -- MAX TEMPS



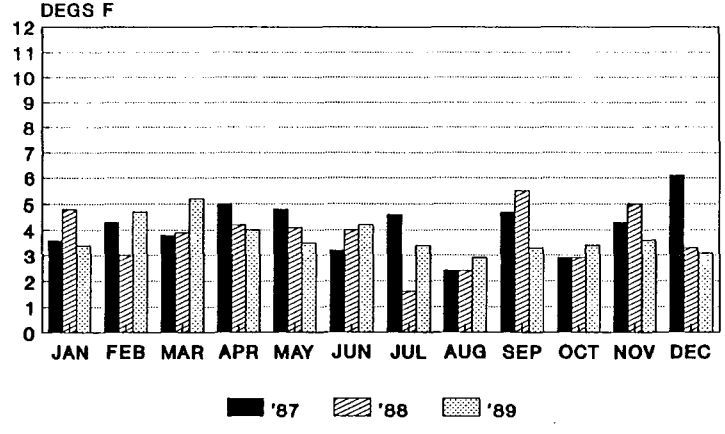
POCATELLO
MAE -- MAX TEMPS



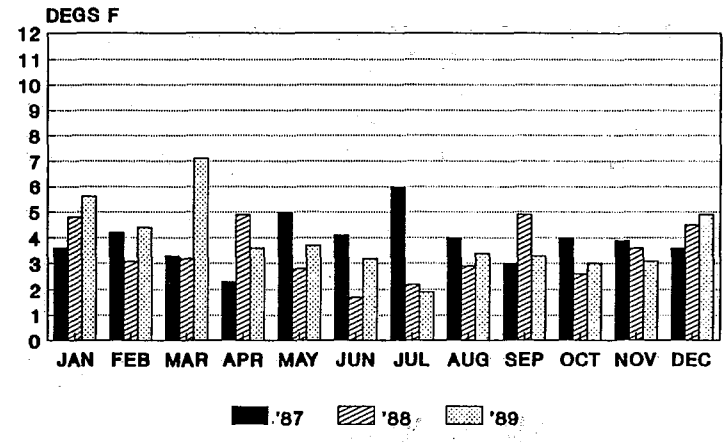
IDAHO FALLS
MAE -- MAX TEMPS



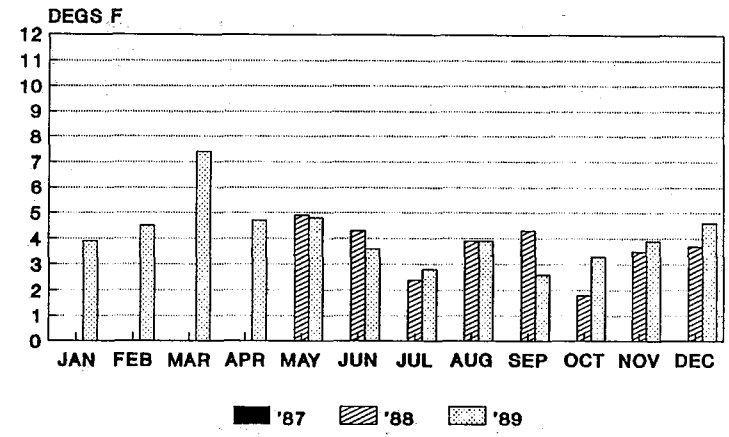
REXBURG
MAE -- MAX TEMPS



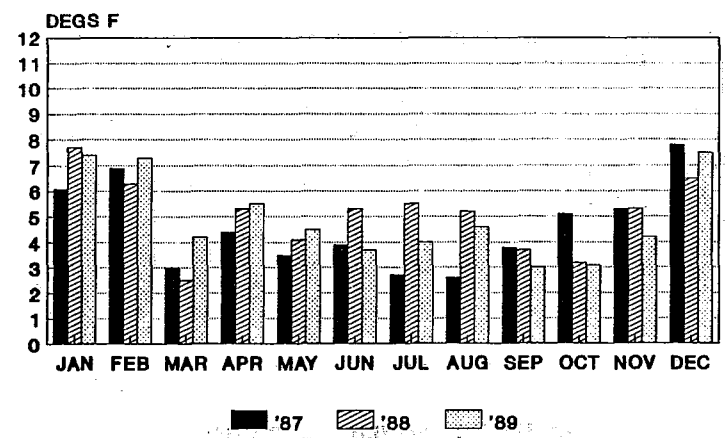
MALAD
MAE -- MAX TEMPS



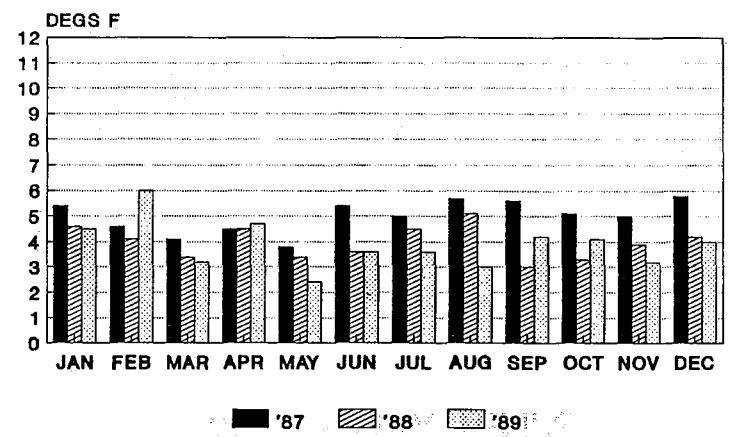
SODA SPRINGS
MAE -- MAX TEMPS



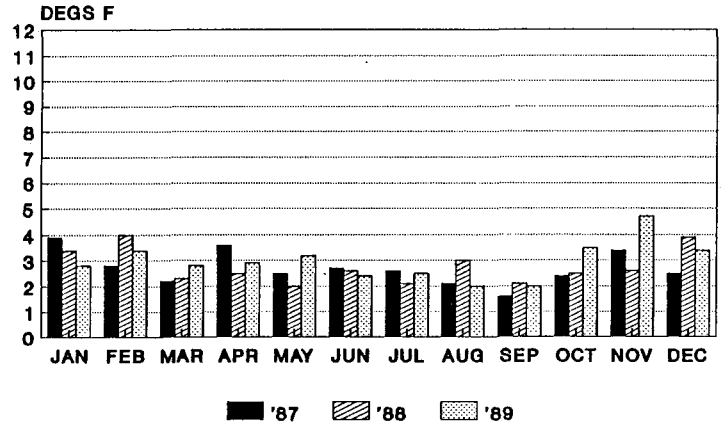
MULLAN
MAE -- MIN TEMPS



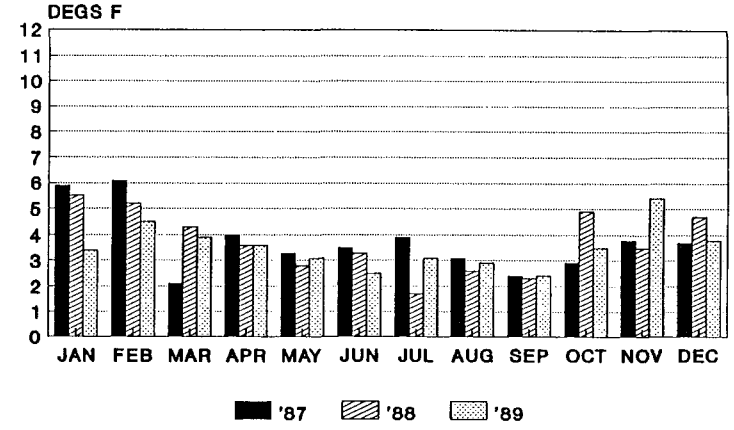
SANDPOINT
MAE -- MIN TEMPS



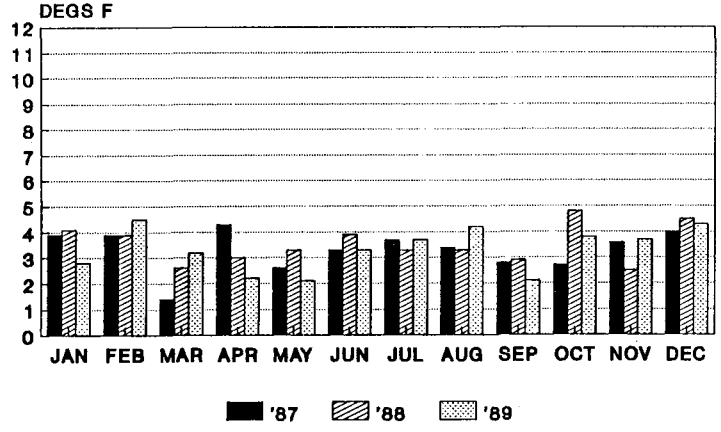
LEWISTON
MAE -- MIN TEMPS



