From: Interagency Nutrient Management Committee, January 10, 2019

Subject: Request to move fall Bermuda application window

A request has been made to move the fall Bermuda application window further into the fall based on the perception that the freeze date is later. At this time, the INMC does not believe a blanket extension of the Bermuda window is warranted based on available data.

In the appendix find information regarding first Frost Dates published by a now retired Agricultural Meteorologist in the Horticultural Science Department:
https://content.ces.ncsu.edu/average-first-fall-frost-dates-for-selected-north-carolina-locations

While the data is old, what is important is the document gives you the +/- window where you might see First Frost. Per the CES publication, first frost in Sampson County is Oct 29 (+ or - 11 days).

Below is more recent data from the State Climate Office (SC). It does not have the "error bars" around the average so it was suggested to use the CES +/- days and the State Climate Office average.

An example of extending the window is as follows. The current Bermuda window closes on September 30. If we extend to October 20, as was the case in the one-time allowance this year, AND the State Climate Office frost (October 26) arrives in the minus 11 day window (i.e., early), then the date will be before the last application of animal waste and the nitrogen may not be utilized. If the Bermuda is overseeded, we might be fine. If the Bermuda is not overseeded, then there is no active growing crop until April and we are just leaving nitrogen in the environment to be lost by all the usual pathways. If we do extend to October 20 and we hit the average frost date of October 26, it is improbable that the crop can take up the majority of the nitrogen in six days.
There also is a concern about physiological response to the late application. The nitrogen will encourage another flush of growth and that growth would be tender thus making the Bermuda much more susceptible to winter kill (which could result in large patches of no-grass come spring).

At this time, the INMC does not believe a blanket extension of the Bermuda window is justifiable given the climate date presented in the map above and the appendix below, nor is it advisable given the limited window for N uptake that will follow. These are permitted non-discharge systems, which can be changed on a site-by-site basis by regional agronomist.

Appendix: Average First Fall Frost Dates for Selected North Carolina Locations

Frost forms on solid objects when the water vapor in the atmosphere changes from its vapor phase to small ice crystals. Frost is not frozen dew. If you see frost than you know that the temperature of the object it is on reached 32°F or lower. However, the air temperature, measured at five feet above ground in the vicinity of this object, is likely several degrees higher. Conversely, not every air temperature recorded at or below 32°F means frost formed on solid objects in the area. In spite of this, the average date of the last spring air temperature of 32°F has traditionally been called the last frost date. The dates presented in this leaflet are the average date of the last recorded air temperature at 32°F or lower for the period 1951 - 1980. The standard deviation is an important statistic to consider along with the average date. The standard deviation tells the amount of dispersion around the average. The average date minus one standard deviation gives the date before which there is only a 16% chance of frost. A frost will occur before this date about twice in every 10 year period. For example, in Albemarle a frost will occur before October 13 (the average date of October 25 minus one standard deviation of 12 days) about twice in every 10 year period. The average date minus two standard deviations gives the date before which there is only a 2% chance of frost. A frost will occur before this date about twice in every 100 year period. For example, in Albemarle a frost will occur before October 1 (the average date of October 25 minus two standard deviations of 12 days) about twice in every 100 year period.

For information on how to protect plants from frost and freeze damage see HIL-705, *Frost/Freeze Protection for Horticultural Crops*, and consult the references listed below.

Below the first fall frost data are listed by Station Name (Table 1) and by County (Table 2).

There are several published references for North Carolina climate data. These references are available from the North Carolina State University Department of Communication Services, Publications, Box 7603, Raleigh, NC 27695-7603; (919) 515-2861.

- Weather and Climate in North Carolina AG-375 ($2.50)
- Probabilities of Dry Periods in North Carolina AG-411 ($2.00)
- Risk of Frost and Freeze Damage for North Carolina Fruit Crops AG-403 (free)
- Low-Temperature Probability Data for North Carolina AG-403S ($3.00)
- Growing Degree Days in North Carolina AG-236 ($3.00)
Table 1. Average first fall frost date for North Carolina by station (1951-1980)

Average first fall frost date and its standard deviation for selected North Carolina locations listed by station name. Data are for the period 1951 - 1980.

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### Average first fall frost date and its standard deviation for selected North Carolina locations listed by station name. Data are for the period 1951 - 1980.

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Table 2. Average first fall frost date and its standard deviation for selected North Carolina locations listed by county. Data are for the period 1951 - 1980.

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<td>Williamston 1 ENE</td>
<td>November 3</td>
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</table>
Average first fall frost date and its standard deviation for selected North Carolina locations listed by station name. Data are for the period 1951 - 1980.

<table>
<thead>
<tr>
<th>Station Name</th>
<th>County</th>
<th>Average Date</th>
<th>Standard Deviation (days)</th>
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<td>Chapel Hill 2 W</td>
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<tr>
<td>Pender</td>
<td>Willard 4 SW</td>
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Author: Katharine Perry, Horticultural Science

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