WEATHER FORECASTS FOR MAPLE PRODUCERS

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Weather conditions are the single most important factor affecting sap production in the sugar maple. Weather forecasts, therefore, can be a very valuable tool for maple syrup producers. The most popular weather forecasts are those that are disseminated to the public through radio, television and newspapers. These short-range forecasts predict temperature and precipitation patterns over the next few days. They have increased in accuracy over the past few years, due in large part to improved computer models and advances in radar and satellite technology. These forecasts have the greatest accuracy for the next 24 to 48 hours, with decreased accuracy beyond three to five days.

The National Weather Service and commercial weather forecasters (example The Weather Channel, AccuWeather, local TV stations) all use the same information and computer models. The human factor interpreting the information can produce different forecasts, but there is no general reason why one would be better than another. The National Weather Service has eleven forecast offices within the maple producing areas of the Northeast. These offices produce forecasts for each county within their area of responsibility and issue severe weather watches and warnings, when necessary.

A less well known, but potentially useful category of forecasts, is the medium-range forecasts distributed by the National Weather Service. They are available on the Climate Prediction Center's web site: http://www.cpc.ncep.noaa.gov/products/predictions/. These outlooks are less precise, as they indicate only general trends, rather than specific projections of daily temperature extremes and precipitation amounts. These forecasts are routinely created for 6-10 days and also 8-14 days into the future. Generally their accuracy is better than 50%. They can, therefore, be useful as a tool for planning operations for the next week or two. An accurate medium-range forecast can help predict the advent of the sap flow season with a lead-time of one to two weeks.

Medium-range forecasts are based on understanding atmospheric circulation, improved statistical techniques, and increasingly sophisticated computer models. The finishing touches are still applied by an experienced human forecaster. Some of the tools used in creating these forecasts have such exotic names as "neural networks", "teleconnections", and "ensemble spaghetti diagrams". Some of these tools are purely statistical in nature. Others are based on knowledge of how similar weather systems have evolved in the past. The most relied-upon tools, however, are computer models of the expected changes of weather patterns beginning with the present situation and prognosticating out through the next two weeks. These models are based

on measurements of existing weather conditions at the surface (i.e. locations of high and low pressure areas, orientation of warm and cold fronts, and temperature patterns) and in the upper atmosphere (i.e. location of the jet stream). Based on known physical interactions that occur within the atmosphere, the models are able to forecast future movement and evolution of weather systems and the expected temperature and precipitation patterns.

The final type of forecast product is the long-range forecast. There are two types of long-range forecasts, monthly and seasonal. Monthly forecasts are usually done two and a half weeks ahead of the start of each month. Seasonal forecasts cover 3-month periods extending out for one year. At this time, there are relatively few climate phenomena that can significantly influence the accuracy of long-range forecasts; the El Niño and La Niña conditions are among the best known. Most of the time, long-range forecasts will not be useful management tools for maple producers.

Medium-range and long-range temperature and precipitation forecasts take the form of categorical forecast maps. Categorical forecasts begin with each region having an equal chance of "above normal", "near normal" and "below normal" temperatures or precipitation amounts for the period in question. When considering a large number of years, each of these three categories occurs, on the average, a third of the time. These categories are based on observed temperatures and precipitation amounts over the last three decades-currently 1971 through 2000.

Using the first week of March in Lake Placid as an example, a third of the years between 1971 and 2000 had an average temperature for the week of less than 20 degrees Fahrenheit, a third were between 20 and 23.8 degrees, and a third above 23.8 degrees. Therefore, 20.0 degrees represents the cutoff between below normal and near normal temperatures for the week, while 23.8 degrees is the cutoff between near normal and above normal temperatures. Based on this, a March 1-7 period with an average temperature of 25 degrees would be classified as "above normal". Cutoffs for these three categories for precipitation are computed in much the same manner.

Categorical "equal chance" (EC) forecasts are then adjusted based upon information about conditions that drive weather events. If it seems likely that conditions in a region will be above normal, then the above normal category is moved higher than 33.3% and the below normal category moved to a lower probability to maintain a total of 100%. Portrayals by the media of medium and long-range forecasts typically only describe the highest probability outcome and don't tell you what the probability estimate is. Thus it is possible to have a forecast of "above normal" when the probability of that occurring is less than 50%. Following is a sample of the 6-10 day temperature forecast map issued on April 8th,, which covers the period April 14-18 where the probabilities are shown. The highest probability on this map is 50%. "Normal" usually

means that there is an equal chance for each of the three categories occurring. Climate Prediction Center long-range forecast maps use "EC" rather than "normal" to reflect the equal chance condition.

The Northeast Regional Climate Center (NRCC) is one of the country's six regional climate centers. Established in 1983, the NRCC is located in the Department of Earth and Atmospheric Sciences at Cornell University. It serves the 12-state region extending from Maine to Maryland and West Virginia. The mission of the NRCC is to facilitate the collection, dissemination and use of climate data; assess regional climate conditions and their impacts; and conduct applied research in support of these goals. You can visit the NRCC web page at: http://www.nrcc.cornell.edu.