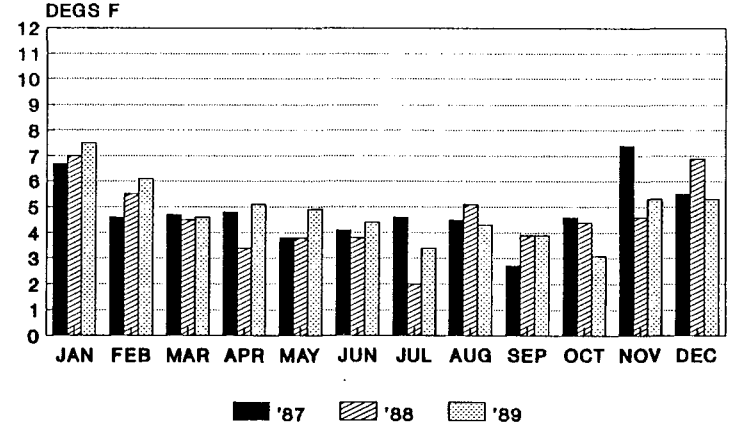
GRANGEVILLE
MAE -- MIN TEMPS



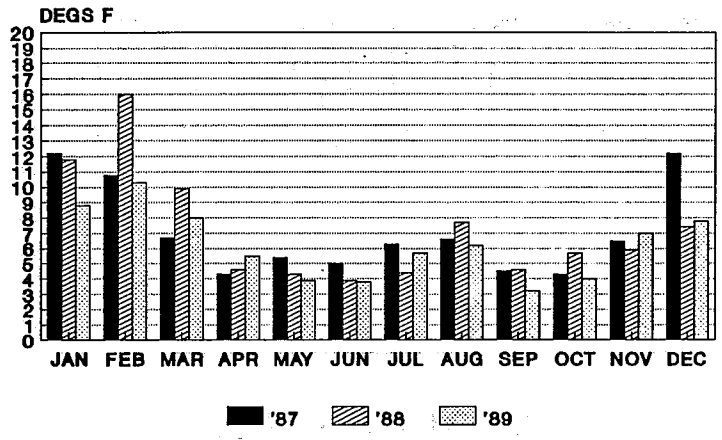
MOSCOW
MAE -- MIN TEMPS



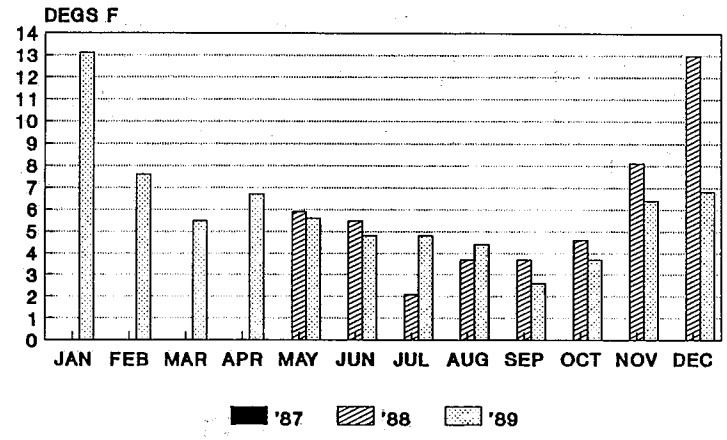
SALMON
MAE -- MIN TEMPS



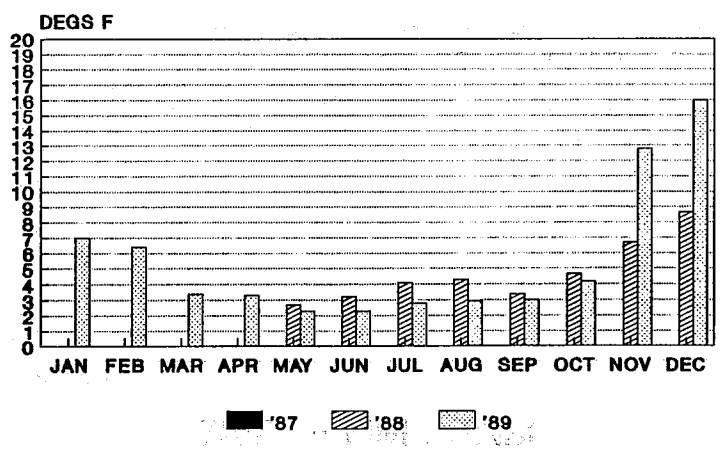
STANLEY
MAE -- MIN TEMPS



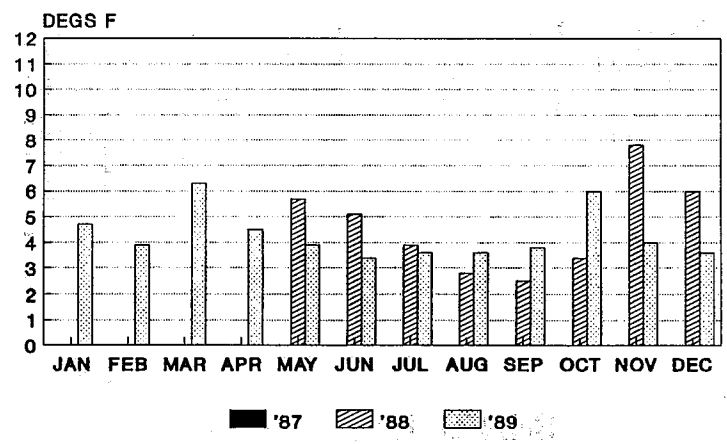
CHALLIS
MAE -- MIN TEMPS



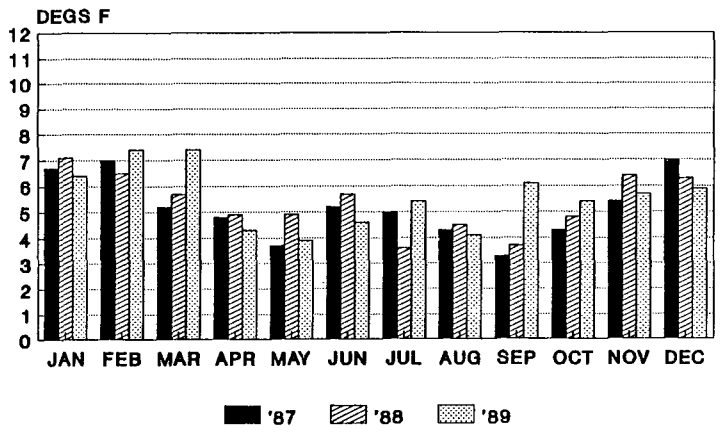
LOWELL
MAE -- MIN TEMPS



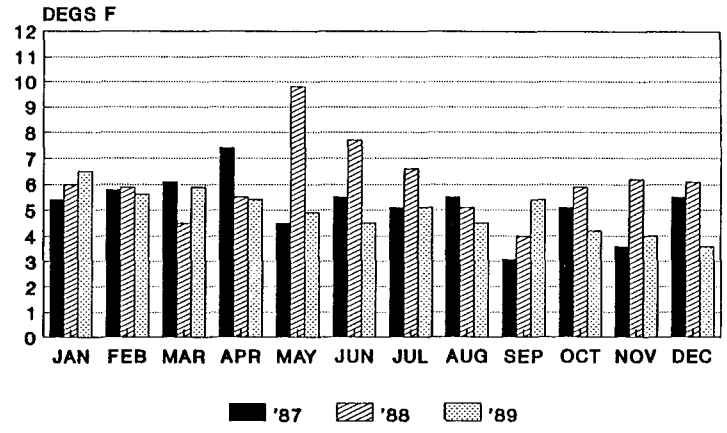
IDAHO CITY
MAE -- MIN TEMPS



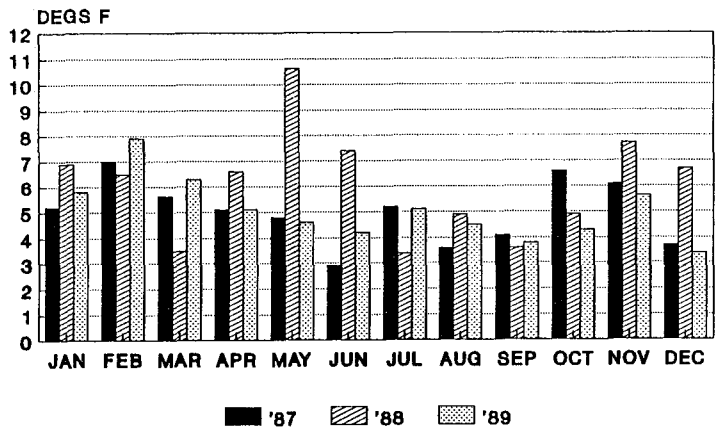
MCCALL
MAE -- MIN TEMPS



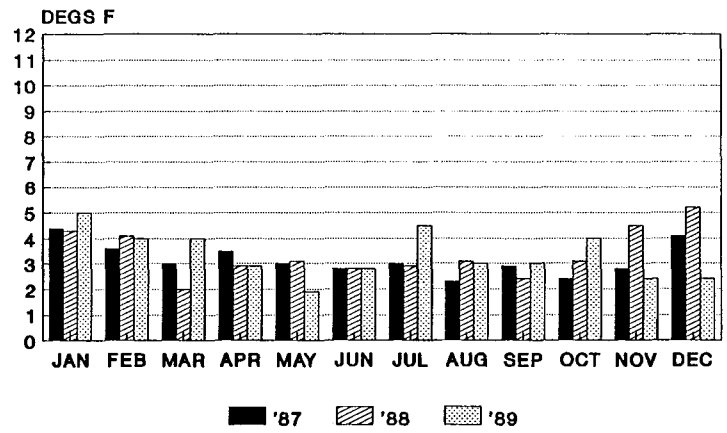
ONTARIO
