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Beginner School 2008 - Frost Management

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Frost Management

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UMass Amherst

Cranberry Station



Frost protection

- Fact sheet
- Weather tips
- Frost tolerances
- Frost protection



What is a frost night?

- Working definition - any night when the temperature on the bog is lower than the tolerance of the cranberry plants



What is a frost night?

- Realistically frost is often associated with certain conditions that result in the on-bog temperature being less than that in the surrounding uplands
 - calm: cold air drains into low-lying bogs
 - clear: radiational cooling occurs from vegetation mass
 - dry: little moisture to buffer temperature drop near the dew point



Weather factors involved in frost events

- Dewpoint

For upland settings - rule of thumb is that minimum temperature on a frost night will approach the dewpoint by morning. NOT TRUE for bogs - temperature may be much lower due to low elevation and radiational cooling



Weather factors involved in frost events

- Wind
 - Cold wind in the day that dies in the evening can increase frost danger
 - Wind is protective against radiational cooling but if the wind dies, temperature can drop as much as 10 degrees in 2 hours
 - With high pressure, winds <10mph won't hold



Weather factors involved in frost events

- Clouds

High clouds are not protective

Low clouds persisting until after midnight can be protective - temperatures may only drop 1 degree/hour after they dissipate



Weather factors involved in frost events

- Precipitation

1-1.5 inches of rain within a day or so before the cold night may keep bog temperatures above the prediction

Drought conditions increase frost danger



Weather factors involved in frost events

- Time of frost occurrence

Spring: generally not until near dawn

Fall: quite early, often just after dark
by late fall



Weather conditions that favor reaching the predicted minimum

- Clear skies
- Calm - no wind
- Dry - low dew points
- Drought conditions



The 'perfect frost night'

- On-bog temperature will routinely be at least 10 degrees colder than the surrounding upland.
- May be as much as a 20 degree differential.
- The exact differential will vary!





Spring tolerance based on bud stage.



Spring frost notes

- Ben Lear break dormancy first
- Early Black most tolerant early:
15°F or less in early April
- Howes green more slowly but are
no more tolerant than Early Black in
early spring



Spring frost notes

- Ben Lear and Stevens are less tolerant than Early Black and Howes at a given developmental stage
- No damage was ever seen at 30°F or higher



Spring frost tolerances

Bud stage	Tolerance EB and H	Tolerance S and BL
Dormant	18°F	20°F
White bud	20°F	22°F
Bud loosening	22°F	25°F
Bud swell	25°F	27°F
Elongation	27°F	29.5-30°F
Roughneck	29.5-30°F	29.5-30°F





Fall frost tolerance is estimated by fruit color.



Fall frost tolerances

- Early Oct. - Short (1-2 hr) exposures to 24°F or 23°F tolerated
- At full color, up to 5 hours exposure to 23°F or 24°F (Ben Lear) tolerated (Howes and Stevens even lower)
- When over-ripe, tolerance of Howes and Stevens may go back up to 23°F



Full tolerance - long exposure

- EB: 23°F
- H: 20°F
- S: 22°F
- BL: 24°F



Frost protection

- Irrigation system
Heat of fusion as water freezes
Need 0.1" per hour
- Flooding
may be preferred early season if winds
variable and sprinkler freezing likely



So – why not just protect whenever the temperature reaches 32°F?

- Waste of water
(unless automated and intermittent)
- Keeps soil colder in the spring
- Saturates the soil – bad



Questions?

