



# Orchard and Vineyard Air Quality Management

## Conservation Practice 752 – Specification Sheet

May 2010

Client: \_\_\_\_\_

### Definition:

Managing air emissions from agricultural production activities at orchards and vineyards.

### Purposes:

The purpose of this practice is to address the following NRCS air quality resource concerns at orchards and vineyards:

- Particulate matter
- Ozone precursors
- Greenhouse gases
- Where Used:

This practice applies at orchards and vineyards that include any one or a combination of the following types of activities:

- Fuel-combustion sources
- Handling of prunings, trimmings, and removed vegetation
- Management of floor surfaces and vehicle travel areas
- Pesticide usage

### Resource Management System:

Managing air quality on orchards and vineyards can involve a suite of practices contained in this standard depending on the sources of air pollution on the orchard or vineyard. Sources of direct particulate matter, oxides of nitrogen and volatile organic compounds (precursors to ozone and fine particulate matter formation), and/or carbon dioxide (a greenhouse gas) are :

- Liquid or solid fuel-fired combustion sources (such as diesel-fired smudge pots) used for frost protection

- Stationary Engines
- Other liquid or solid fuel-fired combustion sources
- Burning of vegetative biomass from the pruning, trimming, or removal of orchards and vineyards
- Disturbances on floor surfaces and vehicle travel areas
- Pesticide application: drift, volatilization, over-application

This practice can be established concurrently with other conservation practices as part of a resource management system. These practices may include:

- Conservation Cover (code 327)
- Dust Control on Unpaved Roads and Surfaces (interim – code 729)
- Heavy Use Area Protection (code 561)
- Irrigation System (codes 441, 442, 443, and 447)
- Mulching (code 484)
- Pest Management (code 595)
- Precision Pest Control Application (interim – code 718)
- Windbreak/Shelterbelt Establishment (code 380)
- Irrigation System, Microirrigation (code 441)
- Irrigation System, Sprinkler (code 442)
- Combustion Systems Air Emissions Management (code 723)

### Practice Specifications:

Practice Specifications are provided to assure that air quality management on orchards and vineyards meets the resource needs and producers' objectives. These requirements are recorded on 752 OR – Orchards and Vineyards Air Quality Management Specification Sheet.

**Natural Resources Conservation Service, Oregon** **April 2010**  
**Orchards and Vineyard Air Quality Management –**  
**Wind Machines Specification Sheet**

|              |  |              |  |
|--------------|--|--------------|--|
| Client:      |  | Farm/Tract:  |  |
| Location:    |  | County/SWCD: |  |
| Prepared by: |  | Date:        |  |

**Design Approval:**

| Practice code No.                  | Practice               | Lead Discipline | Controlling factor | Units | Job class |    |     |    |     |
|------------------------------------|------------------------|-----------------|--------------------|-------|-----------|----|-----|----|-----|
|                                    |                        |                 |                    |       | I         | II | III | IV | V   |
| 752                                | Orchards and Vineyards | CED-EE          | Area               | Acres | 5         | 12 | 25  | 50 | All |
| <b>Number of Acres in Project:</b> |                        |                 |                    |       |           |    |     |    |     |

This practice is classified as Job Class: \_\_\_\_\_

Design Approved by: /s/ \_\_\_\_\_ Date: \_\_\_\_\_

Job title: \_\_\_\_\_

**I. SCOPE**

The work shall consist of furnishing and installing a wind machine for frost protection in accordance with the manufacturer’s recommendation at the location as shown on the drawings.

Wind machines apply only where their use replaces diesel burning smudge pots or other combustion sources and a Frost Protection Plan has been approved.

**II. SUBMITTALS**

The following items are to be submitted for review and approval prior to installation of the wind machine:

1. Design Report addressing criteria and considerations shown in Sections III and IV.
2. Frost Protection Plan;
3. Equipment and Materials list;
4. Construction drawings and specifications; and
5. Procedures for Operation and Maintenance.

**III. CRITERIA FOR WIND MACHINES**

In some applications, wind machines can be an effective alternative to using diesel burning smudgepots during a radiation freeze. Radiation freezes are characterized by clear skies, calm winds, and temperature inversions. Radiation frosts occur because of heat losses in the form of radiant energy. Under clear, nighttime skies, more heat is radiated away from an orchard than it receives, so the

temperature drops. The temperature falls faster near the radiating surface causing a temperature inversion.

Wind machines are not effective for protection of crops affected by advection freezes. An advection frost occurs when cold air blows into an area to replace warmer air that was present before the weather change. It is associated with moderate to strong winds, no temperature inversion, and low humidity.

A Frost Protection Plan shall be developed. The plan shall include the climate history, frost damage patterns, crop requirements, appropriate siting, density of machines, power source options and requirements, and any local requirements. The plan shall address operation of the wind machine to manage frost protection in all climatic conditions. It shall also address conditions when water can be pumped from the stream to assist in frost protection during times when the wind machine does not provide adequate protection.

