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CORRELATION OF FIRE WEATHER OBSERVING SITES WITH MOS SITES ACROSS WYOMING

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1. Introduction

Numerical guidance to make forecasts across a given area has been well documented. One of the drawbacks of specific numerical guidance (like MOS guidance for specific cities) is that it cannot be used directly for other places in the forecast area. For example, it would obviously be unwise to use a MOS site forecast for a site 3000 feet higher, even though the sites may only be a few miles apart.

This is one of the many problems that face fire weather forecasters in trying to develop automated forecasts using MOS guidance. One way to solve this problem is to develop regression equations for the individual fire weather sites based on MOS guidance (Walts and Pochop, 1977). This has been attempted at the WSFO Cheyenne, and the results are presented here.

The final objective of all this research is the implementation of an automated fire weather forecast product. Such efforts have already been documented (Mollner and Olsen, 1978), but it is hoped that a regression equation approach would generate more accurate forecasts for the specific sites.

2. Methodology

To obtain regression equations one must have raw data. The data that was input as independent variables in this study were 1 PM LST temperatures for the eight MOS sites that either are in Wyoming or surround the state. These sites were Cheyenne (CYS), Casper (CPR), Lander (LND), Sheridan (SHR), Rock Springs (RKS), Scottsbluff (BFF), Rapid City (RAP), and Billings (BIL). Data was input for the months June through September, which roughly corresponds to the fire weather season. Data was available for three years.

The dependent variables were the corresponding 1 PM LST temperatures for 15 fire weather observing sites. These sites were chosen since fire weather zone forecasts are made for the stations. Also, they are widespread across the forecast region so that they represent most of the climates present in the

region. A list of these stations are presented in the "Results" section. Figure 1 shows a map of the Wyoming fire weather forecast region, and where the 15 fire weather sites are in relation to the MOS sites.

All of the data for each station was input into an AFOS file. To save time, and since monthly average temperatures did not deviate very much, it was decided to place all the data for each station in one file. It would have been more accurate to do each month separately, and, in fact, this was done for a test station. The results from that test led the authors to believe that a simple summer correlation would be close enough as compared to a monthly correlation. Records for each station averaged about 288. More data, of course, would have led to more accurate equations, or at least more confidence in those equations.

After the data was input, the regression equations were computed using the AFOS program "REGRS" (Stone, 1985). This program uses a backward elimination process to determine the best correlation between independent and dependent variables. Multiple correlation coefficients (MCC) and regression equation coefficients are generated. The program was run for each station.

3. Results

The number of records, the resulting equations, and the multiple correlation coefficients are listed.