MAE -- MIN TEMPS



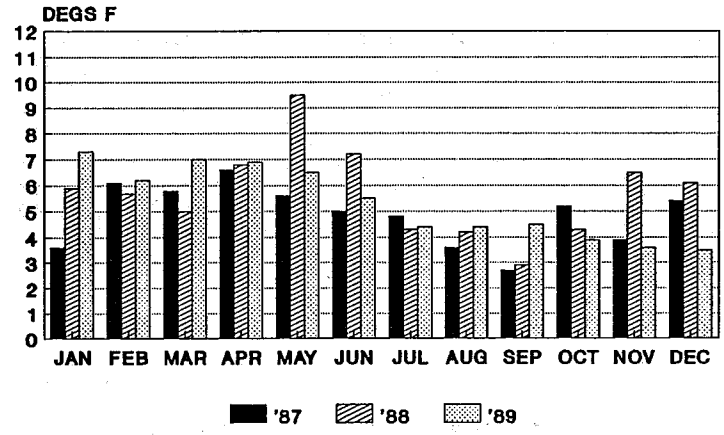
WEISER
MAE -- MIN TEMPS



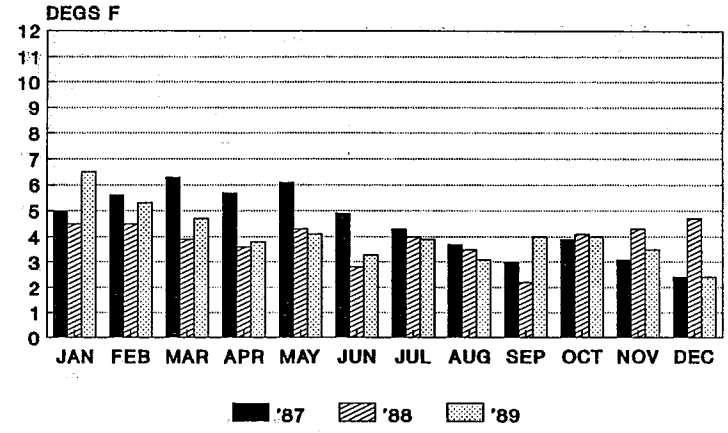
EMMETT
MAE -- MIN TEMPS



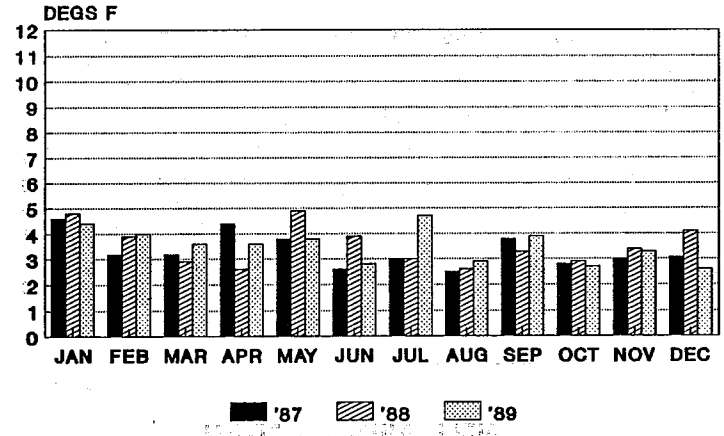
PARMA
MAE -- MIN TEMPS



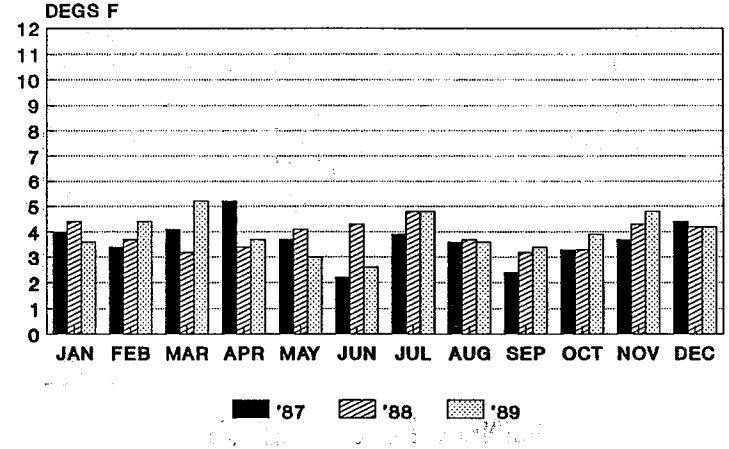
CALDWELL
MAE -- MIN TEMPS



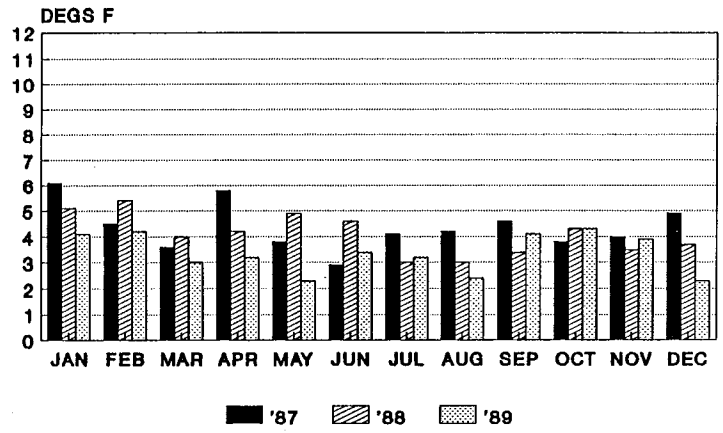
BOISE
MAE -- MIN TEMPS



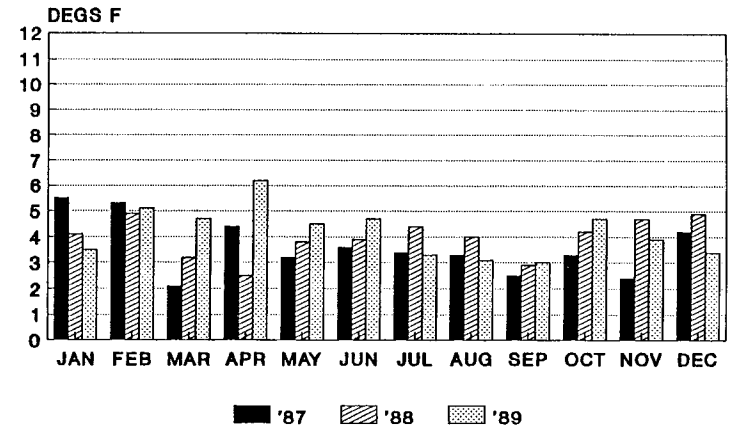
MOUNTAIN HOME
MAE -- MIN TEMPS



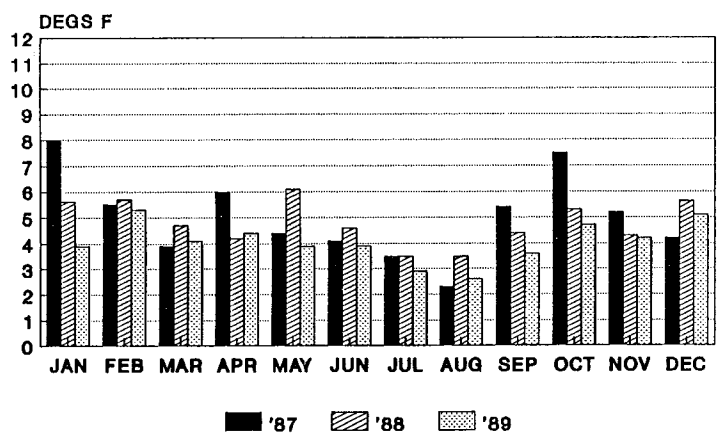
JEROME
MAE -- MIN TEMPS



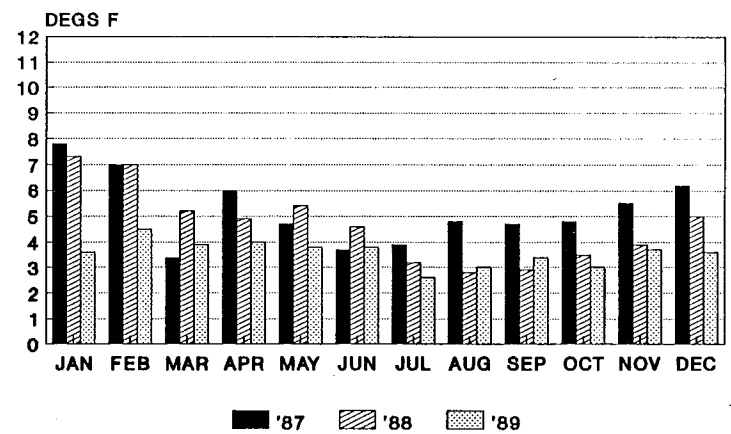
TWIN FALLS
MAE -- MIN TEMPS



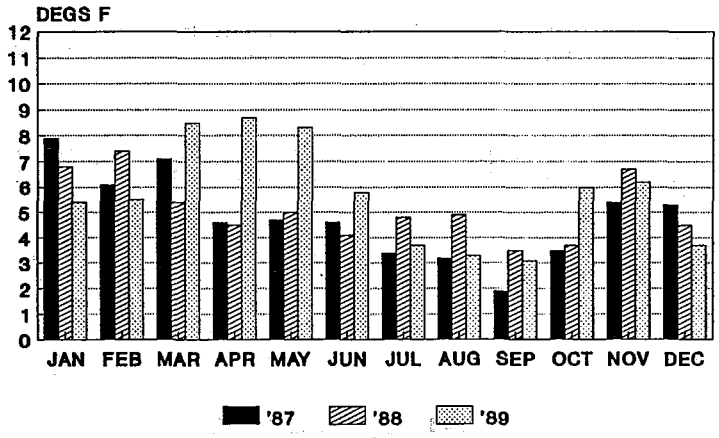
