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 air borne 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.

This practice does not apply to plantings that are intended to function primarily as field borders, hedgerows, or riparian forest buffers, for which other standards are applicable. Refer to the conservation practice standards for Field Border (386), Hedgerow Planting (422), and Riparian Forest Buffer (391).

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 shall be the expected height of the tallest row of trees or shrubs at age 20 for the given site.

Species must be adapted to the soils, climate and site conditions.

No plants on the Federal or state noxious weeds list shall be planted.
Spacing between individual plants shall 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” and changes in wind direction.

Avoid planting trees or shrubs where they will interfere with structures and above or below ground utilities.

Moisture conservation or supplemental watering shall be provided for plant establishment and growth where natural precipitation is too low for the selected species.

Refer to Tree/Shrub Establishment Standard (PA612) for further guidance on planting trees and shrubs.

**Additional Criteria to Reduce Wind Erosion and Protect Growing Plants**

The interval between windbreaks shall be determined using current, approved, wind erosion technology. Interval widths shall not exceed that permitted by the soil loss tolerance (T), or other planned soil loss objective. Calculations shall account for the effects of other practices in the conservation management system.

For wind erosion control, temporary measures will 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 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.

For snow distribution across a field, the windbreak density (during expected snow-producing months) shall 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.

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 shall be controlled by supporting practices.

Tree or shrub rows should be oriented on or near the contour where water erosion is a concern.

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**Additional Criteria to Provide Shelter for Structures, Livestock and People**

For wind protection, the minimum barrier density will be 65 percent during the months of most troublesome wind.

The area to be protected will fall within a leeward distance of 10H.

Drainage of snowmelt from the windbreak shall not flow across the livestock area.

Drainage of livestock waste from the livestock area shall not flow into the windbreak.
**Additional Criteria for Noise Screens**
Noise screens shall 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 shall be twice as long as the distance from the noise source to the receiver.

For high-speed traffic noise, the barrier shall not be less than 65 feet wide. For moderate speed traffic noise, the barrier width shall 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 shall 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 shall 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) shall 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, shall be greater than 65%.

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

Windbreaks for odor and chemical control increase in effectiveness as the amount of foliage available for intercept increases. Utilize multiple-row, wide plantings that offer greater interception potential than 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.

**Additional Criteria for Enhancing Wildlife Habitat**
Plant species selection shall benefit targeted wildlife species including pollinators.

Design dimensions of the planting shall be adequate for targeted wildlife species.

**Additional Criteria for Improving Irrigation Efficiency**
For sprinkler irrigation systems, the windbreak shall be taller than the spray height.

The windbreak shall 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 plant growth rates, shade tolerance, soil moisture requirements and tolerances, and other plant characteristics when selecting tree and shrub species. In cropping systems select windbreak and shelterbelt species that minimize adverse affects to crop growth (e.g. shade, allelopathy, competing root systems or root sprouts).

Consider the length of time needed to achieve the desired purpose. Slow-growing species will take longer to reach the design height than fast-growing species. Seedlings will take longer than containerized or balled-and-burlapped plant stock.

Avoid selecting plant species or planting near existing species that may be alternate hosts to undesirable pests, or that may be considered invasive or undesirable. Species diversity, including use of native species, should be encouraged to minimize problems due to species-specific pests.

Consider potential benefits to wildlife and pollinators when selecting or siting tree and shrub species.

Consider using plants that have multiple wildlife and/or pollinator values such as those suited for nesting habitat, fruit, seeds, nectar, browse, and protective cover.

When designing and locating a shelterbelt or windbreak, consider that it be used as a travel corridor to connect existing patches of wildlife habitat.

Consider the need for invasive and noxious weed control within and between rows. For windbreaks that will be maintained with mowing, consider that plant spacing will need to accommodate mowing equipment.

Consider access routes and the need to maintain space for future expansion when designing windbreaks near buildings.

**PLANS AND SPECIFICATIONS**

Plans and specifications for this practice shall be prepared in accordance with the previously listed criteria. Plans and specifications shall contain sufficient detail to ensure successful implementation of this practice and may be recorded in narrative form, on Implementation Requirements (IR) worksheets, or other approved forms.

The following items shall be addressed, as appropriate:

- Purpose of the windbreak;
- Method of site preparation;
- Species selected for establishment and planting dates;
- Length of the windbreak, number of rows, and spacing within and between rows;
- Rate and type of soil amendments to be applied (if any);
- Method(s) used to protect plantings from animal damage (e.g., fencing, repellents, tree shelters, etc.) or for weed control (e.g., weed mats, mulch).

**OPERATION AND MAINTENANCE**

The following actions shall be carried out to insure 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).

Document applicable Operations and Maintenance requirements on the Implementation Requirements worksheet. At a minimum, the following components will be addressed, as applicable:
Inspect the windbreak at least annually. Shape and replant areas damaged by heavy rainfall, animals, chemicals, tillage, or equipment traffic, and any other areas where the vegetation is not adequate;

Thin or prune the windbreak/shelterbelt to maintain its function only after trees and shrubs are established;

If survival is less than expected during the first two years, replant as needed to achieve the intended purpose of the practice. If natural regeneration of trees and/or shrubs (other than what was planted) become established, and this cover meets the intended purpose of the practice, the cover should be considered adequate;

Apply nutrients periodically as needed after the first year but only if needed to maintain plant vigor and at a rate based on soil test results;

Protect the planting from wildfire and damage from livestock, wildlife, and equipment, to the extent feasible;

Control undesirable plants by pulling, mowing, or spraying with a selective herbicide;

Provide supplemental water to plantings as necessary.

REFERENCES