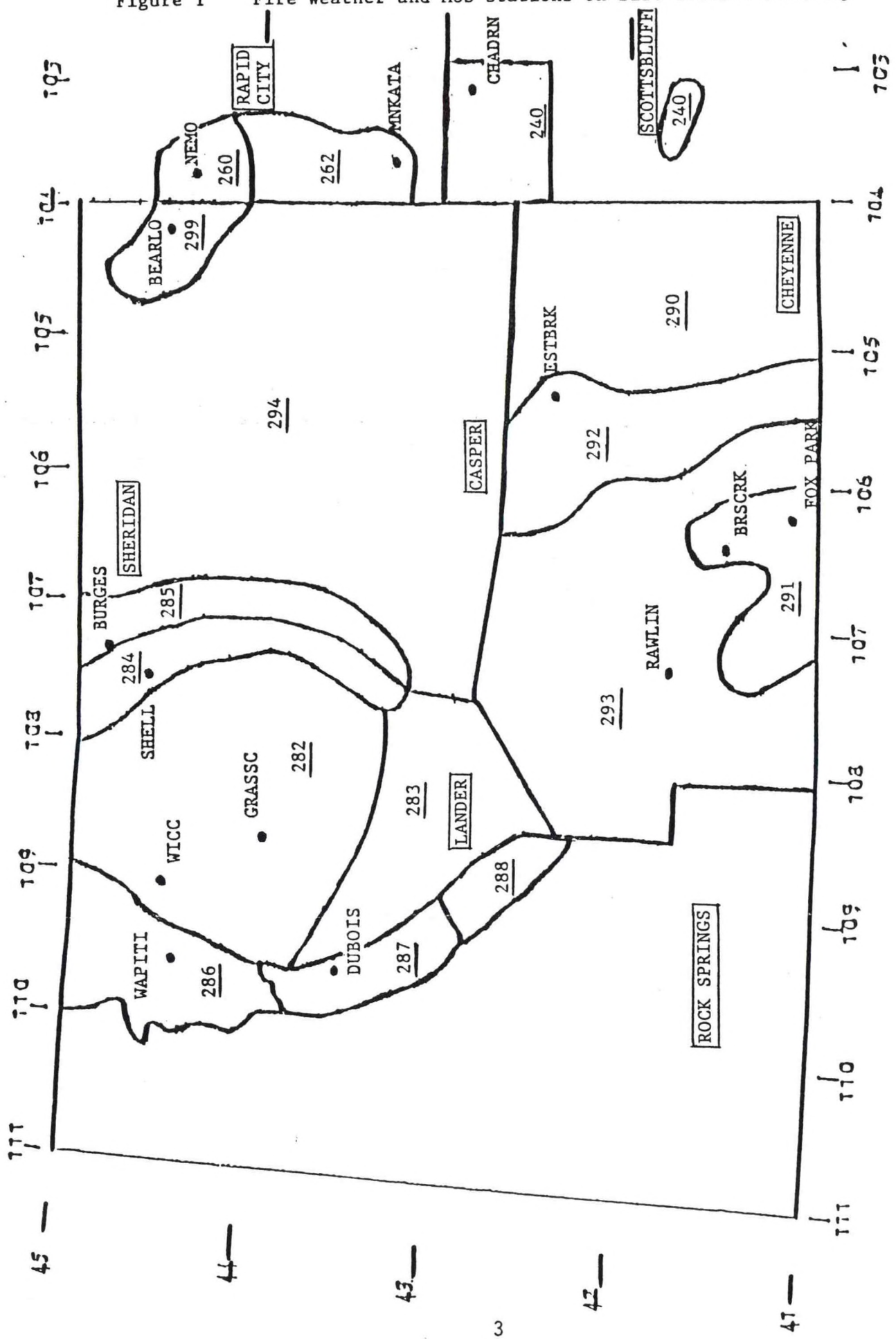
Station	Record	Equation	MCC
Bearlodge	317	.41(SHR) + .68(RAP) - 10.2	.915
Brush Creek	303	.29(CYS) + .52(CPR) + 9.6	.845
Burgess	302	.35(CPR) + .51(SHR) - 5.6	.915
Chadron	213	.55(BFF) + .36(RAP) + 5.4	.917
WICC (Cody)	301	.45(SHR) + .45(BIL) + 3.4	.918
Dubois	232	.91(LND) - .10(RAP) + 7.5	.787
Esterbrook	311	.50(CYS) + .58(CPR) - 3.7	.908
Fox Park	309	.33(CYS) + .46(CPR) + 1.8	.846
Grass Creek	284	.38(CPR) + .56(SHR) + 0.2	.934
Medicine Wheel	272	.35(CPR) + .45(SHR) - 5.8	.904
Minnekahta	308	.41(BFF) + .57(RAP) - 2.2	.936
Nemo	319	.27(BFF) + .65(RAP) - 2.1	.918
Rawlins	266	.52(CPR) + .25(LND) + 12.1	.859
Shell	294	.46(CPR) + .39(SHR) - 3.7	.892
Wapati	287	.44(LND) + .45(BIL) + 2.2	.901

The average MCC was .893.

4. Conclusion

Similar techniques will be used to calculate relative humidities. It is felt that wind speeds, especially in the mountains, will have little correlation with MOS output wind speeds. All of these equations will be written into a computer program (using MOS as input), and the output will be in the form of written zone forecasts.

Figure 1 Fire Weather and MOS stations on fire weather zone map



5. References

Mollner, M. and Olsen, D., 1978: Automated Fire Weather Forecasts. National Weather Service Western Region Technical Memorandum NWS WR-131.

Stone, H. M., 1985: Correlation and Regression Equation Program - REGRS, National Weather Service Eastern Region Computer Program NWS ERCP-31.

Walts, D. S., and L. O. Pochop, 1977: Operational Objective Temperature Forecasts at Non-MOS Stations. Mon. Wea. Rev., 105, 3-8.