BURLEY
MAE -- MIN TEMPS



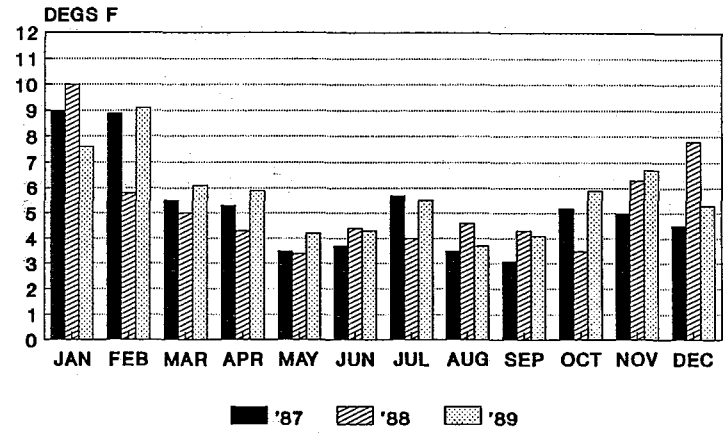
RUPERT
MAE -- MIN TEMPS



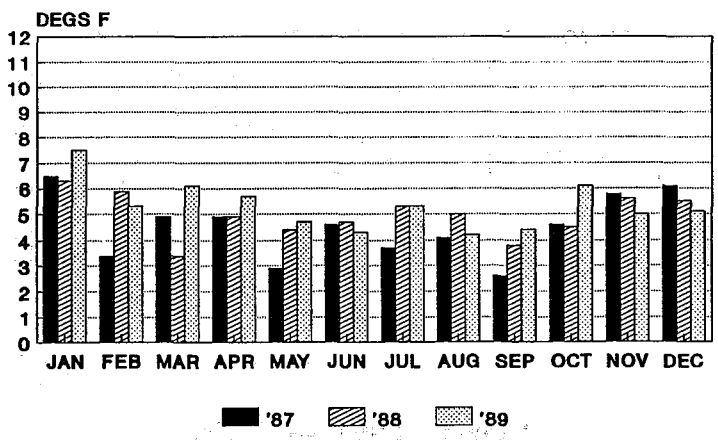
HAGERMAN
MAE -- MIN TEMPS



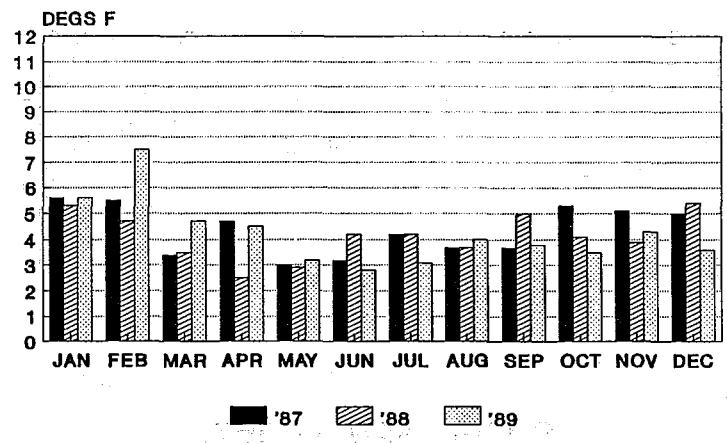
FAIRFIELD
MAE -- MIN TEMPS



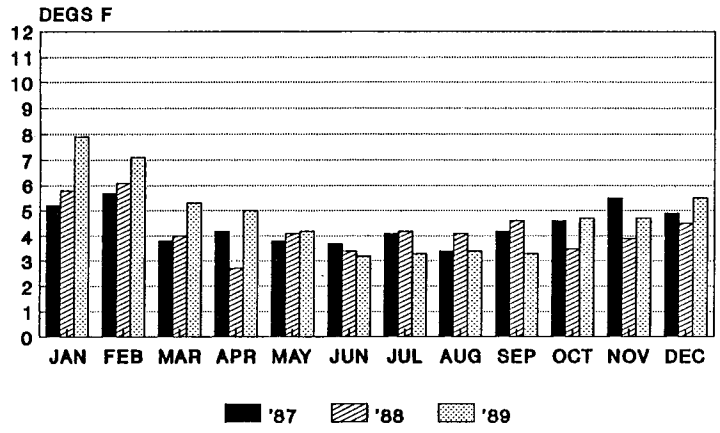
SUN VALLEY
MAE -- MIN TEMPS



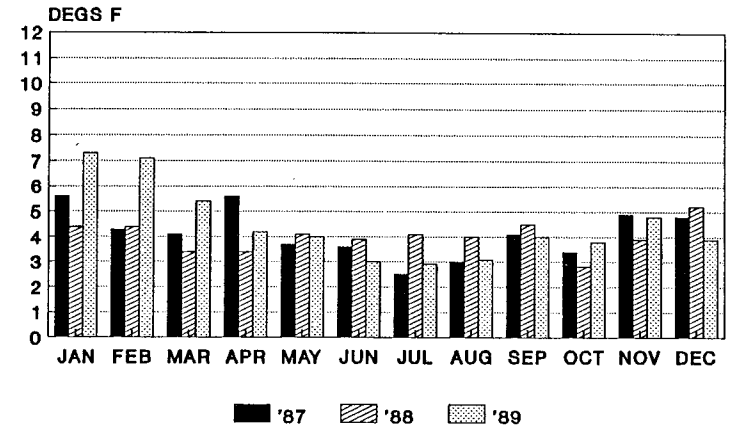
POCATELLO
MAE -- MIN TEMPS



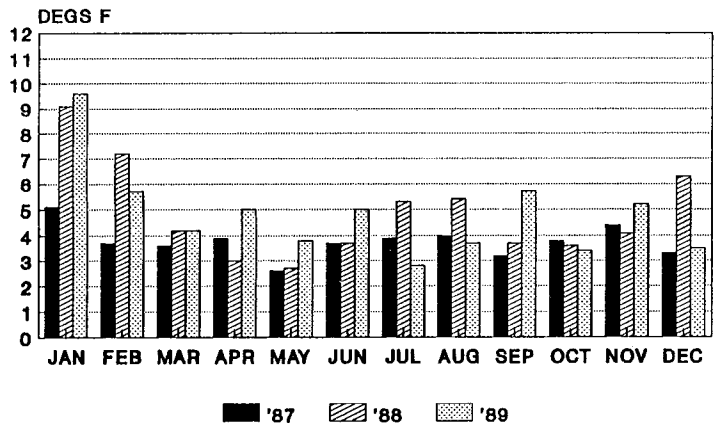
IDAHO FALLS
MAE -- MIN TEMPS



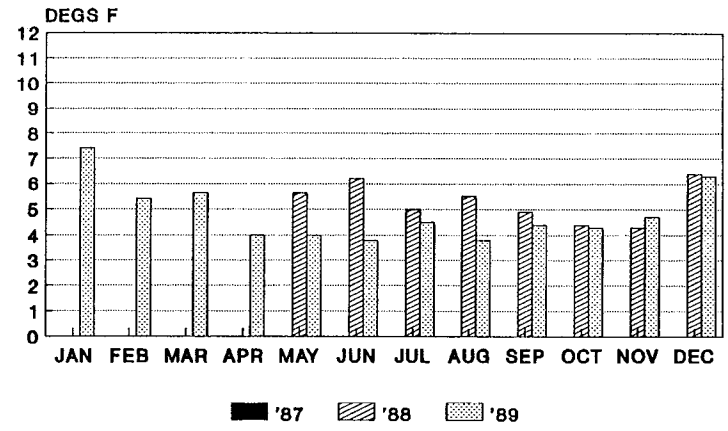
REXBURG
MAE -- MIN TEMPS



MALAD
MAE -- MIN TEMPS



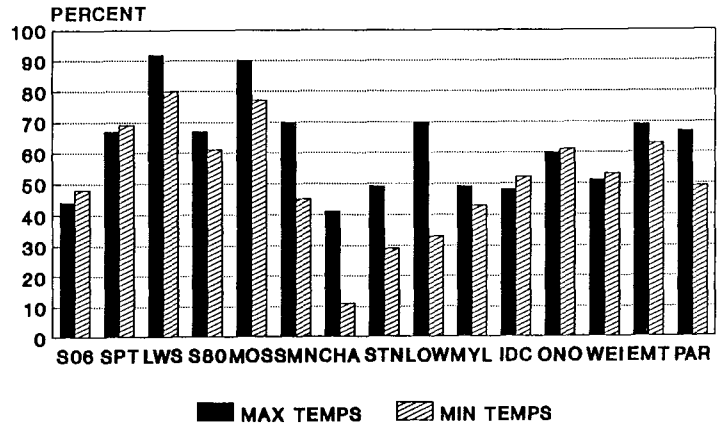
