

Frost Protection with Wind Machines

Susceptibility to frost damage depends on a tree's stage of development, variety, and location, but certain preventative measures can be taken. The goal of all frost protection methods is to maintain the blossom temperature above the critical temperature.



A wind machine mixes the warmer air from the upper portions of the inversion layer with the colder air near the ground, raising air temperatures around the trees by a few degrees.

The lowest several hundred feet of the atmosphere becomes stratified under calm, clear, frost conditions. An inversion condition thus exists, meaning that temperature increases as it rises to the top of the inversion layer. A wind machine mixes the warmer air from the upper portions of the inversion layer with the colder air near the ground, raising air temperatures around the trees by a few degrees.

Wind machines are motor driven and therefore consume fuel, although not nearly as much as stack heaters. There are two types of wind machines: those that have the engine mounted at the top of the fan and those with the engine located on the ground. Having the type with the engine on the ground makes servicing the machine easier. They work under calm, clear conditions as long as the frost is not too “deep”; that is, temperatures are not more than three or four degrees below the critical temperature. Wind machines do not work under cold, windy conditions, because the wind usually mixes the atmosphere enough to prevent an inversion layer from developing.

When using wind machines, it is important that the machines are turned on when the air temperature in the orchard is still above critical temperatures. If air temperature is being monitored in a protected shelter within or outside of the orchard, the machines should be initiated when the air temperature is still above 32°F. It is very possible that bud temperatures may be several degrees below the air temperature due to radiational cooling, and they can experience damage even if the air is still above freezing.

More information about choosing and implementing frost protection systems can be obtained from your county extension educator or from commercial dealers that offer frost protection systems and components.

For additional information, please refer to the [Penn State Extension Tree Fruit Production Guide](#).

Contact Information

Robert Crassweller

Professor of Tree Fruit

rmc7@psu.edu

814-863-6163

extension.psu.edu

Penn State College of Agricultural Sciences research and extension programs are funded in part by Pennsylvania counties, the Commonwealth of Pennsylvania, and the U.S. Department of Agriculture.

Where trade names appear, no discrimination is intended, and no endorsement by Penn State Extension is implied.

This publication is available in alternative media on request.

Penn State is an equal opportunity, affirmative action employer, and is committed to providing employment opportunities to all qualified applicants without regard to race, color, religion, age, sex, sexual orientation, gender identity, national origin, disability or protected veteran status.

© The Pennsylvania State University 2017



PennState Extension