Department of Horticultural Science

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# WEATHER AND CLIMATE INFORMATION FOR NORTH CAROLINA

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The use of weather information in crop management and particularly the aspects of disease and insect management is growing at a fast pace. Two things drive this growth. Research has provided the understanding of the weather disease and weather insect interactions and technological advances in meteorology and communications have allowed easier and faster access to weather observations. Also, the relatively low cost of the computer systems that provide the decision support for applying this knowledge to every day operations have made them more affordable and practical.

The number of sources of weather information has been expanding during the last decade, but 1996 brought a significant change in weather services for the agricultural community. Prior to April 1, 1996 agricultural weather services were provided by the federal government (primarily through the National Weather Service). The National Weather Service terminated agricultural weather services effective April 1, 1996 as part of down sizing the Federal Government. These services must now be provided solely by the private sector.



## Sources of Weather Forecasts

Today, numerous sources of weather information exist. A farmer has many choices of where and when to obtain weather forecasts and information.

Although no longer providing products specific to agriculture the **National Weather Service** (NWS) provides numerous products that farmers can use. It issues forecasts of air temperature, sky conditions, and precipitation for 104 forecast zones in North Carolina for the coming three consecutive 12 hour periods. For example, a forecast is issued at 4:30 a.m. for the periods 4:30 a.m. to 4:30 p.m. (called today, 4:30 p.m. to 4:30 a.m. (tonight), and 4:30 a.m. to 4:30 p.m. the next day (tomorrow). Wind speed and wind direction are included for the first two periods but not the third.

These forecasts from the National Weather Service are updated every 6 hours. A 5 day outlook is issued twice a day. It predicts temperatures, sky conditions, and precipitation probabilities on a regional basis.

Weather radio is a simple way to receive the NWS forecasts. The National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce provides continuous broadcasts of the latest weather information directly from NWS offices. Taped messages are repeated every 4 to 6 minutes and are routinely revised every 1 to 3 hours or more

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frequently if needed. Most stations operate 24 hours daily. NOAA Weather Radio broadcasts are transmitted on one of three high band FM frequencies 162.55 megaherz (MHz) (Raleigh/Durham, Wilmington, and Norfolk), 162.00 MHz (Asheville, New Bern, and Winston-Salem), or 162.475 MHz (Charlotte, Fayetteville, Rocky Mount, and Cape Hatteras). These frequencies are not found on the average home radio.

A variety of special weather radios are available. NOAA Weather Radio broadcasts can usually be received as far as 40 miles from the antenna site, and sometimes more. The effective range depends on many factors, particularly the height of the broadcasting antenna, terrain, quality of the receiver, and type of receiving antenna. NWS forecasts are also broadcast by many commercial radio stations.

Many of the forecasts and guidance products of the National Weather Service and some produced by the Climate Prediction Center, another agency within the Department of Commerce, are available on the World Wide Web. Following is list of URLs (Universal Resource Locators), also called 'bookmarks' or 'addresses' of these and other products. This list is certainly not complete but will provide you with a few good places to start looking for the information that will serve you best.

### Weather and Climate Information Web Sites

**North Carolina Cooperative Extension Service Agricultural Weather Information:**
http://www.ces.ncsu.edu/weather/

From this site, one can navigate to numerous sites that include weather information for North Carolina. These include:

- North Carolina Agricultural Research Service Automated Weather Station Network data
- North Carolina State Climate Office
- Southeast Regional Climate Center (includes North Carolina Climate Normals)
- Climate Prediction Center (includes Drought Severity Index, Crop Moisture Index and products such as 6-10 Day Forecast and 8-day temperature guidance)
- Recent precipitation totals for North Carolina
- Radar
- Doppler Radar
- Ohio State Weather Page (includes North Carolina products)
- WeatherNet (includes North Carolina products)

Some additional weather information sites are:

**NC State University Atmospheric Sciences page:**
http://meaculpa.nrrc.ncsu.edu/

**National Drought Mitigation Center—Nebraska:**
http://enso.unl.edu/ndmc/

**Penn State Weather page:**
http://www.ems.psu.edu/wx

**Virginia State Climatology Office home page:**
http://faraday.clas.Virginia.EDU/~climate/

Many commercial television and radio stations have their own staff meteorologists who serve as another source of weather information. Television presentation adds the benefit of visual products (such as maps, radar scans, and satellite images). Many television stations also support a Web site and include weather information. Many cable networks offer The Weather Channel, a 24 hour, weather only station.

The information in these broadcasts may differ from NWS forecasts, reflecting the fact that a forecaster has numerous pieces of information to integrate into the forecast. There is often room for disagreement in the inexact science of weather forecasting. However, it is important to note that only the National Weather Service may issue watches and warnings for severe weather.

Commercial Providers of Specialized Weather forecasts are increasing. This source of forecasts and weather information is the most promising for agricultural users. Some of these vendors provide site specific forecasts tailored tithe specific needs of the user. They charge a fee, usually $1.00 to $2.00 per day based on the products desired. These companies offer various methods of product delivery which include fax, email, World Wide Web, and satellite dish dissemination systems.