SODA SPRINGS
MAE -- MIN TEMPS



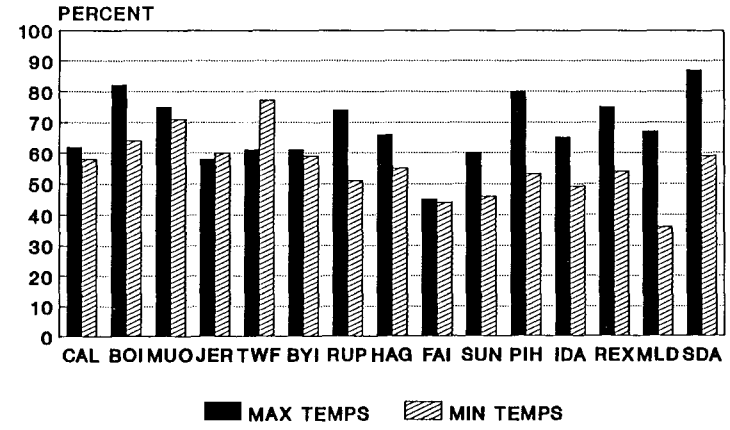
APPENDIX III

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

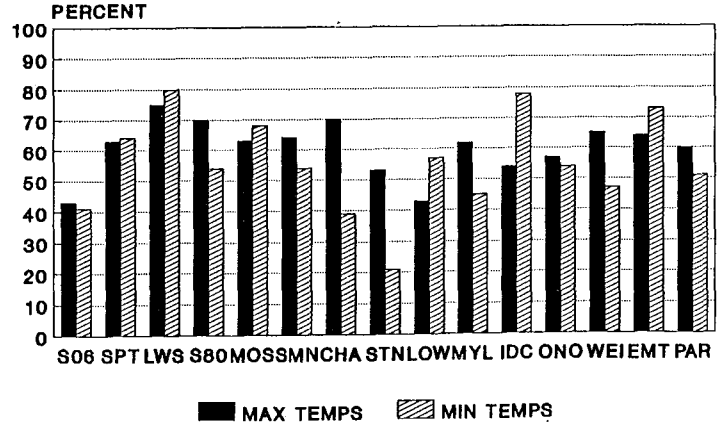


JANUARY '87-'89
PCT. FCSTS <= 5 DEGS F

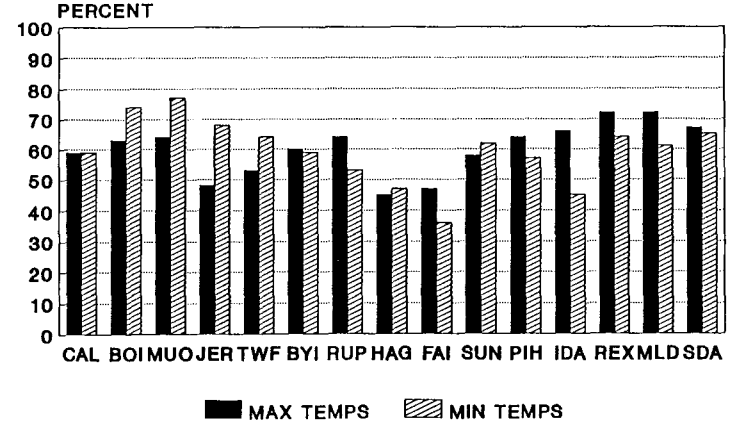


III-1

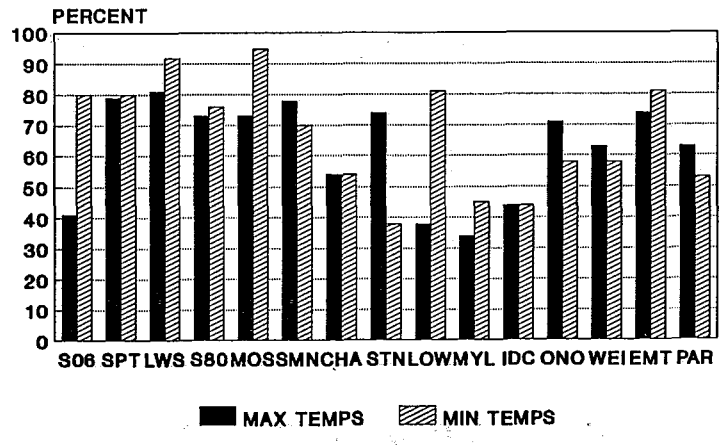
FEBRUARY '87-'89
PCT. FCSTS <= 5 DEGS F



FEBRUARY '87-'89
PCT. FCSTS <= 5 DEGS F



MARCH '87-'89
PCT. FCSTS <= 5 DEGS F



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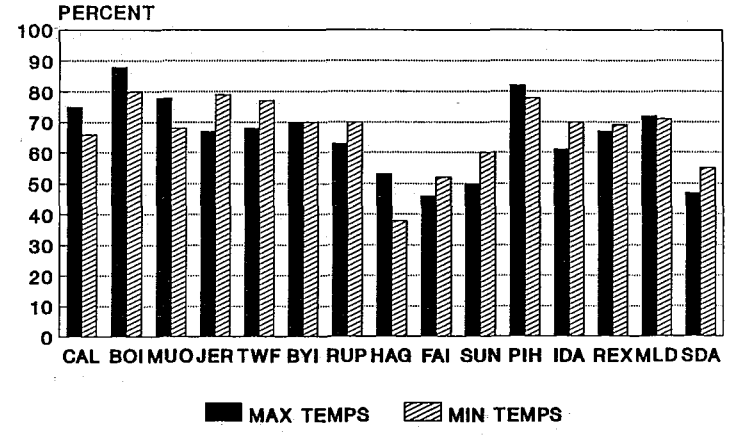
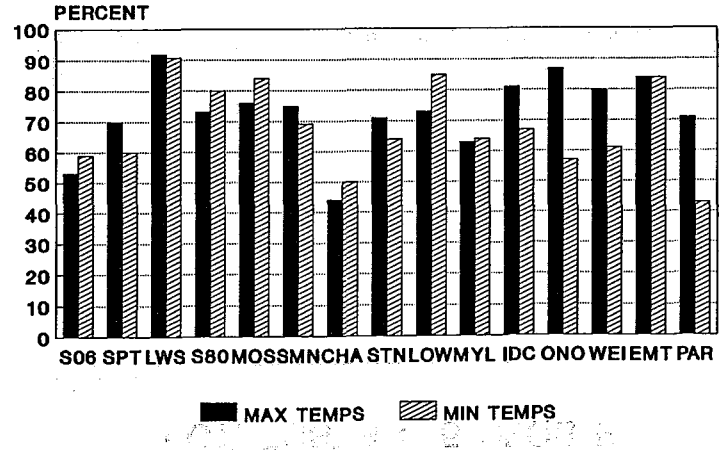


