NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

WINDBREAK/SHELTERBELT ESTABLISHMENT

(Feet)
Code 380

DEFINITION

Linear plantings of single or multiple rows of trees or shrubs established for environmental purposes.

PURPOSE

* Reduce soil losses from wind erosion.

* Protect growing plants.

* Manage snow.

* Provide shelter for wildlife and livestock.

* Provide wildlife habitat.

* Provide living screens.

* Improve aesthetics.

CONDITIONS WHERE PRACTICE APPLIES

On any area where woody plants are suited.

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.

The design height (H) for the system shall be the expected height of the tallest row of trees or shrubs at age 20 for the site.

Species must be suitable and adapted to the soils, climate, and purpose.

Site preparation shall be sufficient for establishment and growth of selected species and appropriate for the site.

Only viable, high quality, and adapted planting stock will be used.

Multiple species, within rows, may be used if heights and growth forms are similar.

The planting shall be done at a time and manner to ensure survival and growth of selected species.

The planting will be protected from livestock grazing and fire.

Avoid planting trees or shrubs where they will interfere with structures or any 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.

Additional Criteria to Reduce Wind Erosion and Protect Growing Plants. The windbreak will be oriented as close to perpendicular to the critical wind direction as possible.

The interval between windbreaks shall be determined using current, approved wind erosion technology to achieve the quality level desired for the soil, or plant resource. The maximum distance sheltered by the

barrier shall be ten times the design height (H).

To protect plants, base spacing on the level of plant protection desired. Some crops and their annual/acre tolerance to windblown soil are listed below.

Tolerant (3 tons): oats, rye, wheat.

Moderate tolerance (2 tons): corn, soybeans, grain sorghum, sunflowers.

Low tolerance (1 ton): fruit trees.

Very low tolerance (< 1 ton): alfalfa, most vegetables, and potatoes.

Additional Criteria to Manage Snow. The windbreak will be oriented as close to perpendicular to the snow-bearing wind as possible.

For snow distribution, the maximum windbreak density will be 65 percent and the interval between barriers will not exceed 20H.

For snow accumulation, the minimum barrier density will be 50 percent and the windward row will be at least 100 feet from the area to be protected.

Windbreaks will be located so that snow deposition will not adversely impact the area to be protected.

To reduce potential snow damage to the windbreaks use widest spacings and/or locate a shrub row windward 40-75 feet windward of the primary windbreak.

For "living snow fences" adjacent to roads or lanes:

Snow barriers should extend 100 feet beyond the ends of roadway areas to be protected.

Snow trap areas should be no less than 75 feet wide.

Use only shrubs and/or evergreens.

Additional Criteria to Provide Shelter for Livestock. The windbreak will be oriented as close to perpendicular to the troublesome wind as possible.

For wind protection, the minimum barrier density will be 65 percent and the area to be protected will fall within 10H of the design height.

Additional Criteria for Living Screens. Noise screens shall be dense, as tall and as close to the noise source as practical and legal.

Visual screens shall be located as close to the observer as possible. Use plants that will add color, texture, and diversity to the site.

Evergreen trees and shrubs are most effective for year-round protection. Plantings should be twice as long as the distance from the noise source to the receiver, extending equal distances on each side of the receiver.

For high-speed traffic: The edge of the planting should be 100-150 feet from the center of the nearest traffic lane. The tallest tree row should be capable of attaining a mature height of at least 45 feet.

For moderate-speed traffic: The edge of the planting should be 50-80 feet from the center of the nearest traffic lane. The tallest tree row should be capable of attaining a mature height of at least 30 feet.

Additional Criteria to Provide Wildlife Habitat. Add rows to a planting to increase wildlife benefits. Optimum wildlife usage occurs with ten or more rows.

Use plants of different sizes, growth forms, food-bearing capabilities, and densities to increase plant diversity. A minimum of one evergreen and one shrub row should be included among the additional windbreak rows. Shrub rows should be located on outside rows.

The windbreak layout should include a partial east-west orientation. During the winter months, direct sunlight is available on southern rows throughout the day. The opportunity to "sun" in a protected southern exposure decreases food needs for wildlife.

CONSIDERATIONS

Spacing between windbreaks and rows of windbreaks may be adjusted, within limits of the criteria to accommodate widths of equipment.

Plantings should compliment natural features.

When placing an opening through a windbreak, make openings on an angle that minimizes the loss of wind protection. Whenever possible, locate access roads at the ends of windbreaks beyond where snowdrifts form.

