

Western Region Technical Attachment No. 90-32 September 11, 1990

PACIFIC NORTHWEST QPF VERIFICATION 1989-1990

A program which verifies quantitative precipitation forecasts (QPFs) issued by WSFOs Seattle, Portland, Great Falls, and Boise for the Northwest River Forecast Center continues to run on the AOS computer at WSFO Boise, Idaho. The user-friendly aspects of this program, which began in 1984, are documented in Hill and Mathewson (1986). Figures 1 and 2 depict the QPF forecast points.

As noted in Western Region Technical Attachment (WRTA) 89-28, the principal utility of the verification program is that it allows forecasters to easily view their individual scores for one or more forecast points. This can be very helpful in determining and correcting forecast deficiencies. Useful information can also be gained by perusing composite forecast staff scores. For example, changes (hopefully improvements) in year-to-year scores can provide insight into the impacts of such events as modifications to guidance products and changes in staffing.

Table 1 gives composite scores for each WSFO (identified only as E1 or E2 for east-side and W1 or W2 for west-side offices) for the period October 1, 1989 through July 31, 1990. Comparison of the scores in table 1 with those in table 2 of WRTA 89-28 (not shown) for the October 1988 through July 1989 period indicates that forecasts from WSFO E1 verified with almost identical accuracy. WSFO W1 showed modest improvement over the previous year. Recall that the Threat score is defined as the fraction of the time that precipitation was correctly forecast when there was a "threat", i.e., when precipitation either occurred or was forecast to occur. The Probability of Detection (POD) is defined as the number of times that precipitation was correctly forecast to occur divided by the number of times precipitation actually occurred. Both Threat and POD can vary between 1 (for all correct forecasts) and 0 (for all incorrect forecasts). The Bias can vary from less than one (dry bias) to greater than one (wet bias), with unity indicating no bias. The False Alarm is the fraction of the time that precipitation was forecast to occur but did not. Thus, False Alarm can vary from 0 (for perfect forecasts) to 1 (for all incorrect forecasts). WSFO E2 scored modest declines in Threat scores and False Alarm rate, while their overall Percent Correct (precipitation versus no precipitation) showed an improvement. Note that for E2, the frequency of precipitation events decreased significantly for this past season compared to the previous. Table 1 also indicates that WSFO W2 had overall scores which showed higher False Alarm rates, lower Threat scores, and a wetter bias. For W2 there was also a significant decrease in the frequency of precipitation events compared to the 1988-89 season.

Further insight into the possible effect of frequency of events on scores is illustrated by tables 2 through 4. Table 2 gives verification scores for the October 1 through December 31, 1989 period. Table 3 is for January through March 1990, and Table 4 is for April through July. This division of the data is somewhat arbitrary, but was chosen to capture the drier than normal autumn, followed by a fairly wet winter over much of the Pacific Northwest. Note that for WSFO W2, the frequency of precipitation events doubled from

about 25 percent in autumn (table 2) to nearly 50 percent in winter (table 3), and then fell off to less than 20 percent in spring (table 4).

Figure 3 graphically depicts the first period verification scores for WSFO W2 during the above mentioned three "seasons". Note that the overall Percent Correct changed little from "season" to "season". However, the Threat, False Alarm, and Probability of Detection scores improved significantly from the "dry" autumn to the "wet" winter period. Scores were again poorer for the "dry" spring. These data suggest that for synoptic scale storms with widespread precipitation, the old adage that "it is harder to forecast when rain will hit the rain gage than to forecast when rain will miss the gage" may not necessarily hold true. The data suggest that the more it rains, the better the scores.

Tables 2 through 4 also provide some insight into the aforementioned somewhat poorer scores for WSFO E2. Table 1 showed that the precipitation frequency was significantly less for the E2 area compared to the 1988-89 season. Tables 2-4 show that this was especially true for autumn and winter. Table 4 shows that nearly one-half the total precipitation events occurred during the spring/summer period, when systems are more convective, less organized, and hence more difficult to forecast. Thus, the differences between the 88-89 and 89-90 scores for WSFO E2 may be, at least in part, due to the differences in the seasonal distribution (and hence areal nature) of precipitation between the two years.

