EXTENDED FORECAST ACCURACY FOR THE NEW YORK CITY AREA, 1979

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1. INTRODUCTION

Extended outlooks, beyond the period of 48 hours, are routinely issued by the National Weather Service. Daily outlooks for up to 5 days in advance and more general outlooks for 6 - 10 days, 30 days, and even 90 days are given to the public. The accuracy of these outlooks is often debated. The official position of the American Meteorological Society (2) is that daily temperature forecasts out to 5 days show "moderate skill", daily precipitation forecasts out to 3 days show "moderate skill" but are only slightly better than climatology for the 4th and 5th days; 6 - 10 day outlooks show "some skill" for average temperatures and "slight skill" for precipitation; 30 day outlooks show "some skill" in average temperature but are only "marginal" for precipitation, and 90 day outlooks show "minimal skill". Branick and Bosart (3) described the 6 - 10 day outlook as showing only marginal skill with an apparent bias toward persistence. Andrews (4) countered with NMC data showing more skill and less reliance on persistence. This study was undertaken to get some idea of extended forecast accuracy for one location, New York City, for one year, 1979.

2. DATA

Data were collected for the New York City area from January through December of 1979. They consisted of the 5 day outlook transcribed directly from the NOAA Weather Radio broadcasts, the 6 - 10 day outlooks obtained via facsimile, the 30 day outlooks obtained in the Average Monthly Weather Outlooks, and the 90 day outlooks also obtained via facsimile.

3. ANALYSIS

3.a. 5 Day Outlook

No attempt was made to verify the temperature outlooks for the various days. The vagueness of the forecast and the lack of clearly defined accuracy limits prohibited this. The precipitation forecasts were verified on a very simple, yes-no basis. It was believed that this is the way the public would determine forecast accuracies. Table 1 shows the results of the 3rd day forcast.

Table 1: 3rd Day Forecast Verification

	Forecast no precip.	Forecast precip.
Had no precip.	171	58
Had precip.	41	56

Overall accuracy is good, 70%. However, much of this comes from forecasts on non-precipitation days which were 75% accurate. On days with precipitation, forecast accuracy dropped to 58%. Actually, a forecast of precipitation on the 3rd day only verified about 50% of the time. This does compare favorably to a climatological prediction of 30% but the general public will probably say they could flip a coin and get as good a forecast. Table 2 shows the 4th day results.

Table 2: 4th Day Forecast Verification

	Forecast no precip.	Forecast precip.
Had no precip.	162	58
Had precip.	44	55

Overall accuracy was similar, 68%; still good. Forecast accuracy on days with precipitation also remained about the same, 56%. The verification on days forecast to have precipitation slipped below 50%. Table 3 shows the 5th day results.

Table 3: 5th Day Forecast Verification

	Forecast no precip.	Forecast precip.
Had no precip.	164	58
Had precip.	59	41

Overall accuracy decreased somewhat to 64%. Days with precipitation were forecast accurately only 41% of the time. The accuracy of days forecast to have precipitation was also 41%. Hence, if a forecast of precipitation is given for the 5th day, it most likely will not rain or snow. By the 5th day, the forecast error in the prediction model exceeds 24 hours. Therefore, climatology becomes more important.

3.b. 6 - 10 Day Outlook

The 6 - 10 day outlooks don't give day to day forecasts, rather they provide comparisons to normal for the 5 day period for both temperature and precipitation. Temperature outlooks are given in 5 categories; much above normal (MA), above normal (A), normal (N), below normal (B), and much below normal (MB). Precipitation is given in just 3 categories; above normal (A), normal (N), and below (B). Verification was determined using the category limits given in Rieck (5). The results of the temperature verification are shown in Table 4.

Table 4: 6-10 Day Temperature Verification, 5 categories (MA, A, N, B, MB)

Error	Occurrences
Perfect	34
1 category miss	52
2 category miss	26
3 category miss	3
4 category miss	2

Since there is no simple yes-no verification on such forecasts, one must determine what is meant by an accurate forecast. Is a one category miss a good forecast? The author suggests that this will vary depending on the use of the forecast. A one category miss may be perfectly acceptable to the general public, but poor guidance for certain agricultural interests. Hence, it is very important for the forecaster to determine the needs of the user and then to determine the accuracy of the forecasts in light of those needs. It is also crucial to tell the user the general accuracy of the forecasts given. Only then will these forecasts be correctly utilized. Thus, in this case, if a one category miss is acceptable, the forecast is 74% accurate. If not, the accuracy drops to 29%, a poor forecast. For the 5 categories, a one category miss would probably be acceptable to most users.

Combining the temperature outlooks into just 3 categories (above, normal and below), gives the results in Table 5.

Table 5: 6-10 Day Temperature Verification, 3 categories (A, N, B)

Error	Occurrences
Perfect	49
1 category miss	50
2 category miss	18

Here again, the difference between a very good forecast and a poor one depends on the acceptable error. For only 3 categories, a one category miss would be less tolerable, but again the specific use of the forecast should be determined.

For the precipitation outlook, the results are given in Table 6.

Table 6: 6-10 Day Precipitation Verification, 3 categories (A, N, B)

Error	Occurrences
Perfect	36
1 category miss	56
2 category miss	25

The precipitation forecast are notably inferior to the temperature forecasts. If a one category miss was not acceptable, the accuracy would only be 31%.