APRIL '87-'89
PCT. FCSTS <= 5 DEGS F



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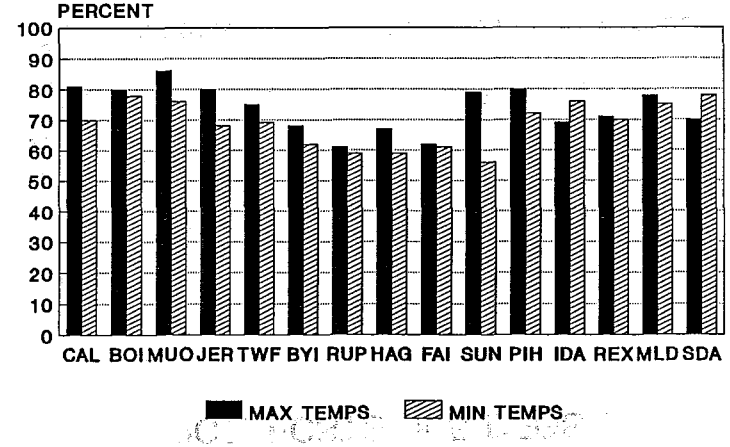
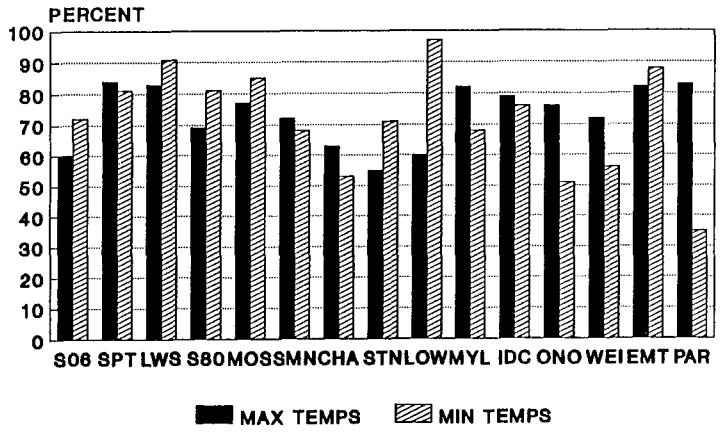
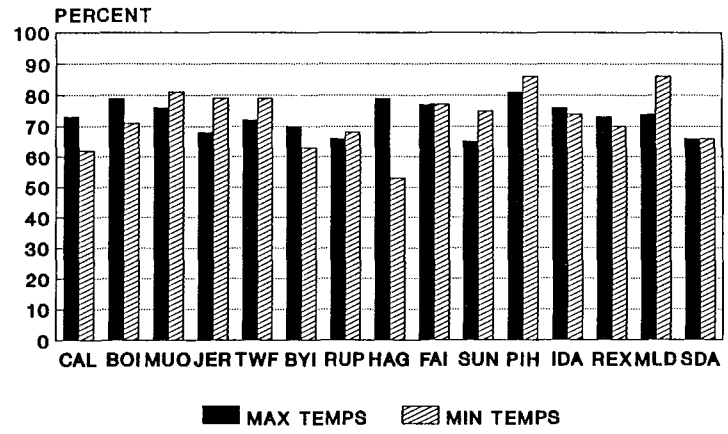


MAY '87-'89
PCT. FCSTS <= 5 DEGS F



MAY '87-'89
PCT. FCSTS <= 5 DEGS F



JUNE '87-'89
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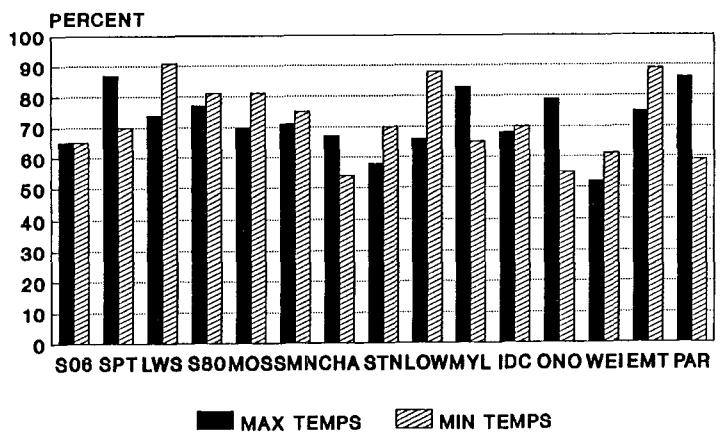
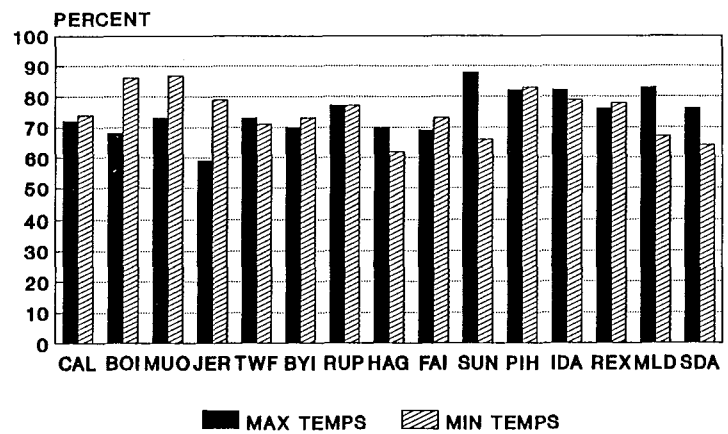


JUNE '87-'89
PCT. FCSTS <= 5 DEGS F



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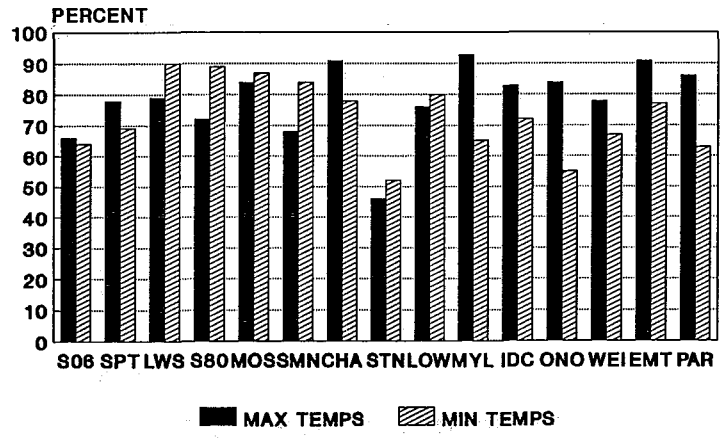

JULY '87-'89
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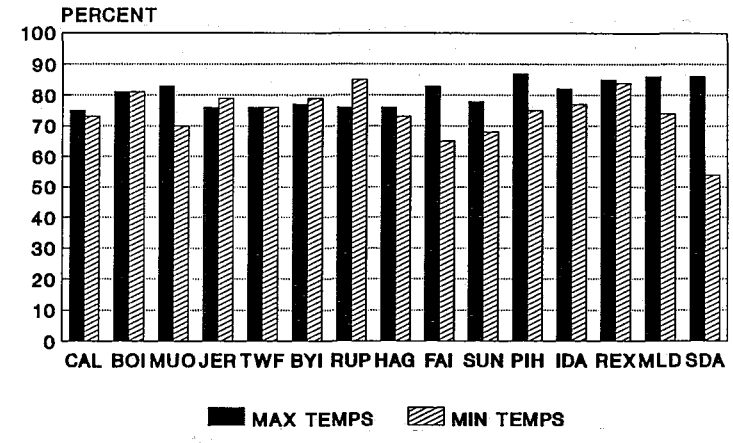
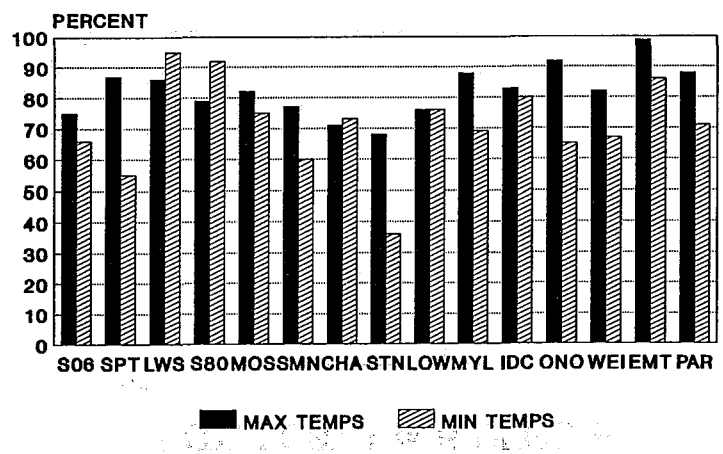