The verification system for the Pacific Northwest QPFs is fully automated, user friendly, and very flexible. The program is accessible to all forecasters via a dial-in port on the Boise AOS computer. We encourage Pacific Northwest forecasters to make use of the program.

References

Hill, C.D., 1989. Pacific northwest qpf verification program. Western Region Technical Attachment 89-28.

Hill, C.D. and M.A. Mathewson, 1986. An automated qpf verification program which provides both real-time and long-term statistical scores in a user-friendly environment. NOAA Technical Memorandum NWS SR-117, 13-19.

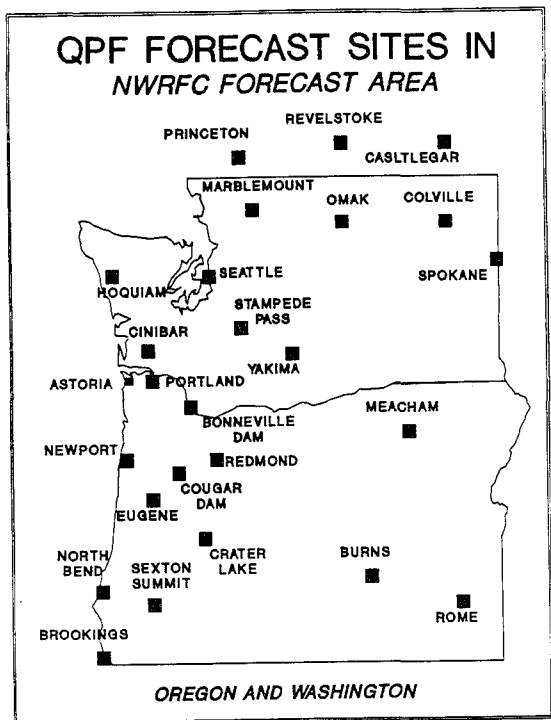


Figure 1

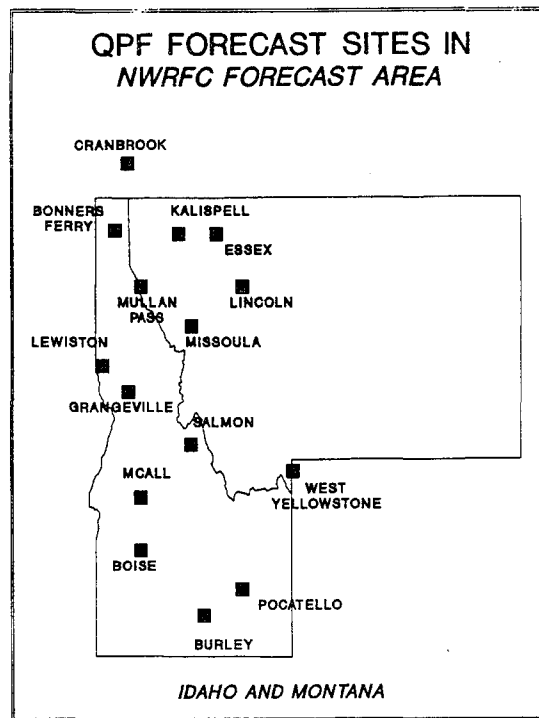


Figure 2

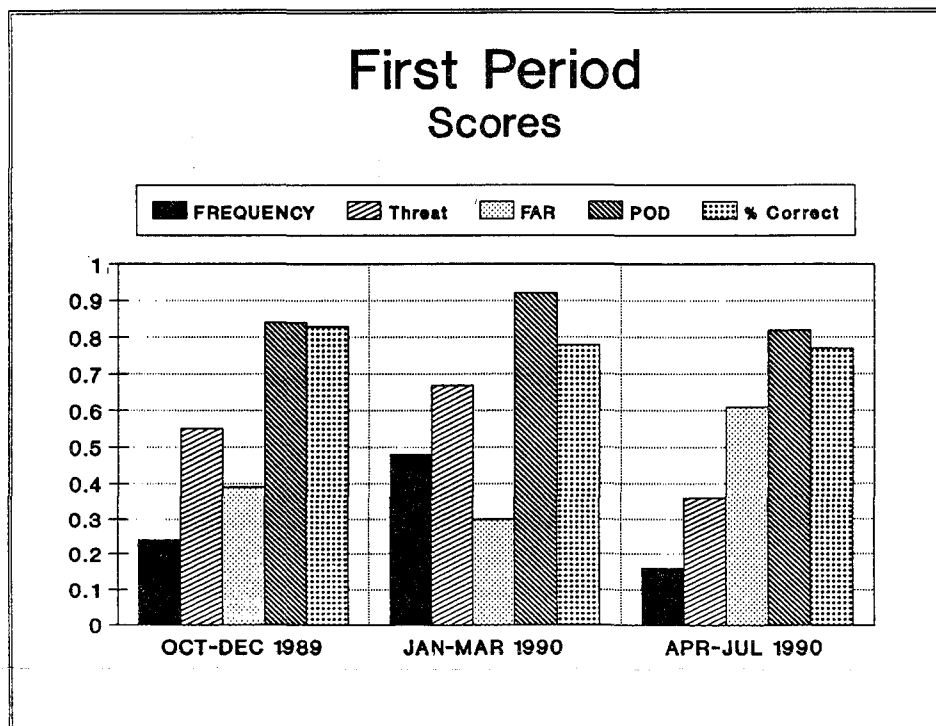


Figure 3

VERIFICATION FOR OCT 1 1989 THRU JUL 31 1990

24 HOUR STATISTICS CALCULATED EACH DAY FOR ALL SITES AND ALL FORECASTERS
 OUTPUT FORMAT FOR EACH WSFO: DAY 1/DAY 2/DAY 3

WET/DRY STATS	E1	W1	W2	E2
* FCSTS.....	543/ 548/ 552	1243/1227/1216	1423/1450/1454	1626/1626/1641
