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VERIFICATION OF FORECAST SNOW AMOUNTS OVER THE SOUTH COAST MOUNTAINS 1979/80

Vello Puss, Meteorologist
Pacific Weather Centre, Vancouver

INTRODUCTION

The forecasting of snow amounts in the mountains of British Columbia has always presented certain problems. The most insoluble part of such forecasts is the actual variability in the snowfall amounts over relatively small geographic separations. There have been occasions where the 24-hour snowfall amount has ranged from zero to 50 centimetres within a separation of 50 miles.

Obviously, short of resorting to point forecasts, such a range cannot be covered in the PWC output. Normally the forecast aims for an average representative range, although certain circulatory patterns do allow the emphasis of greater or lesser snow amounts over relatively small geographic extents of the forecast region.

THE GUIDANCE

The guidance available to the mountain forecaster includes the QPF amounts from both the CMC and NWS numerical models, as well as statistical guidance using the MTNP1 program. A description of the MTNP1 (also knows as the PWC statistical guidance) is given by Gigliotti (PRTN 79-015). The numerical and statistical subjective snow amount forecasts are issued as part of the PWC mountain forecasts.

THE MTNP1 DATA FOR 1979-80

The data covers a four month period from December 1979 to March 1980. The MTNP1 program was run daily with predicators of 1000-500mb thickness and the 850mb wind. The results are tabulated in figures 1 to 3. The percentage of "hits" is less than inspiring. Combined with the "near miss" (defined as verifying in the adjacent range , the success rate rises into the upper seventy percents. The total "miss" category accounts for 21 to 23% of the results.

It might be noted that MTNP1 tends to overforecast rather than underforecast the snow amounts. Figure 7 lists the MTNP1 results by each month, and also separates the "near miss" category into two parts. The "near hi" indicates the number of adjacent overforecasts, with "near lo" referring to the underforecasts. The tendency to overforecast is quite apparent. A similar pattern exists for the "miss" category.

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THE PWC FORECASTS FOR 1979-80

The subjective forecast snow amounts for Grouse and Whistler are significantly better than those derived from the statistical guidance. Allison, on the other hand, shows very little difference. The verification results are tabulated in figures 4 to 6. The monthly breakdown is shown in figure 8, Grouse and Allison show a bias toward overforecasting. No such tendency is apparent at Whistler.

Figures 9 and 10 depict the 5-year trend of the percentage of hits at Grouse and Whistler. It is seen that Grouse Mountain peaked during the drought years of 76/77 and 77/78, but now has settled into the lower 60 percents. Whistler over the years has shown an unbroken rise which has steadied at 69% over the past 2 years.

CONCLUSION

The percentage of "hits" established by the MTNP1 program appears lower than desirable. In fact, the scores for Grouse and Whistler for the past winter are some 3 to 4 percent below those achieved in 1878/79 (Refer PRTN 79-015). One of the problems with the program is the limited amount of stored data available for the basic statistical analysis. The entry of new numbers from this year's data should result in some improvement for the coming winter.

Given the variability of measured snow amounts, the subjective forecast amounts for the south coast mountains during the winter 1979/80 are quite acceptable, less than ten percent of the forecasts can be considered as "busts".

ACRONYMS

PWC - Pacific Weather Centre
CMC - Canadian Meteorological Centre
NWS - National Weather Service (U.S.)
MTNP1 - Computer Program for Statistical Guidance of Snow Amounts
PRTN - Pacific Region Technical Notes
QPF - Quantitative Precipitation Forecasts

REFERENCE

Gigliotti - Examination of the PWC Mountain Forecast Program QPF PRTN 79-015

CONTINGENCY TABLES OF STATISTICAL GUIDANCE FORECAST AGAINST ACTUAL AMOUNTS

FIG. 1 GROUSE

	FORECAST					
ACTUAL	0	.1 – 10	11 – 20	21 – 50	>50	TOTAL
0	34	22	9	9		74
.1 – 10	4	8	10	9		31
11 – 20		1	4	5		10
21 – 50			1	1		2
>50						
TOTAL	38	31	24	24		117

Hits 47 = 40%
Near Miss 43 = 37%
Miss 27 = 23%

FIG. 2 WHISTLER

	FORECAST					
ACTUAL	0	.1 – 10	11 – 20	21 – 50	>50	TOTAL
0	26	10	11	2		49
.1 – 10	5	16	10	10	1	41
11 – 20		3	9	5		17
21 – 50			2	2		4
>50				1		1
TOTAL	31	29	32	20	1	112

Hits 53 = 47%
Near Miss 36 = 32%
Miss 23 = 21%

FIG. 3 ALLISON

	FORECAST					
ACTUAL	0	.1 – 10	11 – 20	21 – 50	>50	TOTAL
0	26	7	3	4		40
.1 – 10	3	16	4	7		30
11 – 20	3	2	3	1		9
21 – 50		1		1		2
>50					1	1
TOTAL	32	26	10	13	1	82

Hits 47 = 57%
Near Miss 17 = 21%
Miss 18 = 22%

CONTINGENCY TABLES OF ISSUED FORECAST VALUES AGAINST ACTUAL AMOUNTS

FIG. 4 GROUSE

	FORECAST					
ACTUAL	0	.1 – 10	11 – 20	21 – 50	>50	TOTAL
0	37	24	2			63
.1 – 10	3	36	4			43
11 – 20	1	7	3			11
21 – 50		1		1		2
>50		1				1
TOTAL	41	69	9	1		120