AUGUST '87-'89
PCT. FCSTS <= 5 DEGS F



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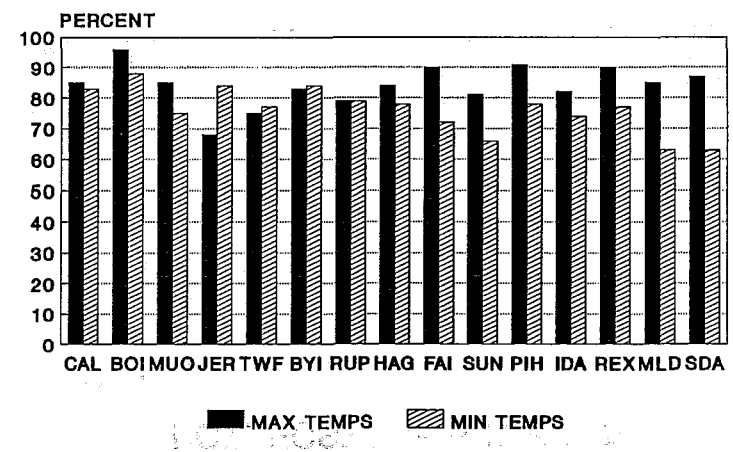
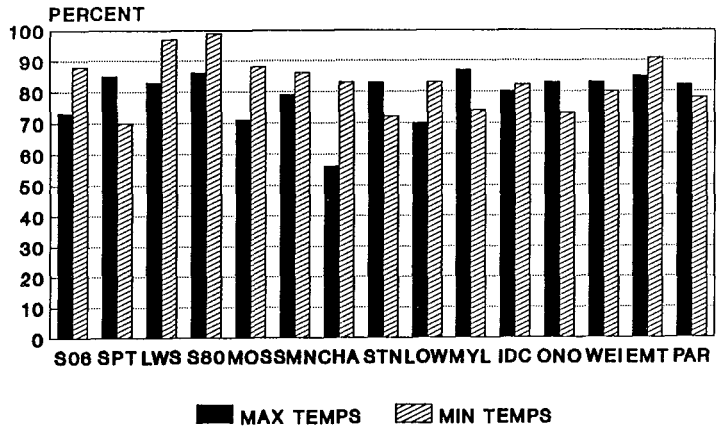


SEPTEMBER '87-'89
PCT. FCSTS <= 5 DEGS F



SEPTEMBER '87-'89
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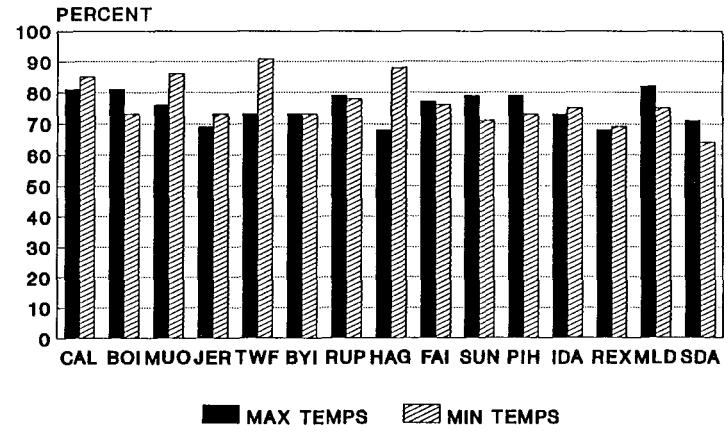

OCTOBER '87-'89
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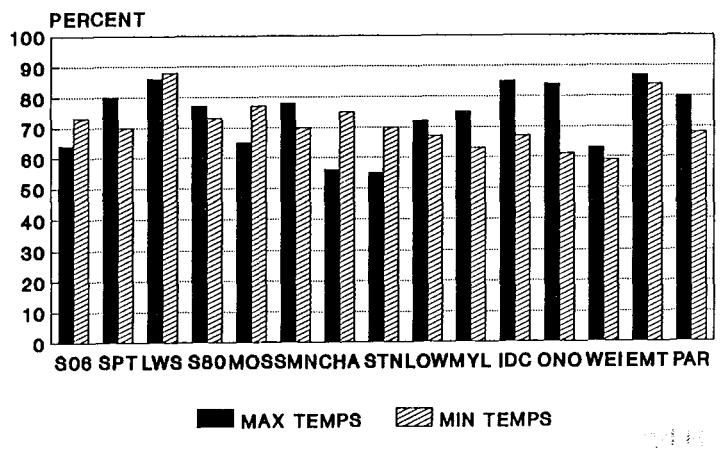

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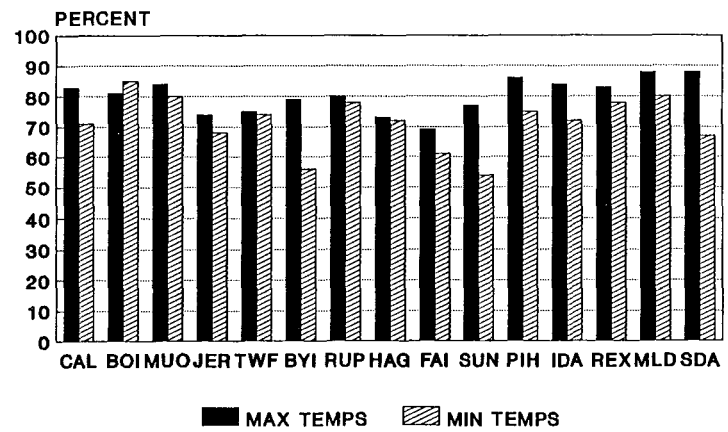

NOVEMBER '87-'89
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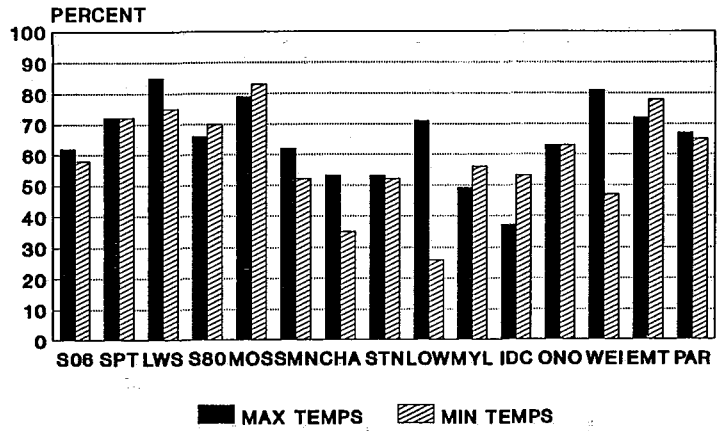

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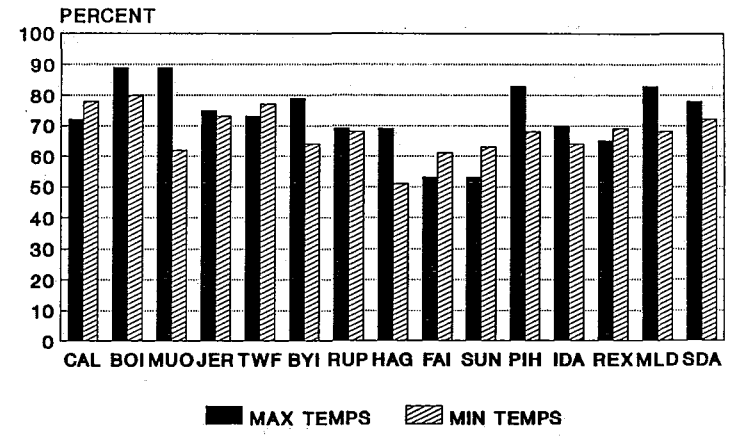