* PCPN EVNTS	213/ 216/ 218	561/ 546/ 552	455/ 459/ 468	389/ 390/ 390
* THREATS...	271/ 299/ 303	672/ 686/ 679	689/ 721/ 698	545/ 628/ 680
* WET FCSTS.	184/ 220/ 190	563/ 534/ 495	638/ 648/ 556	483/ 448/ 381
PCPN FREQ...	39/ 39/ 39	45/ 44/ 45	32/ 32/ 32	24/ 24/ 24
THREAT SCORE	46/ 46/ 35	67/ 57/ 54	59/ 54/ 47	45/ 35/ 28
F.A.R.....	32/ 38/ 45	28/ 26/ 26	37/ 40/ 41	39/ 51/ 55
P.O.D.....	59/ 63/ 48	81/ 72/ 67	89/ 84/ 78	63/ 56/ 44
* CORRECT...	73/ 78/ 64	82/ 76/ 74	88/ 77/ 74	82/ 75/ 74
WET BIAS....	86/ 102/ 87	188/ 98/ 98	148/ 141/ 119	184/ 115/ 98

7-CAT STATS

* CORRECT...	58/ 54/ 52	59/ 54/ 52	62/ 59/ 59	72/ 66/ 68
SKILL SCORE.	25/ 22/ 14	38/ 28/ 24	36/ 31/ 25	31/ 28/ 18
BIAS BY CAT				
DRY	189/ 99/ 108	188/ 102/ 109	81/ 81/ 91	99/ 95/ 101
0.01--0.09	8/ 8/ 8	73/ 71/ 56	159/ 168/ 156	65/ 81/ 88
0.10--0.25	159/ 196/ 201	136/ 135/ 144	143/ 158/ 198	188/ 215/ 188
0.26--0.50	144/ 142/ 71	97/ 102/ 123	121/ 152/ 68	96/ 67/ 15
0.51--1.00	73/ 108/ 29	188/ 97/ 78	147/ 97/ 33	71/ 39/ 8
1.01--2.49	8/ 288/ 8	92/ 62/ 16	184/ 184/ 18	8/ 33/ 8
2.50--	8/ 8/ 8	48/ 48/ 8	8/ 33/ 8	8/ 8/ 8
END				

