



New York Berry News

Volume 11, Number 3b

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Special Frost Protection Edition

FROST WARNING*FROST WARNING*FROST WARNING*FROST WARNING*FROST WARNING

The risk of frost damage to berry crops is dependent on several factors: berry crop development stage, minimum temperature(s), cloud cover (or lack thereof), wind etc. The extremely warm and early start to the 2012 season brings immediate risk of frost damage to berry crops; frost free dates for most areas are early to late-May in NY, making the frost risk a lengthy proposition this season. Below is are resources for monitoring frost risks in your area followed by a short article to help you understand when, how and under what conditions frosts occur. Also included are resources to assist in making frost management decisions for berry crops.

Special Weather Statement, National Weather Service Buffalo NY, 416 AM EDT Mon Mar 26 2012

For the counties of Niagara-Orleans-Monroe-Wayne-Northern Cayuga-Oswego-Jefferson-Lewis-Northern Erie-Genesee-Wyoming-Livingston-Ontario-Chautauqua-Cattaraugus-Allegany-Southern Erie- Including The Cities of...Niagara Falls, Medina, Rochester, Newark, Fair Haven, Oswego, Watertown, Lowville, Buffalo, Batavia, Warsaw, Geneseo, Canandaigua, Jamestown, Olean, Wellsville, Orchard Park, Springville

Freezing Temperatures To Return To Western NY...

Mother Nature is reversing course from the recent record warmth...now back to winter-like temperatures across western and central New York. A much colder airmass will filter into the region behind a cold front.

The impressive recent warm spell across the area has prompted many plants and trees...especially fruit trees...to bloom well ahead of schedule across western and central New York. Many of these plants are very susceptible to a freeze. A damaging freeze is very likely tonight. The ingredients will be in place...the combination of light winds and a cold airmass under clear skies will allow temperatures to drop into the 20s across most locations even to the teens east of Lake Ontario. **Those with agricultural interests will need to take precautions to protect sensitive plants from the cold.**

Special Weather Statement, National Weather Service Binghamton NY, 1124 AM EDT Mon Mar 26 2012

For the Counties of Northern Oneida-Yates-Seneca-Southern Cayuga-Onondaga-Steuben-Schuylar-Chemung-Tompkins-Madison-Southern Oneida-Cortland-Chenango-Otsego-Tioga-Broome-Delaware-Sullivan-Bradford-Susquehanna-Northern Wayne-Wyoming-Lackawanna-Luzerne-Pike-Southern Wayne-Including the cities of, Boonville, Penn Yan, Seneca Falls, Auburn, Syracuse, Corning, Hornell, Watkins Glen, Elmira, Ithaca, Oneida, Utica, Rome, Cortland, Norwich, Oneonta, Cooperstown, Owego, Binghamton, Walton, Delhi, Monticello, Towanda, Sayre, Montrose, Tunkhannock, Scranton, Wilkes-Barre, Hazleton, Milford, Honesdale.

Hard Freeze Tonight...

A much colder airmass is moving into central New York and Northeast Pennsylvania this afternoon. Tonight...low temperatures will range in the teens to lower 20s under mainly clear skies. Due to the unseasonably warm temperatures so far this month...some

Fruit trees and sensitive vegetation may already be vulnerable to temperatures this cold. Anyone with agricultural interests may need to take precautions to protect any sensitive plants.

Monitoring Local Weather Conditions – Cathy Heidenreich, Department of Horticulture, Cornell University

How can I know if frost is predicted in my location? For local weather conditions go to: <http://www.noaa.gov/> and enter your city and state. You will find local conditions and for example special weather statements like the ones above they are providing for this evening.

Alternatively, check out <http://newa.cornell.edu/index.php?Page=degree-days-forecasts>. There is a column for expected minimum temperatures at multiple locations in NY for the coming week.

How can I know what the temperature is in my planting(s)? There are several companies that offer temperature monitoring equipment that may be installed directly into your planting: Some offer warning systems to indicate the need to begin overhead irrigation.

Examples of Temperature Monitoring Systems

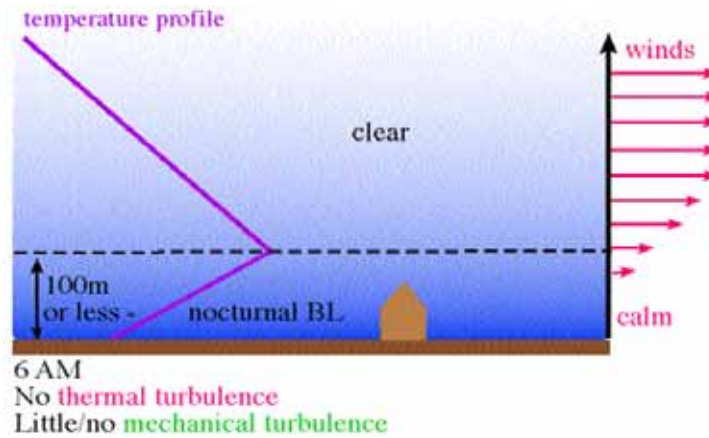
- Frost Alert <http://www.orbitcoms.com/FrostAlert.php>
- Computemp Frost Alarm <http://www.glacierv.com/SPD/-202--computemp-frost-alarm--170000-946228786.jsp>
- Spectrum Watchdog Cellular Frost Alert <http://www.specmeters.com/weather-monitoring/environmental-meters/frost-alarms/cellularalert/#description>