DECEMBER '87-'89
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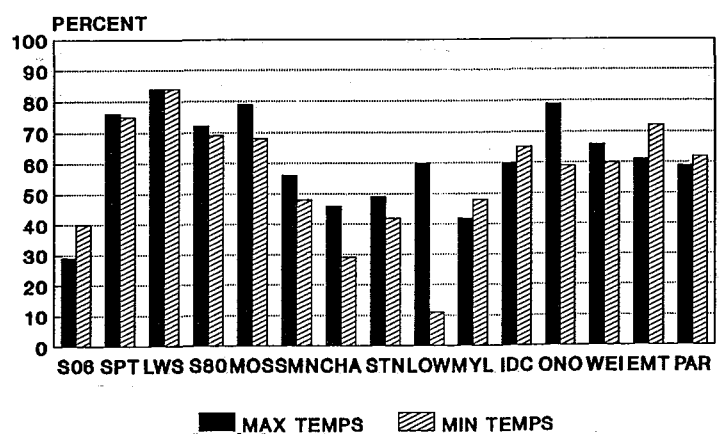

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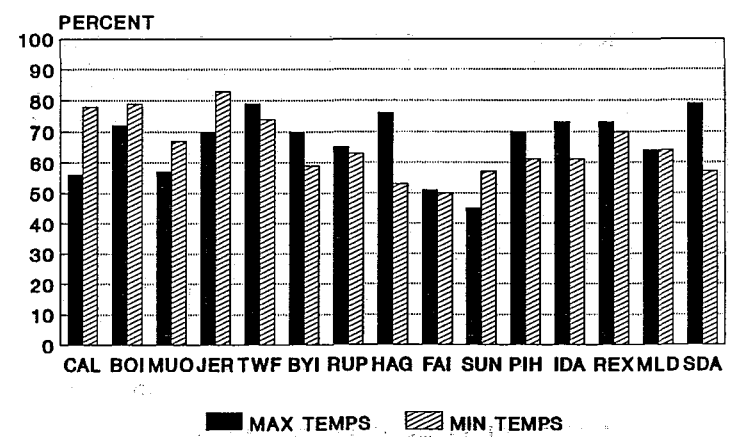

APPENDIX IV.

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 x M) + D + 150)/2)/57.3 ; Jan-Jun D= Day of month
A= (((30 x M) + D - 210)/2)/57.3 ; Jul-Dec M= Month of year

Maximum temperature equation first; Minimum temperature equation second

Mullan= (GEG + MSO)/2 - 2 -(2 x c) + (7 x s) - (4 x w)
Mullan= (GEG + MSO)/2 -(3 x w) + (4 x c)

Sandpoint= GEG + 1 + (1 x w) - (3 x c)
Sandpoint= GEG - 4 - (1 x w) + (4 x c)

Lewiston= LWS MOS max
Lewiston= LWS MOS min

Grangeville= LWS - (7 x cs) - 92.5 x w)
Grangeville= LWS - 10 - (3.5 x w) + (5 x c)

Moscow= ((LWS + 3) + (GEG - (5 x cs)))/2
Moscow= ((LWS + 4) + (GEG -5))/2

Lowell= (LWS - 5) + (3 x c)
Lowell= (LWS - 3) - (4 x w) + (2 x c)

Salmon= MSO + 4
Salmon= MSO + 3

Stanley= (PIH - 9 x cs) - (5 x c) - (3 x w)
Stanley= (PIH - 15) + (8 x c)

Mccall= (BOI - 10 x cs) - (1 x w) - (4 x c)
Mccall= (BOI - 15) - (5 x w) + (4 x c)

Idaho City= (BOI - 4) + (5 x s)
Idaho City= (BOI -12) + (5 x w)

Challis= (PIH - 5) + (6 x w)
Challis= (PIH + 1) - (5 x w)

Ontario= (BOI + 4 x cs) + (2 x w) - (4 x c x cs)
Ontario= (BOI - 2) + (5 x w) + (4 x c)

Weiser= ONO - (2 x cs)
Weiser= ONO - 2 + (.9 x w)

Emmett= BOI + 2 - (1 x w)
Emmett= BOI - 2 - (1 x 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)

Mullan= ((GEG + MSO)/2) - 2 + (3 x w)

Sandpoint= (GEG + 4) - (2 x c)
Sandpoint= (GEG - 3) + (4 x c)

Grangeville= (LWS - 9 x cs) - (3 x w)
Grangeville= (LWS - 8) - (3.5 x w) + (5 x c)

Lowell= (LWS - 3) - (4 x w) + (2 x c)
Lowell= (LWS - 5) + (3 x c)

Salmon= MSO + 5
Salmon= MSO - 1 + (3 x c)

Stanley= (BOI - 13) + (11 x c)
Stanley= (BOI - 30) + (27 x c) - (6 x c)

Mccall= (BOI - 9) - (6 x c)
Mccall= (BOI -17) + (10 x c) + (3 x w)

Idaho City= (BOI + (2 x w) + (2 x c)
Idaho City= BOI - 14 + (12 x c) + (1.5 x w)

Challis= PIH - 3 + (4 x w)
Challis= PIH + 1 + (5 x w)

Ontario= (BOI - 3) + (3 x w)
Ontario= (BOI - 3) + (4 x w) - (2 x c)

Weiser= ONO - 2
Weiser= ONO - 1

Emmett= (BOI + 1) - (1 x w)
Emmett= (BOI - 1) - (1 x w)

Parma= ONO + 1
Parma= ONO + 1

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

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

Jerome= BYI + 3 - (2 x w)
Jerome= BYI + 2 - (2 x w)

Twin Falls= (BYI + 3) + (2 x w)
Twin Falls= (BYI + 1) + (3 x w)

Rupert= BYI + 3
Rupert= BYI - 1 + (2 x w)

Hagerman= BYI + 10 + (2 x w) - (3 x c)
Hagerman= BYI + 5 + (2 x w) + (2 x c)

Fairfield= BOI - 10 + (3 x w) - (2 x c)
Fairfield= ((BOI + PIH)/2) - 17 - (5 x w) + (3 x c)

Sun Valley= (BOI - 7) + (3 x w) - (2 x c)
Sun Valley= (BOI - 15) - (3 x w) + (3 x c)

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

Rexburg= PIH - 3
Rexburg= PIH - 4 + (2 x w)

Malad= PIH + (4 x c)
Malad= PIH -5 + (4 x c)

Soda Springs= (MLD - 6) + (3 x c)
Soda Springs= (MLD - 5) + (4 x w)

142 The Usefulness of Data from Mountaintop Fire Lookout Stations in Determining Atmospheric Stability. Jonathan W. Corey, April 1979. (PB298899/AS)
143 The Depth of the Marine Layer at San Diego as Related to Subsequent Cool Season Precipitation Episodes in Arizona. Ira S. Brenner, May 1979. (PB298817/AS)
144 Arizona Cool Season Climatological Surface Wind and Pressure Gradient Study. Ira S. Brenner, May 1979. (PB298900/AS)
146 The BART Experiment. Morris S. Webb, October 1979. (PB80 155112)
147 Occurrence and Distribution of Flash Floods in the Western Region. Thomas L. Dietrich, December 1979. (PB80 160344)
149 Misinterpretations of Precipitation Probability Forecasts. Allan H. Murphy, Sarah Lichtenstein, Baruch Fischhoff, and Robert L. Winkler, February 1980. (PB80 174576)
150 Annual Data and Verification Tabulation - Eastern and Central North Pacific Tropical Storms and Hurricanes 1979. Emil B. Gunther and Staff, EPHC, April 1980. (PB80 220486)
151 NMC Model Performance in the Northeast Pacific. James E. Overland, PMEL-ERL, April 1980. (PB80 196033)
152 Climate of Salt Lake City, Utah. Wilbur E. Figgins (Retired) and Alexander R. Smith. Fourth Revision, March 1989. (PB89 180624/AS)
153 An Automatic Lightning Detection System in Northern California. James E. Rea and Chris E. Fontana, June 1980. (PB80 225592)
154 Regression Equation for the Peak Wind Gust 6 to 12 Hours in Advance at Great Falls During Strong Downslope Wind Storms. Michael J. Oard, July 1980. (PB91 108367)
155 A Raininess Index for the Arizona Monsoon. John H. Ten Harkel, July 1980. (PB81 106494)
156 The Effects of Terrain Distribution on Summer Thunderstorm Activity at Reno, Nevada. Christopher Dean Hill, July 1980. (PB81 102501)
157 An Operational Evaluation of the Scofield/Oliver Technique for Estimating Precipitation Rates from Satellite Imagery. Richard Ochoa, August 1980. (PB81 108227)
158 Hydrology Practicum. Thomas Dietrich, September 1980. (PB81 134033)
159 Tropical Cyclone Effects on California. Arnold Court, October 1980. (PB81 133779)
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