TABLE 1

VERIFICATION FOR JAN 1 1990 THRU MAR 31 1990

24 HOUR STATISTICS CALCULATED EACH DAY FOR ALL SITES AND ALL FORECASTERS
 OUTPUT FORMAT FOR EACH WSFO: DAY 1/DAY 2/DAY 3

WET/DRY STATS	E1	W1	W2	E2
* FCSTS.....	137/ 141/ 145	424/ 414/ 488	539/ 568/ 565	511/ 531/ 548
* PCPN EVNTS	53/ 54/ 53	222/ 215/ 211	261/ 261/ 262	114/ 118/ 118
* THREATS...	64/ 73/ 68	262/ 252/ 264	362/ 378/ 359	193/ 243/ 218
* WET FCSTS.	37/ 48/ 35	238/ 209/ 228	342/ 348/ 311	157/ 286/ 168
PCPN FREQ...	39/ 38/ 37	52/ 52/ 53	48/ 47/ 46	22/ 22/ 22
THREAT SCORE	41/ 48/ 29	76/ 68/ 63	67/ 62/ 60	48/ 33/ 31
F.A.R.....	38/ 48/ 43	17/ 18/ 24	38/ 32/ 31	58/ 61/ 68
P.O.D.....	49/ 54/ 38	89/ 88/ 79	92/ 89/ 82	68/ 69/ 58
* CORRECT...	72/ 69/ 67	85/ 81/ 76	78/ 75/ 74	77/ 69/ 72
WET BIAS....	78/ 89/ 66	187/ 97/ 184	131/ 138/ 119	138/ 175/ 142

7-CAT STATS

* CORRECT...	61/ 53/ 57	55/ 51/ 44	49/ 47/ 47	68/ 59/ 65
SKILL SCORE.	24/ 15/ 12	38/ 31/ 23	31/ 28/ 24	27/ 17/ 21
BIAS BY CAT				
DRY	119/ 187/ 128	92/ 183/ 95	71/ 74/ 84	89/ 79/ 88
0.01--0.09	8/ 8/ 8	66/ 49/ 73	115/ 112/ 116	183/ 122/ 83
0.10--0.25	188/ 157/ 132	152/ 163/ 175	128/ 113/ 221	243/ 321/ 369
0.26--0.50	171/ 143/ 57	88/ 88/ 126	131/ 163/ 78	188/ 117/ 35
0.51--1.00	288/ 288/ 288	124/ 186/ 92	175/ 134/ 57	388/ 788/ 8
1.01--2.49	8/ 8/ 8	117/ 78/ 29	147/ 168/ 28	8/ 188/ 8
2.50--	8/ 8/ 8	67/ 67/ 8	8/ 58/ 8	8/ 8/ 8
END				

TABLE 3

VERIFICATION FOR OCT 1 1989 THRU DEC 31 1989

24 HOUR STATISTICS CALCULATED EACH DAY FOR ALL SITES AND ALL FORECASTERS
 OUTPUT FORMAT FOR EACH WSFO: DAY 1/DAY 2/DAY 3

WET/DRY STATS	E1	W1	W2	E2
* FCSTS.....	152/ 152/ 153	452/ 459/ 466	633/ 641/ 648	497/ 496/ 502
* PCPN EVNTS	65/ 64/ 65	197/ 198/ 201	154/ 158/ 166	184/ 181/ 99
* THREATS...	82/ 81/ 83	241/ 269/ 247	236/ 268/ 251	148/ 164/ 177
* WET FCSTS.	53/ 59/ 46	289/ 226/ 173	212/ 233/ 182	112/ 128/ 122
PCPN FREQ...	43/ 42/ 42	44/ 43/ 43	24/ 25/ 26	21/ 28/ 28
THREAT SCORE	44/ 52/ 34	68/ 58/ 51	55/ 58/ 39	46/ 35/ 25
F.A.R.....	32/ 29/ 39	21/ 31/ 27	39/ 44/ 47	39/ 52/ 64
P.O.D.....	55/ 66/ 43	84/ 78/ 63	84/ 83/ 58	65/ 56/ 44
* CORRECT...	78/ 74/ 64	83/ 75/ 74	83/ 88/ 76	84/ 78/ 74
WET BIAS....	82/ 92/ 71	186/ 114/ 86	138/ 147/ 118	188/ 119/ 123