Weather 101: Understanding Frost - Art DeGaetano, Department of Earth and Atmospheric Science, Northeast Regional Climate Center, Cornell University, atd2@cornell.edu

The occurrence of frost is an ongoing concern to berry growers in the Northeast. On average across New York, the date of the last frost in spring ranges from mid-April in the New York City area, to early May in the Albany area and along the Lakes. In the Adirondacks the frost-free period does not start on average until late May. A more conservative guide is given by the date after which there is only a 10% chance of seeing frost. Across the state, this date ranges from around April 20th in the City to almost June 10th in the Adirondacks. Along the Lakeshores May 10th is the approximate date, with May 20th being the appropriate date in much of the Hudson Valley.

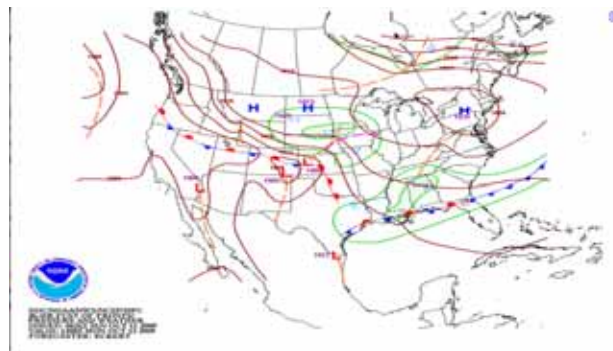
Meteorologically frost is defined as the condition that exists when the temperature falls below 32°F. In some cases, the fuzzy layer of ice crystals that most people associate with frost may be present. This is known as hoar frost. In other instances below freezing temperatures may exist without the formation of ice crystals. This depends on how humid the air is on a given day. Typical meteorological temperature observations are taken at a height of 2 m above the ground. Therefore it is possible that a grower may observe hoar frost, while the local meteorologist is reporting a temperature above freezing.

It is important to understand a bit of the physics behind the meteorological conditions that most often bring frost to our region. Frosts can be either radiative or advective. Advective frosts are referred to as freezes by the National Weather Service. These occur under windy conditions as below freezing air is transported into a region, usually from areas to the north and west of New York. Radiative frosts are usually responsible for the last spring frost and therefore are of biggest concern to growers. These occur under clear and calm conditions. Clear skies and calm winds allow the atmosphere to cool from below. This creates a condition known as an inversion, in which temperature increases with height in the atmosphere. Thus the coldest air lies at ground level with warmer air aloft as shown in the figure below.



Example of a temperature inversion near the ground. Temperature is given by the purple line, with colder temperatures to the left in the figure. Inversions usually extend upward in the atmosphere from the ground to a height of 10-1000m. Most are 100m deep as shown in the figure.

Inversions are associated with fairly easily identifiable weather patterns. Most occur with large high pressure systems are centered over an area. The high provides the calm winds and clear skies that are necessary for an inversion to form.



Weather map with a large high pressure system centered over central NY.

Not all inversions bring below freezing temperatures, so meteorologists must also consider the ambient temperature and humidity conditions when predicting a frost. A good rule of thumb is to look at the dew point observed during the evening hours. Dew points are reported in most weather observations and represent the temperature to which the air must cool before dew or (if the value is below freezing) hoar frost forms. On clear calm nights, the coldest air temperature is generally equal to the dew point.

Since most inversions are shallow, with warm (above freezing) air existing just a 100 m off the ground, mechanical means of mixing the air above a grower's field can often be used to protect a crop from frost. Typical methods of mixing the air include wind turbines, helicopters and ground-based heaters. Irrigation can also be used as a means of frost protection, since the freezing of irrigation water releases heat to the surrounding air and vegetation. Row covers also provide some degree of frost protection. However, proper site selection, particularly in upstate New York where the topography and lakes provide both favorable and unfavorable microclimates, remains an important means of minimizing the risk of frost damage and crop loss.

