NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

WINDBREAK/SHELTERBELT ESTABLISHMENT

(Ft.)

CODE 380

DEFINITION

Windbreaks or shelterbelts are single or multiple rows of trees or shrubs in linear configurations.

PURPOSE

- Reduce soil erosion from wind.
- Protect plants from wind related damage.
- Alter the microenvironment for enhancing plant growth.
- Manage snow deposition.
- Provide shelter for structures, animals, and people.
- Enhance wildlife habitat.
- Provide noise screens.
- Provide visual screens.
- Improve air quality by reducing and intercepting airborne particulate matter, chemicals and odors.
- Delineate property and field boundaries.
- Improve irrigation efficiency.
- Increase carbon storage in biomass and soils.
- Reduce energy use

CONDITIONS WHERE PRACTICE APPLIES

Apply this practice on any areas where linear plantings of woody plants are desired and suited for controlling wind, noise, and visual resources. Use other tree/shrub practices when wind, noise and visual problems are not concerns.

CRITERIA

General Criteria Applicable to All Purposes

The location, layout and density of the planting will accomplish the purpose and function intended within a 20-year period.

Refer to Tree/Shrub Site Preparation Standard 490, for preparing site conditions for plant establishment.

The maximum design height (H) for the windbreak or shelterbelt will be the expected height of the tallest row of trees or shrubs at age 20 for the given site. Also reference Windbreak Establishment and How Windbreaks Work.

Species must be adapted to the soils, climate and site conditions. Table 1, in the Specification, provides a description for a limited number of the trees and shrubs that may be used for windbreaks in New Mexico (please note that Table 1 is not an exhaustive list, and species other than those listed here may be used if they are adapted to soils, climate and site conditions).

No plants on the Federal or state noxious weeds list will be planted. (For example, species such as Russian olive and Siberian elm should not be used). For information on Federal and state noxious weeds, see the NRCS noxious and invasive plants page.

Spacing between individual plants will be based on the needed growing space for plant type and species, the accommodation of maintenance equipment, and the desired characteristics of the stem(s), branches and canopy as required for a specific purpose.

The windbreak will be oriented as close to perpendicular to the troublesome wind as possible.

The length of the windbreak will be sufficient to protect the site including consideration for the "end effect" (the increased wind velocities at the end of the windbreak) and changes in wind direction.

Avoid planting trees or shrubs where they will interfere with structures or above or below ground utilities. Avoid creating blind corners at intersections.

State and local regulations will be followed in locating plantings adjacent to roads, and ordinances related to species and placements. An example of an ordinance is the Albuquerque pollen ordinance which prohibits planting of *Morus* species (Mulberry), *Juniperus* (Juniper) species and others.

Moisture conservation or supplemental watering will be provided for plant establishment and growth. This is crucial in New Mexico's arid environment, and in some areas the windbreak will require supplemental water throughout the life of the windbreak. See windbreak specification for more information on watering trees, and visit Waterwise Guide for Trees. A list of species adapted to New Mexico and their water needs, as well as site adaptability, is also available on the New Mexico State Forestry website here.

Plantings will be protected from adverse impacts from livestock and wildlife.

Refer to Tree/Shrub Establishment Standard 612 for further guidance on planting trees and shrubs.

Additional Criteria to Reduce Wind Erosion and Protect Growing Plants

The interval between windbreaks will be determined using current, approved wind erosion technology. Interval widths will not exceed that permitted by the soil loss tolerance (T), or other planned soil loss objective. Calculations will account for the effects of other practices in the conservation management system. Also reference: Field Windbreaks; Windbreaks for Fruit and Vegetable Crops; and Windbreaks in Sustainable Agricultural Systems.

For wind erosion control, temporary measures may be installed to supplement the windbreak until it is fully functional.

Sites, fields, and plants are protected within an area 10 times the design height (H) on the leeward side[1] and two times the design height (H) on the windward side of the windbreak.

Select species that are taller than the crops being protected.

Additional Criteria to Manage Snow Deposition

The windbreak will be oriented as close to perpendicular to the snow-bearing wind as possible. Also reference Windbreaks for Snow Management.

For snow distribution across a field, the windbreak density (during expected snow-producing months) will not be less than 25 percent or greater than 50 percent. The interval between barriers will not exceed 20H.

For snow accumulation, the minimum barrier density, during expected snow-producing months, will be 50 percent.

The length of the windbreak will extend beyond the area being protected to allow for end drifts. Where the site and property lines allow, windbreak lengths will extend 150 feet beyond each side of the area being protected.

Windbreaks will be located so that snow deposition will not pose a health or safety problem, management constraints, or obstruct human, livestock or vehicular traffic.

Where water erosion and/or runoff from melting snow is a hazard, it will be controlled by supporting practices.

Additional Criteria to Provide Shelter for Structures, Livestock and People

For wind protection, the windbreak density will be at least 65 percent during the months of most troublesome wind.

The area to be protected will fall within a leeward distance of 10H (H is the maximum design height).

Drainage of snowmelt from the windbreak will not flow across confined livestock areas.

[1] *The 'leeward side' is the side away from the troublesome wind.*

Drainage of livestock waste from the livestock area will not flow into the windbreak.