3.c. 30 Day Outlook

The 30 day outlooks are given at the beginning and during the middle of each month. Here, temperature outlooks are given in 3 categories (above, normal and below), and precipitation in 2 (above and below). Verification was accomplished using the category limits given in the Average Monthly Weather Outlook. The results for the temperature verification are shown in Table 7.

Table 7: 30 Day Temperature Verification, 3 Categories (A, N, B)

Error	Occurrences
Perfect	10
1 category miss	9
2 category miss	5

Again, with only 3 categories, a one category miss may well be significant. If it is considered as a bad forecast, overall accuracy is only 42%. Over 20% of the forecasts were complete busts.

The precipitation verification is shown in Table 8.

Table 8: 30 Day Precipitation Verification, 2 categories (A, B)

Error	Occurrences
Perfect	12
Miss	12

Only a 50% accuracy is noted. One interesting point is that for both temperature and precipitation, the outlooks at the beginning of the month were better than those given in the middle of the month.

3.d. 90 Day Outlook

In 1979, the 90 day outlooks were only given 4 times a year, for each season. Only temperature outlooks were given with three categories (above, normal, below.) The results are shown in Table 9.

Table 9: 90 Day Temperature Verification, 3 Categories (A, N, B)

Error	Occurrences
Perfect	0
1 category miss	2
2 category miss	2

Although no significant conclusions can be reached with such a limited data base, these results indicate very little accuracy in the extended outlooks.

4. SUMMARY

These results would seem to indicate only marginal accuracy on extended forecasts beyond 48 hours. Daily precipitation forecasts become poor by the 5th day. The 6 - 10 day outlooks could be useful in some instances for planning. The 30 day outlooks were tentative at best, and the 90 day outlooks for this year were worthless. In most instances, temperature forecasts were better than precipitation forecasts.

Two points should be stressed. First, determine the accuracy needs of the user. Secondly, make sure the user knows how accurate the forecasts are. The author hopes that similar studies for other areas will be undertaken in the future.

REFERENCES AND FOOTNOTES

1. Edward A. Brotak is a Professor of Meteorology at University of North Carlina - Asheville. He teaches courses in synoptic meteorology and weather forecasting. His research has been in synoptic meteorology and forest fire weather.

2. "Policy Statement of the American Meteorological Society on Weather Forecasting". 1979. Bulletin of the American Meteorological Society, 60 (12): 1453-54.

3. Branick, M.L. and L.F. Bosart. 1979. "Verification of the NMC 6-10 Day Temperature Outlook". Monthly Weather Review, 107 (10): 1245-1253.

4. Andrews, J.F. 1980. "Comments on Verification of the NMC 6-10 Day Temperature Outlook". Monthly Weather Review, 108 (10): 1701.

5. Rieck, R.E. 1979. "Class Limits for 5 Day Temperature and Precipitation Forecasts". Technical Procedures Bulletin No. 256, 14 pp.

ANNUAL MEETING - CALL FOR PAPERS

The Annual Meeting of the National Weather Association will be held at Penn State University, University Park, PA on November 4 and 5, 1982. Participation of all members is encouraged. Time will be allocated for (a) presentation of papers, (b) informal discussion of forecasting topics, (c) informal presentation of ideas on solving common forecasting/communication problems and (d) a panel discussion of forecaster training, retraining and development. There will be opportunities to observe and use the Penn State minicomputer-based weather station facilites, and a business meeting. Sessions will be held in the Walker Building, site of the Penn State Weather Stations, and in the Nittany Lion Inn, on the Penn State campus. A luncheon meeting will take place at the Inn on Thursday, November 4 at noon.

Those wishing to make a presentation should send a short abstract or very brief summary to Dr. John J. Cahir, 620 Walker Building, University Park, PA 16802 prior to September 10, 1982 so that sessions can be planned.

Blocks of rooms have been reserved at The Nittany Lion Inn and Elby's State College Inn. The Nittany Lion Inn is within walking distance of the Walker Building and of several good restaurants. Elby's is a couple of miles out, but costs less. Be sure to mention your National Weather Association affiliation when reserving at either place. Room charges at the Nittany Lion Inn range from $35 for a single (only a few available, $39 for single occupancy of a double) to $42 for twin singles and $52 for twin doubles, with double occupancy. Reservations must be made prior to 4 October 1982. Elby's is new and offers nice rooms at $23.35 single and $26.95 double. Write the Nittany Lion Inn, University Park, PA 1680 or call 814-237-7671. For Elby's, write Elby's State College Inn, 1661 South Atherton Street, State College, PA 16801 (note different ZIP) or call 814-237-8005.

North Carolina State plays football with Penn State on Saturday, November 6 at University Park. For those who wish to stay for the game, the motels/hotels require a 2-night (Friday and Saturday night) package at elevated rates between $50 a night (Elby's) and $75-$90 a night (Sheraton Penn State). Full payment in advance is required, and reservations close when payments are received; those planning to stay should reserve early. Rules vary on number of people in a room; Elby's appears to be liberal. It is occasionally possible to buy a cancellation at Elby's as the game day approaches. The Nittany Lion Inn almost never has a room or cancellation.

Penn State is accessible via Interstate 80 (east-west; get off at Milesburg traveling east and at Lamar traveling west); US 322 (from Harrisburg), US 22/220/322 from Pittsburgh. There is also bus and commuter air service. Allegheny Commuter (USAIR) now services University Park not Philipsburg.