As a final note, climate change is likely to deliver a mixed message in terms of the risk of frost to the berry and fruit industry in New York. Over recent decades, we have seen a marked trend toward earlier dates of the last spring frost. Indeed, the frost-free season has been starting earlier and earlier in the year and the overall length of the growing season has been expanding. Unfortunately, berries do not operate off the calendar. Rather, their critical phenological stages are driven by the accumulation of degree-days. In a warming climate, these stages are also reached earlier and earlier in the year. Thus, strawberries that typically bloom in mid-May may in the future be blooming in late April or early May. Thus the risk of frost damage may in the end remain unchanged or even possibly increase.

(Reprinted from: *Proceedings Empire Fruit and Vegetable EXPO, Syracuse, NY January 2011*)

For more on this topic:

1. Perry, K.B. (2001) Frost/Freeze Protection for Horticultural Crops, <http://www.ces.ncsu.edu/depts/hort/hil/hil-705.html>

For Small Fruit Bud Stages Stages

The potential for frost damage varies with both growth stage and temperature. For photos of blueberry developmental stages see following: http://blueberries.msu.edu/growing_blueberries/growth_stages_table.

Critical Spring Temperatures for Small Fruit Bud Stages – compiled by Mark Longstroth, District Extension Educator, MSU Extension

	Degrees Fahrenheit				
Strawberries	Buds in Crowns	Buds Emerged	Buds Closed	Flowers Open	Small Fruit
Damage	10	20	22-27	28	28
Blueberries	Bud Burst	Pink Bud	Open Flowers	After Petal Fall	Green Fruit
Damage	<20	<25	27	28	28

These numbers were taken from Blueberries NCS-HIL-201-E, Strawberries – modified from NRAES-88. The publication in its entirety, which also includes temperatures for tree fruit and grapes, is available here: <http://cherries.msu.edu/pdf/weatherCriticalTemp.pdf>

Protecting Berry Plantings from Frost Damage

General Information

- Snyder R. L. and de Melo-Abreu, J. P. 2005. Frost Protection: fundamentals, practice, and economics - Volume 1 <http://www.fao.org/docrep/008/y7223e/y7223e00.htm#Contents>
- Demchak, K. (ed). 2011. Appendix A Expanded Special Topics– Frost and Freeze Protection in Mid-Atlantic Berry Guide <http://pubs.cas.psu.edu/freepubs/pdfs/AGRS097k.pdf>
- Longstroth, M. 2012. Using Sprinklers to Protect Plants from Spring Freezes http://news.msue.msu.edu/news/article/using_sprinklers_to_protect_plants_from_spring_freezes
- Demchak, K. 2007. Frost Protection – Tips and Techniques, <http://www.fruit.cornell.edu/berry/production/pdfs/frost%20protection%20tips%20techniques.pdf>
- Powell, A.A. and Himelrick, D.G. Principles of Freeze Protection for Fruit Crops, <http://www.aces.edu/dept/peaches/freeze.html>

Blueberries

- Cline, B. and Fernandez, G. 1998. Blueberry Freeze Damage and Protection Measures, <http://www.ces.ncsu.edu/depts/hort/hil/hil-201-e.html>
- -----2011. Frost and Freeze Protection: Blueberries. <http://www.extension.org/pages/29222/frost-and-freeze-protection:-blueberries>

Strawberries

- Pritts, M. Frost Protection in Strawberries. <http://www.fruit.cornell.edu/berry/production/pdfs/strfrostprotect.pdf>
- Fisher, P. and Shortt, R. 2009. Irrigation for Frost Protection of Strawberries. http://www.omafra.gov.on.ca/english/crops/facts/frosprot_straw.htm

Examples of Frost Protection Products

Floating Row Cover/Frost Blankets

- Agribon frost blankets, double-bonded edges for ultra-strength. Available in 0.45 to 2.0 oz weights. Provides 4-6 degrees protection depending on fabric weight. <http://www.agriculturesolutions.com>, other companies
- DeWitt Frost blankets, comes in 4 weights of fabric offering 4- 10 degrees protection, depending on fabric weight. <http://www.agriculturesolutions.com>, other companies
- Floating Row Cover <http://www.glacierv.com/CategoryProductList.jsp?cat=Row+Cover:Frost+Cover>

Overhead Irrigation

- Rainbird Blueberry Frost Protection <http://www.rainbird.com/ag/applications/blueberries.htm>

Wind Machines

- Amarillo Wind Machine LLC <http://www.amarillowind.com/>
- Orchard-Rite LTD, Inc. <http://www.orchard-rite.com/>
- ShuR Farms Frost Protection <http://www.shurfarms.com/CADvWM12010.html>

Heaters

- Clean-Burning Propane-Fueled Orchard Heaters
http://www.agpropane.com/uploadedFiles/Agriculture/Resource_Library/Dockets/FS_11116_Orchard_Heat_HI_GHRES.pdf

Questions or comments about the New York Berry News?

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