**Tower Wind Machine (for frost protection)** – The area protected by one tower wind machine depends on local topography and microclimate patterns. A general rule is one tower machine can be used for 10 acres with an inversion layer of height 50 ft and temperature differential of 10°F. For variable terrain, the blades of tower wind machine heads can be contoured and the tilt angle adjusted according to site-specific conditions.

The structural components of tower wind machines shall be designed by a Civil Engineer or Structural Engineer, licensed to practice in Oregon, as required to meet all state, county and local building codes. The wind machine shall be suitable for the site and designed to meet all site-specific requirements. NRCS shall provide the designer with a detailed site map (showing all planned practices), a topographical map and NRCS Soil Survey information as requested by the designer. The engineer shall provide construction plans, specifications and operation and maintenance guidance for the tower wind machines.

The design shall consider all anticipated loads, including live loads, dead loads, wind, snow, ice and seismic loads that influence the performance of the structure, material properties and construction quality. Design assumptions and construction requirements shall be indicated on the drawings. The plans, including the foundation work, shall be signed and sealed by a registered Civil or Structural Engineer..

**Tower-less Wind Machines (for frost protection)** – Wind machines that that do not include structural components are designed in accordance with the manufacturer's recommendations. Placement of the tower-less wind machines is critical to successful frost protection. These machines must be placed in the coldest spot of a depression. The tower-less wind machine shall be suitable for the site and designed to meet all site-specific requirements. NRCS shall provide the designer with a detailed site map (showing all planned practices), a detailed topographical map and NRCS Soil Survey information as requested by the designer

#### **IV. CONSIDERATIONS**

While intending to enhance environmental conditions, there is potential to directly or indirectly have adverse impacts to birds, mammals, amphibian and/or reptiles that may be using cover in or near fields with wind machines. Noise produced when machines are in use may significantly disturb terrestrial species behavior.

Operation of tower wind machines during an advection frost can cause more damage to crops than no protection (tower wind machine would move cold air onto crops.)

Wind machines equipped with internal combustion engines may be sources of particulate matter

emissions (PM10 and PM2.5), which can degrade local air quality. Utilizing cleaner burning engines, such as propane-fueled engines, will significantly reduce particulate emissions. Electric-powered wind machines emit no air pollution at the source.

#### **V. SITE PREPARATION (where required)**

**Clearing and disposal methods shall be in accordance with applicable state and county laws with due regard to the safety of persons and property.**

#### **VI. CONCRETE (when specified)**

Concrete shall conform to the requirements of Construction Specification for Major Structure per applicable ACI concrete code(s). The structure shall be analyzed per the latest ASCE 07: minimum design loads for buildings and other structures and any other state, federal, or local requirements.

#### **VII. INSTALLATION**

Installation of the unit shall be done in such a manner that erosion and air and water pollution are minimized and held within legal limits. The owner, operator, Contractor or other persons will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regard to the safety of all persons and property. NRCS shall be notified when installation will occur so NRCS can be available to do a construction inspection if necessary.

#### **VIII. VEGETATIVE COVER (where required)**

The planting of vegetative materials, if specified, shall conform to the requirements of Conservation Practice Specification 342-Critical Area Planting.

#### **IX. ASSOCIATED CONSERVATION PRACTICES (where required)**

Installation of associated conservation practices shall be as shown on the drawings, and shall be installed in accordance with the appropriate NRCS Conservation Practice Specification.

#### **X. BASIS OF ACCEPTANCE**

The acceptability of the wind machine shall be determined by inspection to check:

- Appropriate submittals are provided; and
- Submittals are reviewed and approved by NRCS prior to installation of practice measures; and
- The wind machine is installed.

The Installer shall certify the installation complies with the requirements of the installation instructions provided by the manufacturer.

A written guarantee shall be furnished that protects the owner against defective workmanship and materials for not less than 3 years, and includes the name the manufacturer of the wind machine.

Acceptability of any associated conservation practices shall be in accordance with the appropriate NRCS Conservation Practice Specification.

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Client's Acknowledgement Statement:

The Client acknowledges that:

- a. They have received a copy of the specification and understand the contents and requirements.
- b. All required documents as detailed above must be provided to NRCS by the client before this practice can be certified as applied.
- c. It shall be the responsibility of the client to obtain all necessary permits and/or rights, and to comply with all ordinances and laws pertaining to the application of this practice.

Accepted by: /s/ \_\_\_\_\_ Date: \_\_\_\_\_

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Certification:

I have completed a review of the information provided by the client and certify this practice has been applied.

Certification by: /s/ \_\_\_\_\_ Date: \_\_\_\_\_

Job title: \_\_\_\_\_

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