



**Western Region Technical Attachment
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Temperature Verification in the Pacific Northwest

As detailed last year in Western Region Technical Attachment (WRTA) 88-24, four WSFOs in the Pacific Northwest (Seattle, Portland, Boise, Great Falls) have been providing quantitative precipitation forecasts (QPF) for numerous sites to the Northwest River Forecast Center (NWRFC). These QPFs are issued once a day and are used as input into the NWRFC hydrologic snow melt and stream flow models. As shown in WRTA 88-24, the WSFOs demonstrated significant skill in predicting rainfall events and amounts for days 1, 2 and 3.

The QPF season generally runs from October 1 to the time when spring run-off has abated, usually in July. From about mid-March until the end of the season, the WSFOs also provide 5-day maximum temperature forecasts for many sites in the Pacific Northwest. These forecasts are also input into the hydrologic models to aid in snow melt and stream predictions. This attachment will review the temperature verification for 1988.

As with the QPF data, the daily temperature forecasts and observations for each site are transmitted on AFOS and collected by the verification software on the AOS computer system at WSFO Boise. Daily and weekly cumulative verification summaries are generated and transmitted back to the WSFOs. The verification software is entirely automated.

The total number of sites for which maximum temperatures are forecast is 25. For the most part, these sites are remote and, except for a few, there is no central numerical guidance available for these stations. Once a day, about 1200Z, the WSFOs prepare daily maximum temperature forecasts for these sites, out to 5 days, and transmit this with the QPFs to the NWRFC.

Table 1 shows the absolute and algebraic errors for forecasts made by three WSFOs for the period March 1 - July 5, 1988. (Note: Because of a data base problem, data for one of the WSFOs could not be included). The absolute temperature error is quite large, increasing with projection to almost 8 degrees by day 5. The size of the error may be partially attributed to a lack of numerical guidance for these locations. Also, since most of these sites are rather remote and at various elevations, numerical guidance for nearby stations may not be applicable. Additionally, at the time of the forecast, the forecaster does not have the previous days maximum temperature for these sites. This data does not arrive at the WSFO until 1830Z the following day. So the forecaster is working with a maximum temperature observation almost two days old. Nonetheless, it seems that there is room for significant improvement in these scores. The algebraic errors in Table 1 show steadily increasing negative values, culminating in significantly underforecast maximum temperatures by day 5.

Individual WSFO results are given in tables 2-4. The trend is the same for each office, showing absolute errors increasing with time and an increasing negative bias with time. In spite of the errors noted, the NWRFC feels that the maximum temperature forecasts are extremely valuable in predicting snow melt and stream flow during the run-off season, and are therefore an important input into the hydrologic models.

An added feature of the verification software package on the AOS computer in Boise is the dial-in option. Each WSFO can dial into a menu-driven program which allows them to produce their own verification statistics for any period, and for individual sites and forecasters. We suggest that offices participating in this forecast program use this feature to identify trends and biases.

References:

Barker, Timothy B., 1987: AOS QPF Verification User's Guide, Oct 26 pp.

Western Region Technical Attachment 88-24, 1988: QPF Verification in the Pacific Northwest, July.

Table 1

```
*****
START      STOP      WSFO      SITE      FCSTR #    PCPN MODE
OCT  1    JUL  5    ALL      ALL      0         ALL DAYS
*****
```

| | DAY 1 | DAY 2 | DAY 3 | DAY 4 | DAY 5 | OVERALL |
|------------|-------|-------|-------|-------|-------|---------|
| ABS ERR... | 4.30 | 5.16 | 6.36 | 6.61 | 7.80 | 6.10 |
| ALG ERR... | .06 | -.27 | -1.40 | -1.60 | -2.75 | -1.24 |

Table 2

```
*****
START      STOP      WSFO      SITE      FCSTR #    PCPN MODE
OCT  1    JUL  5    BOI      ALL      0         ALL DAYS
*****
```

| | DAY 1 | DAY 2 | DAY 3 | DAY 4 | DAY 5 | OVERALL |
|------------|-------|-------|-------|-------|-------|---------|
| ABS ERR... | 3.94 | 5.16 | 6.63 | 7.11 | 9.50 | 6.47 |
| ALG ERR... | -.03 | -.71 | -2.05 | -2.09 | -3.90 | -1 |

Table 3

```
*****
START      STOP      WSFO      SITE      FCSTR #    PCPN MODE
OCT  1    JUL  5    SEA      ALL      0         ALL DAYS
*****
```

| | DAY 1 | DAY 2 | DAY 3 | DAY 4 | DAY 5 | OVERALL |
|------------|-------|-------|-------|-------|-------|---------|
| ABS ERR... | 4.27 | 5.14 | 6.08 | 6.01 | 6.88 | 5.75 |
| ALG ERR... | -.26 | -.16 | -1.22 | -1.49 | -2.50 | -1.22 |

Table 4

```
*****
START      STOP      WSFO      SITE      FCSTR #    PCPN MODE
OCT  1    JUL  5    GTF      ALL      0         ALL DAYS
*****
```

| | DAY 1 | DAY 2 | DAY 3 | DAY 4 | DAY 5 | OVERALL |
|------------|-------|-------|-------|-------|-------|---------|
| ABS ERR... | 5.13 | 5.40 | 6.67 | 8.29 | 7.99 | 6.69 |
| ALG ERR... | 1.84 | .48 | -.43 | -.69 | -.94 | .06 |