At this time this author is aware of the following companies serving North Carolina agricultural weather needs:

**AWIS Inc.**
Agricultural Weather Information Service Inc.
P.O. Box 3267
Auburn, AL 36831-3267
email = info@awis.com
tel. 334.826.2149
fax 334.826.2152
Web site = http://www.awis.com

**DTN**
Data Transmission Network Corporation
9110 West Dodge Road
Omaha, NE 68114

**SkyBit, Inc.**
P.O. Box 10
Boalsburg, PA 16827-0010
tel. 800.454.2266
fax 814.466.6691
email: eweather@meso.com
web site = http://www.skybit.com

AWIS, Inc. and SkyBit, Inc. provide site specific products. Their staff work with growers to determine the products they need to support their decision making and other applications. These companies also provide data sets of observations. These are often required to run models that require observed weather as an input. The following list is not complete, but seeks to provide you with an idea of what is available from these companies.

Five day forecast of maximum and minimum air temperature
Five day rain probabilities and outlook
Cotton harvesting forecasts
Livestock heat stress forecast
Poultry heat stress forecast
Growing Degree Day forecasts

Irrigation Management information using pan evaporation
Corn aeration forecast
Five day forecast of hourly air temperature
Extensive frost/freeze and cold protection information including minimum temperature forecasts and temperature duration forecasts

## Sources of Climate Data

The terms *weather* and *climate* are often used interchangeably but actually have unique meanings. *Weather* refers to the current state of the atmosphere—that is, conditions such as cloud cover, temperature, relative humidity, wind speed and direction, solar radiation, and dew point. Forecasts are made for future weather. *Climate* refers to the average or "normal" weather of a particular location for a specified period of time, usually 30 years.

Improvements in our understanding of the global climate system have changed how the NWS provides monthly and seasonal weather outlooks. In 1995 the NWS began the all electronic publication entitled Climate Outlook. It is accessible on the World Wide Web (WWW) home page of the Climate Prediction Center at the address http://www/cpc.ncep.noaa.gov/index.htm. For those not using the Internet, you can contact the State Climate Office (SCO), North Carolina State University, Box 7236, Raleigh, NC 27695-7236; telephone 919-515-3056 for this information. The *Climate Outlook* will provide seasonal forecasts at leads of 2 weeks to about one year ahead. The lead time is the time between when the forecast is issued and the first moment it becomes valid. Forecasts issued will include seasonal mean temperature and total precipitation for all of the United States.

The first choice for climate data (information on weather that has already occurred -- that is, observations, averages, and extremes) should be the SCO (see above address). This office can provide daily maximum and minimum temperatures and precipitation for 156 stations in the North Carolina Climate Observer network, which is administered by the NWS. The data are collected, quality controlled, and published by the National Climatic Data Center, Federal Building, 151 Patton Avenue, Asheville, NC 28801-5001; Phone: 828-271-4800. The process of collecting, controlling, and publishing takes time, so it is 3 to 5 months before data are available from this system. However, the SCO has access to a smaller number of stations from which data are available more rapidly,

although the data quality is not as rigorously controlled. Therefore, if your data request is for a period in the most recent 3 to 5 months, you will have fewer locations from which to choose.

Data other than daily air temperature and precipitation are more limited. Wind speed, wind direction, and relative humidity data are available on a 3 hour interval from the SCO for Raleigh Durham, Greensboro, Asheville, Charlotte, Wilmington, and Cape Hatteras. Data on the daily amount of sunshine in minutes is also available from these stations. Daily solar radiation data are available for Asheville, Charlotte, Cherry Point, and Raleigh Durham. Daily pan evaporation data can be obtained from the SCO. It is observed at the W. Kerr Scott Reservoir, Chapel Hill, Hofmann Forest, and Aurora. Estimated pan evaporation normals (for 1951 through 1980) have been developed for Asheville, Raleigh Durham, Charlotte, and Wilmington because not enough years of actual data have been collected yet to produce an actual normal.

In addition, NC State University has an automated network of 14 stations that collect hourly air and soil temperature, barometric pressure, solar radiation, photosynthetically active radiation, wind speed and direction, rainfall, and relative humidity. The stations in this network are located at the experiment stations of NC State University and the North Carolina Department of Agriculture and Consumer Services (NCDA & CS) in Castle Hayne, Clayton, Clinton, Fletcher, Jackson Springs, Kinston, Lewiston, Oxford, Raleigh(2), Rocky Mount, Salisbury, Waynesville, and Whiteville. This data set can be accessed by contacting the SCO.

There are several published references for North Carolina climate data. It is convenient to have these references on hand to access climate data quickly. References available from the NC State University Department of Communication Services, Box 7603, Raleigh, NC 27695-7603 (919-513-3112) include the following:

*Weather and Climate in North Carolina*, AG375 ($2.50)
*Probabilities of Dry Periods in North Carolina*, AG411 ($2.00)
*Risk of Frost and Freeze Damage for North Carolina Fruit Crops*. AG403 (free)
*Low Temperature Probability Data for North Carolina*, AG403S ($3.00)
*Growing Degree Days in North Carolina*, AG236 (free)