7-CAT STATS

* CORRECT...	53/ 58/ 52	62/ 53/ 54	78/ 67/ 67	74/ 78/ 69
SKILL SCORE.	19/ 38/ 13	41/ 38/ 24	38/ 33/ 26	31/ 28/ 15
BIAS BY CAT				
DRY	114/ 186/ 122	95/ 89/ 111	88/ 84/ 97	98/ 95/ 94
0.01--0.09	8/ 8/ 8	74/ 76/ 48	183/ 196/ 172	47/ 76/ 132
0.10--0.25	133/ 183/ 178	141/ 134/ 131	143/ 186/ 186	238/ 221/ 177
0.26--0.50	243/ 186/ 63	121/ 171/ 154	113/ 159/ 19	88/ 69/ 8
0.51--1.00	88/ 88/ 8	97/ 125/ 63	118/ 52/ 3	8/ 8/ 8
1.01--2.49	8/ 8/ 8	188/ 56/ 8	54/ 38/ 8	8/ 8/ 8
2.50--	8/ 8/ 8	8/ 8/ 8	8/ 8/ 8	8/ 8/ 8
END				

TABLE 2

VERIFICATION FOR APR 1 1990 THRU JUL 31 1990

24 HOUR STATISTICS CALCULATED EACH DAY FOR ALL SITES AND ALL FORECASTERS
 OUTPUT FORMAT FOR EACH WSFO: DAY 1/DAY 2/DAY 3

WET/DRY STATS	E1	W1	W2	E2
* FCSTS.....	254/ 255/ 254	367/ 354/ 350	251/ 249/ 249	618/ 599/ 599
* PCPN EVNTS	95/ 98/ 188	142/ 133/ 140	48/ 48/ 48	171/ 171/ 173
* THREATS...	125/ 145/ 152	169/ 165/ 168	91/ 91/ 88	284/ 213/ 285
* WET FCSTS.	94/ 113/ 189	116/ 99/ 182	84/ 75/ 63	134/ 122/ 91
PCPN FREQ...	37/ 38/ 39	39/ 38/ 48	16/ 16/ 16	28/ 29/ 29
THREAT SCORE	51/ 46/ 38	53/ 41/ 44	36/ 26/ 17	58/ 38/ 29
F.A.R.....	32/ 42/ 48	23/ 32/ 27	61/ 68/ 76	25/ 34/ 35
P.O.D.....	67/ 67/ 57	63/ 58/ 53	82/ 68/ 38	59/ 47/ 34
* CORRECT...	76/ 69/ 63	78/ 72/ 73	77/ 73/ 71	83/ 78/ 76
WET BIAS....	99/ 115/ 189	82/ 74/ 73	218/ 188/ 157	78/ 71/ 53

7-CAT STATS

* CORRECT...	68/ 52/ 49	62/ 58/ 57	71/ 68/ 67	72/ 69/ 69
SKILL SCORE.	29/ 21/ 15	38/ 19/ 28	38/ 28/ 6	34/ 25/ 28
BIAS BY CAT				
DRY	181/ 98/ 94	112/ 115/ 118	79/ 83/ 89	188/ 111/ 119
0.01--0.09	8/ 8/ 8	79/ 88/ 58	261/ 244/ 261	46/ 47/ 68
0.10--0.25	218/ 232/ 268	113/ 111/ 138	275/ 242/ 117	112/ 151/ 92
0.26--0.50	188/ 126/ 88	87/ 48/ 72	57/ 29/ 29	188/ 33/ 5
0.51--1.00	48/ 188/ 25	42/ 12/ 22	8/ 8/ 8	82/ 8/ 8
1.01--2.49	8/ 8/ 8	8/ 8/ 13	8/ 8/ 8	8/ 8/ 8
2.50--	8/ 8/ 8	8/ 8/ 8	8/ 8/ 8	8/ 8/ 8
END				

TABLE 4