Additional Criteria for Noise Screens

Noise screens will be at least 65 percent dense during the time of the year when noise is a problem, as tall as, and as close to the noise source as practicable.

The length of the noise screen will be about twice as long as the distance from the noise source to the receiver.

For high-speed traffic noise, the barrier will not be less than 65 feet wide. For moderate speed traffic noise, the barrier width will not be less than 20 feet wide.

Species selected will be tolerant to noxious emissions, sand, gravel depositions or salt spray from traffic areas.

Additional Criteria for Visual Screens

Visual screens will be located as close to the observer as possible with a density, height and width to sufficiently block the view between the area of concern and the sensitive area.

Additional Criteria to Improve Air Quality by Reducing and Intercepting Airborne Particulate Matter, Chemicals and Odors

The windbreak interval will be less than or equal to 10H depending on site conditions and related supporting conservation practices.

Windbreak density on the windward side of the problem source, (i.e. particulate, chemical or odor) will be greater than 50% to reduce the airflow into the source area.

Windbreak density on the leeward side of the problem source, and windward of the area to be protected, will be greater than 65%.

Select and maintain tree and shrub species with foliar and structural characteristics to optimize interception and absorption of airborne chemicals or odors.

Effectiveness increases with the amount of foliage, so multiple-row, wide plantings offer greater interception potential than do smaller plantings.

Additional Criteria for Increasing Carbon Storage in Biomass and Soils

Maximize width and length of the windbreak to fit the site.

For optimal carbon sequestration, select plants that have higher rates of sequestration in biomass and soils.

Plant and manage the appropriate plant spacing for the site that will maximize above and below ground biomass production.

Minimize soil disturbance during establishment and maintenance of the windbreak/shelterbelt.

When using trees and shrubs for greenhouse gas reductions, prediction of carbon sequestration rates should be made using current, approved carbon sequestration modeling technology. Examples are CVAL and COLE. For additional carbon sequestration tools, see http://www.nrs.fs.fed.us/carbon/tools/.

Additional Criteria for Enhancing Wildlife Habitat

Plant species selection will benefit targeted wildlife species including pollinators. Also reference: Windbreaks for Wildlife.

Design dimensions of the planting will be adequate for targeted wildlife species. Increasing the number of rows and diversity of plant species increases the variety of wildlife species that may utilize the site. Windbreaks can be made to look more naturalistic, with a variety of species, and still provide wildlife habitat and wind protection.

Additional Criteria for Improving Irrigation Efficiency

For sprinkler irrigation systems, the windbreak will be taller than the spray height.

The windbreak will not interfere with the operation of the irrigation system.

Additional Criteria to Reduce Energy Use

Orient the windbreak as close to perpendicular to the troublesome wind as possible

Use proper plant density to meet energy reduction needs.

Use plants with a potential height growth that will be taller than the structure or facility being protected.

CONSIDERATIONS

Consider enhancing aesthetics by using evergreen species or species with features such as showy flowers, brilliant fall foliage, or persistent colorful fruits.

When designing and locating a windbreak or shelterbelt, consider the impact upon the landowner's or public's view of the landscape.

Selection of plants for use in windbreaks should favor species or varieties tolerant to herbicides used in the area.

Plants that may be alternate hosts to undesirable pests should be avoided. As an example, golden currant should not be planted close to southwestern white pine since it is an alternate host of white pine blister rust.

All plantings should complement natural features.

Tree or shrub rows should be oriented on or near the contour where water erosion is a concern. Where water erosion and/or runoff from melting snow is a hazard, it should be controlled by supporting practices.

Wildlife and pollinator needs should be considered when selecting or siting tree or shrub species. Species diversity, including use of native species, should be considered, as they enhance the utility for pollinators and other wildlife.

Increasing the number of rows and diversity of plant species increases the variety of wildlife species that may utilize the site.

Species diversity, including use of native species, should be considered to avoid loss of function due to species-specific pests.

Consider the invasive potential when selecting plant species.

A shelterbelt can be used as a travel corridor to connect existing patches of wildlife habitat.

In cropping systems select windbreak and shelterbelt species that minimize adverse effects to crop growth such as shade, allelopathy (the chemical inhibition of one organism by another), competing root systems or root sprouts.

PLANS AND SPECIFICATIONS

Specifications for applying this practice will be prepared for each site and recorded using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation.

OPERATION AND MAINTENANCE

The following actions will be carried out to ensure that this practice functions as intended throughout its expected life. These actions include normal repetitive activities in the application and use of the practice (operation), and repair and upkeep of the practice (maintenance).

Replacement of dead trees or shrubs will be continued until the windbreak/shelterbelt is functional.

Supplemental water will be provided as needed.

Thin or prune the windbreak/shelterbelt to maintain its function.

Inspect trees and shrubs periodically and protect from adverse impacts including insects, diseases or competing vegetation.

The trees or shrubs will be protected from fire and damage from livestock and wildlife, and protective structures and measures will be modified as needed to maintain tree and shrub protection and health as the plants grow.

Periodic applications of nutrients may be needed to maintain plant vigor.

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