Hits 77 = 64%
Near Miss 38 = 32%
Miss 5 = 4%

FIG. 5 WHISTLER

	FORECAST					
ACTUAL	0	.1 – 10	11 – 20	21 – 50	>50	TOTAL
0	34	10	3			47
.1 – 10	7	43	4			54
11 – 20	1	7	5			13
21 – 50	1	3		1		5
>50		1				1
TOTAL	43	64	12	1		120

Hits 83 = 69%
Near Miss 28 = 24%
Miss 9 = 8%

FIG. 6 ALLISON

	FORECAST					
ACTUAL	0	.1 – 10	11 – 20	21 – 50	>50	TOTAL
0	26	16	2			44
.1 – 10	4	24	3			31
11 – 20	5	3	2			10
21 – 50		2				2
>50		1	1			2
TOTAL	35	46	8			89

Hits 52 = 58%
Near Miss 26 = 29%
Miss 11 = 10%

	DEC	JAN	FEB	MAR	TOTAL	%
GROUSE						
Hit	7	14	9	17	47	40
Near Hi	13	7	9	8	37	32
Near Lo	1	2	0	3	6	5
Miss	10	7	7	3	27	23
WHISTLER						
Hit	14	16	10	13	53	47
Near Hi	3	7	8	7	25	22
Near Lo	3	1	1	6	11	10
Miss	11	4	4	4	23	21
ALLISON						
Hit		16	14	17	47	57
Near hi		6	3	3	12	15
Near Lo		0	4	1	5	6
Miss		4	5	9	18	22

Figure 7. VERIFICATION TABLE 1979/80
Using MTNP1 Forecast Snow Amounts

	DEC	JAN	FEB	MAR	TOTAL	%
GROUSE						
Hit	22	22	16	17	77	64
Near Hi	6	5	9	9	29	24
Near Lo	2	1	3	3	9	8
Miss	1	1	1	2	5	4
WHISTLER						
Hit	19	23	23	18	83	69
Near Hi	4	3	0	6	13	11
Near Lo	3	1	6	5	15	13
Miss	5	2	0	2	9	8
ALLISON						
Hit		23	15	14	52	58
Near Hi		4	7	7	18	20
Near Lo		0	4	4	8	9
Miss		2	3	6	11	12

Figure 8. VERIFICATION TABLE 1979/80
Snow Amounts from the 6am PWC Mountain Forecasts

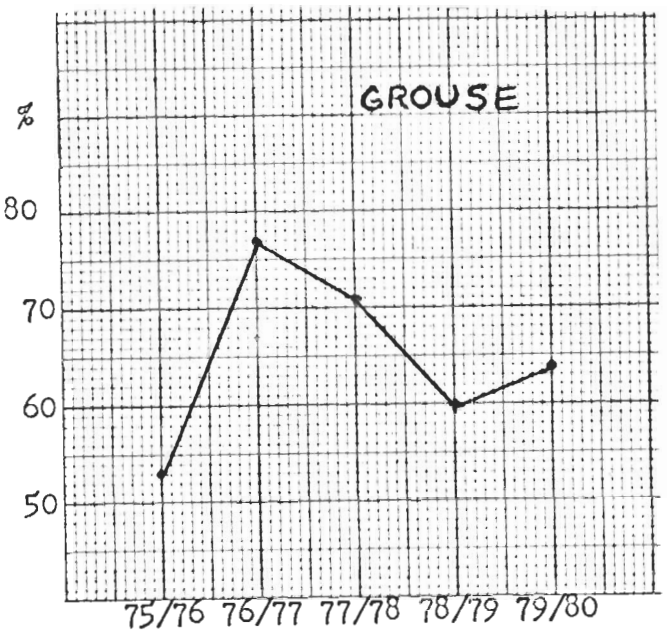

Figure 9.
Percentage of "Hits" at Grouse Mountain over the past 5 winters.

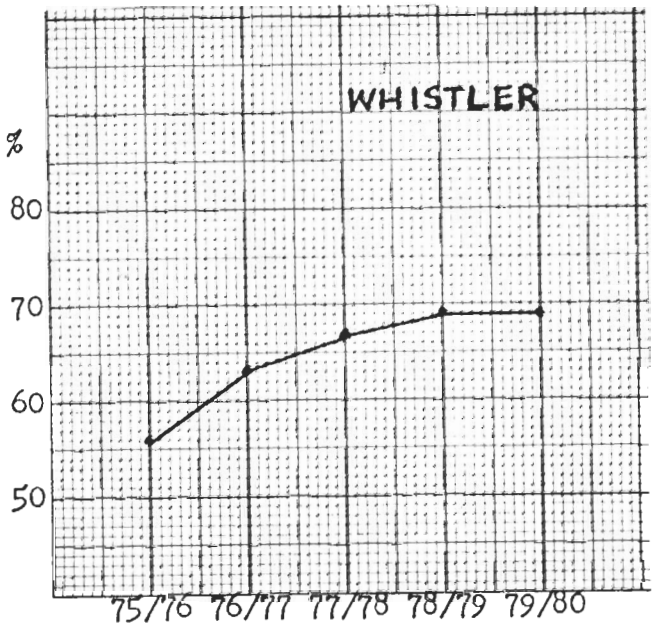

Figure 10.
Percentage of "Hits" at Whistler over the past 5 winters.