MODERN METHODS OF LOCAL WEATHER FORECASTING

O. F. EVANS, UNIVERSITY OF OKLAHOMA

WEATHER FORECASTING was an individual matter before the establishment of government weather bureaus. Although at that time the laws governing the weather were not generally well understood, yet through trial and error a considerable body of valuable weather lore became known to sailors, farmers and others whose work kept them much out of doors. Among so many who were interested in watching the weather there were a few with exceptional observational and reasoning powers who became quite expert. Some ship masters were especially proficient and in rural communities individuals sometimes acquired considerable local reputations through their ability as weather prophets.

However, with the discovery of the laws governing storms and the invention of instruments for observing the weather elements a new era was opened in weather study. It was obvious that if storms moved according to definite laws that observations could be taken simultaneously over a large area and interpreted by a central observer with much better results than would be possible for an individual working in a single locality. The invention of the telegraph made this possible. The value of such a service was quickly recognized and government weather bureaus were soon organized in most of the civilized countries.

After the establishment of weather bureaus the local weather prophets soon fell into disrepute. The government forecasts were regularly as good or better than those of the most skilled of the weatherwise who depended on observations of local conditions alone so that wherever the government reports were available the public soon came to depend on them entirely and has largely ceased its own efforts to observe and interpret weather conditions. This is somewhat unfortunate for although the weather bureau does its work well it necessarily works under some disadvantages and limitations and there is, and probably always will be, plenty of room for the weatherwise to exercise their talents. Weather bureau stations, especially in the United States, are widely separated and so their observations are often more or less incomplete. Forecasts are made for the whole or large part of a state. Local situations often develop that it is impossible for the weather bureau to cover in its forecasts so that the person who will take the trouble through study and experience to become weatherwise will find it interesting and profitable.

To become weatherwise in the modern sense it is necessary, first of all, to acquire a knowledge of the elementary principles of meteorology. Clear ideas concerning what takes place in "lows" and "highs" as well as the fundamental causes of the formation of clouds and of precipitation are necessary. It is also well to know how the bureau makes its observations and forecasts.

After becoming familiar with the principles of meteorology and with the work of the weather bureau it is then necessary to practice observing the weather and to interpret its action according to meteorological principles. In making observations a barometer is indispensable as it furnishes the only means for observing changes of pressure. A thermograph and a

hygrograph are also very useful but not absolutely necessary. It will soon be found that while meteorology is a science, weather forecasting is an art and that a knowledge of the science is of very little value so far as foretelling the weather is concerned unless a considerable apprenticeship is served in the art of forecasting. Often weather conditions are such that it is uncertain just what may develop. Then all the forecaster can do is to form, in the light of his experience, the best possible judgment as to what is likely to occur.

The modern weatherwise person should consider the weather bureau as a valuable source of information rather than trying to compete with it. Make full use of all reports and weather maps that can be obtained as that is the most important source of a knowledge of general weather conditions. The problem in local forecasting is to correlate as far as possible the locally observed conditions with the general conditions and so get a better idea of the coming weather than the government forecast can give for the particular locality. It cannot be too strongly emphasized that constant observation is necessary in order to become weatherwise. This requires some effort at first but in a short time it becomes a habit so that any change of weather will be noted almost subconsciously. Mental notes of cloudiness, wind direction, temperature, and moisture conditions should be made five or six times a day and the barometer read at least three times a day. Remember that all the barometer does is to register air pressure. A rapid change in air pressure either up or down will be accompanied by winds. On the other hand the wind may blow and no change occur in the barometer because the pressure area may move in such a way that the barometer follows along an isobar instead of crossing the lines of pressure. Frequently a low barometer is accompanied by high temperatures and conditions favorable for precipitation and a high barometer by just the reverse. However, a low barometer does not necessarily mean a storm period and precipitation since pressure is only one of the weather elements, and in order to rain humidity and temperature must be favorable.

As experience in observing the weather increases a fund of knowledge will be acquired as to what will happen under certain conditions as illustrated by the following cases.

1. When temperatures are normal or above and it begins to rain about sunrise or soon after it will usually clear by 10 or 11 a.m. It is practically certain to do so if the barometer is normal and not changing.

2. During a drouth in Oklahoma the sky is sometimes overcast with brownish colored clouds. These are not followed by rain if the barometer is steady and general conditions as shown by the government forecast do not indicate rain.

3. In Oklahoma a wind which moves slowly into the east and remains there for twelve hours or more is apt to be followed by rain as it indicates that the position of the observer is in the southwest quadrant of a "high" and that a plane of contact between cold and warm air is approaching from the west.

4. If when the weather bureau has predicted partly cloudy or cloudy it begins to rain between 10 a.m. and 4 p.m. it is likely to continue especially if accompanied by a falling barometer.

No discussion of local weather forecasting would be complete without some reference to weather proverbs. Weather proverbs are short statements, frequently in the form of rhymes, which attempt to give in a few words conditions which precede certain types of weather. Most weather proverbs can be classified under one of three heads.

1. Those founded on co-incidence with events having no relation to the weather. Probably the saying regarding ground hog day is a good example of this. Such proverbs are a result of faulty observations and have no value.

2. Those based on incorrect reasoning as "Frost is likely to follow an eclipse." Such statements may sound plausible but they have no possible basis in fact.

3. Those that are indicators of the prevailing conditions of one or more of the weather elements. These are of considerable value if understood. There are a large number of sayings which relate to the prevailing conditions of humidity, clouds, winds, temperature or pressure and probably fully half of these are in reference to humidity.

"When the dew is on the grass, rain will never come to pass," is a good example. Dew is deposited as a result of chilling of the atmosphere close to the ground. This will occur on nights when radiation of heat is most rapid, and radiation of heat is most rapid on those nights when the atmosphere is clearest, that is, when it contains the least water vapor. Therefore, when dew is deposited it means there is little moisture in the air and so rain is not likely. Sometimes weather sayings which hold for one region become transplanted to another where they do not apply. For instance, "Rainbow in the morning, shepherds take warning. Rainbow at night, shepherds delight," applies very well in a region of prevailing west winds but would need to be reversed in a region of prevailing easterlies. Since most weather proverbs relate to only one weather element, a single saying is not sufficient on which to base a weather prediction. No meteorologist would think of making a prediction on the basis of humidity alone. The absence of dew in the morning is not at all certain evidence of rain although the proverb would lead us to think so, but if in addition we had a "mackerel sky" and the wind had been in the east for 12 hours or more, then we would be justified in thinking it would probably rain within the next 24 hours.

As to the practical results of a study of local forecasting it is difficult to make a statement because individuals vary in ability On the average however after a year's practice in a region, local forecasts should have as high a percentage of accuracy for 12 to 24 hours ahead as the bureau attains for 24 to 48 hours ahead. Where weather reports are available, the local studies should add perhaps 20 to 25% to the value of the government forecasts.