

## **WINTER MANAGEMENT**

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Cranberry vines may be injured or killed by severe winter weather. The injury is classified as a 'physiological drought' when moisture lost from the vines due to wind and evaporation cannot be replaced due to freezing in the root zone. The common term used to describe this injury is 'winterkill'. The symptoms are leaf discoloration and eventual leaf drop. Such injury can occur within 3 days if the root zone is frozen to a depth of 4 inches, air temperature is below freezing, and strong drying winds (10 mph or greater) occur. Injury is prevented by protecting vines with a winter flood that should be in place when winterkill conditions exist. Bogs that have not been harvested and new plantings (first year) are less susceptible to winterkill.

### **General winter flood management:**

The winter flood may be applied as early as December 1 and should remain on the bog as long as winterkill conditions are present or forecast. Delay the flood as long as winterkill conditions are not forecast. Exposure to moderately cold temperatures will encourage deep dormancy leading to lower oxygen demand and greater cold tolerance. Generally, the flood should not need to be held any later than March 15. However, holding the flood for a few days past that date will not harm the bog.

To be effective, the flood should cover the plants entirely (no vine tips sticking out). It is particularly important to maintain a sufficiently deep flood on new plantings to prevent heaving of the plants during freeze/thaw cycles during the winter.

### **For bogs that cannot maintain a winter flood:**

On bogs that cannot maintain a winter flood, additional winter protection may be gained by the application of an antitranspirant. These waxy or resin-based materials reduce the amount of water loss from the leaves by providing an additional physical layer on the leaf surface. Research with Vapor Gard has shown that one application, made prior to the onset of winterkill conditions, may offer some protection against winter injury. Vapor Gard should be applied at the rate of 1 gal/A. Since the material becomes quite thick at low temperatures, application is best when done at temperatures above 45°F. It may be mixed with hot water to facilitate mixing. It can be applied through the irrigation system, by boom sprayer or tank spray apparatus. Vapor Gard needs at least one hour of sunny conditions after application to ensure proper set of the material. Vapor Gard will persist on the plant for several months, so application should be planned for the fall (November typically has favorable conditions).

### **Oxygen deficiency injury:**

A lack of dissolved oxygen in the winter flood water will cause injury to the plants, which in turn reduces the yield potential. Oxygen deficiency injury may occur when oxygen levels in the winter flood water drop below 4 mg/l (full oxygenation = 10+ mg/l). If the flood remains unfrozen (open water) or light penetrates the ice covering the flood, oxygen levels in the flood should remain adequate. However, if the ice is cloudy or covered by snow or sand, oxygen levels will begin to fall as the plants use the oxygen supply. Plants with poor carbohydrate (food) reserves due to large crops, poor sunshine the previous fall, or other stresses have less ability to recover from oxygen deficiency stress and may show injury the next spring. Failure to prevent oxygen deficiency can result in leaf drop, inability of blossoms to set fruit, and crop reduction.

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### **Management to avoid oxygen deficiency injury:**

#### ***Determine if dangerous conditions exist:***

Four inches of snow or one inch of sand on the iced-over flood will prevent light penetration and will begin the oxygen deficiency process if water remains under the ice. Under such conditions, growers should monitor oxygen levels and remove water from beneath the ice when oxygen levels are 5 mg/l or less. A reading of 5 on the standard oxygen test kit (color change test) corresponds to the critical level of 5 mg/l. Bogs with high organic content will deplete oxygen from the water more quickly than will sandy bogs. Be aware that sample collection in areas with significant algal growth can give falsely high readings. Readings will vary under clear ice compared to under cloudy ice; it is best to test in several places or concentrate on areas of concern such as under cloudy or covered ice or in areas of deep flood. Cutting the ice in order to test for oxygen can change the oxygenation of the water. Drilling a hole is preferable to chopping with an ax. It is best to make a hole and then wait for up to one hour before testing the water for oxygen. If testing several locations - cut all holes first and then go back and test the water in the same order that you cut the holes.

#### ***What to do if your bog has reached the critical point:***

Water must be removed from under the ice so air (oxygen) may circulate to the cranberry plants. Note that a stream flowing through the bog is no guarantee that oxygen deficiency conditions will not be present on the parts of the bog away from the stream. When drawing the flood, pull all but the bottom plank and draw water well down in the ditches. Vines crushed (by the weight of ice) into puddles of water in low spots will be hurt quickly and severely by oxygen deficiency.

### **Management after a mid-winter thaw:**

If the water has been removed from beneath the ice to prevent oxygen deficiency, the remaining ice may melt during a mid-winter thaw, leaving the vines exposed. Bogs may be left exposed as long as winterkill conditions are not present (see above). However, long exposures to abnormally warm temperatures (>55°F) may lead to loss of chilling. The result could be a reduction in hardiness and greater susceptibility to spring frost. Depending on the conditions prior to the winter flood, loss of chilling during a mid-winter thaw could also lead to reduction in bud break and flowering the following season. This is especially true if the previous fall was warmer than usual, leading to lack of chilling accumulation. To guard against these possibilities, reflood the bog if a long warm spell is forecast during mid-winter. The water will cool at night and re-warm slowly during the day, buffering against the warm daytime temperatures.

### **Management after the winter flood:**

Once the flood has been removed, the cranberry buds will break dormancy in response to exposure to warm temperatures. The earlier the flood is removed, the sooner the plants will experience enough heat units to break dormancy. To avoid the need for frost protection during the first half of April, hold the winter flood until March 10-15. In the early spring, cranberry buds will survive exposure to at least 18°F. As the buds lose their dormant color and begin to expand, they must be protected from frost damage. The tolerance varies by variety and growth stage. Refer to the "Frost protection guide for Massachusetts cranberry production" and the Frost Management BMP for further information.