Where water erosion, feedlot runoff, or runoff from melting snow is a hazard, runoff should be controlled by supporting practices.

Where early wind and snow protection is desired, use close spacing guidelines within the rows.

Vegetation diversity will reduce insect or disease problems, enhance wildlife values, and improve aesthetics.

Consider the effects of the windbreak on adjacent landowners when plantings are on or near property boundaries.

The distance that protection extends from the windbreak's leeward side is proportional to its height. The zone of most effective protection extends to a distance two to five times (2H - 5H) its height, while significant protection extends to 10H.

Order trees and shrubs well in advance of anticipated planting time to ensure that the desired stock will be available.

When considering species, base selection(s) on soil type, desired height, growth rate, wildlife needs, landuser objectives, windbreak density requirements, hardiness, growth form, and tree/shrub life expectancy.

OPERATION AND MAINTENANCE

The following actions shall be carried out to ensure that this practice functions as intended. These actions include normal repetitive activities in the application, operation, repair, and upkeep of the practice.

Control competing vegetation for the life of the planting or until plants close the area and shade out competition. If using herbicides, follow all label directions.
All plantings will be protected from livestock. Protect plantings from wildlife as needed in order to ensure adequate survival.

Replace dead trees and shrubs as necessary in order to maintain planting function. Replant with the same species or species with similar growth form and potential.

Supplemental water will be provided as needed.

Protect plantings from fire. Maintain necessary firebreaks around all plantings.

Pruning should be done only for the purposes of removing dead, injured, or diseased wood. Inspect windbreaks at least every six months for insect and disease problems.

SPECIFICATIONS

Adapted Species. For adapted species and cultivars, refer to the Field Office Technical Guide, Section II-N, Trees and Shrubs for Windbreak and Environmental Plantings.

Density. Windbreak densities can be controlled through the type of plants and the number of rows used. Using the row guidelines below will achieve the desired barrier densities outlined in the Windbreak/Shelterbelt (380) practice standard.

Number of Rows: For minimum effectiveness, windbreaks for all purposes, except wind erosion, plant protection and living snow fences, will contain two rows of trees. Three or more rows may be used to enhance wildlife values, meet landowner objectives, increase diversity, improve natural beauty, and increase density.

For specific windbreak row minimums, use the following chart to achieve desired densities.

WINDBREAK TYPE	MINIMUM NUMBER OF ROWS AND COMPOSITION
FARMSTEAD	ΔΔo or ΨΨΨΨo
FEEDLOT	ΔΔo or ΨΨΨΨo
FIELD	Δ or Ψ or o
HIGH-SPEED TRAFFIC SCREEN	ΔΔΔΨΨΨ or ΔΔΔΨΨo or ΔΔΔΨoo or ΔΔΔooo
LOW or MEDIUM SPEED TRAFFIC SCREEN	ΔΔΨ or ΔΔo
UNSIGHTLY VIEW SCREEN	ΔΔ or ΔΨ or Δo
WILDLIFE	ΔΨΨΨΨ or ΔΨΨΨo or ΔΨΨoo or ΔΨooo or Δoooo
LIVING SNOW FENCE, unsheltered distance < 1000feet	Δ or o
LIVING SNOW FENCE, unsheltered distance > 1000feet	ΔΔ or Δo

Δ = Coniferous tree
Ψ = Deciduous tree
o = Shrub

These are minimum designs to meet the stated purpose. Consider increasing the number of rows and species diversity in order to provide additional benefits.

Plant Spacing. If using equal spacings in adjacent rows, stagger tree spacing so the trees in one row will be planted opposite the opening in the other row.

Example:

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   X     X     X
X     X     X     X
   X     X     X
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For specific spacing distances, see Tree/Shrub Establishment (612).

Row spacings should be at least four feet wider than any equipment planned for between-row maintenance not to exceed the maximum allowed spacing.

Twin Row High Density: Twin row high density windbreaks are designed with each twin row planted as a closely spaced double row. Each twin row will contain the same species.

The windbreak will contain a minimum of two twin rows (four rows total).

The spacing between twin rows will be 50 to 100 feet to accommodate planned use needs.

For plant spacing within twin rows, use the closest row spacings listed in Tree/Shrub Establishment (612).

Site Preparation. Competing vegetation will be controlled by one or more of the following methods:

If cover is sod, alfalfa, or weedy cropland cover, control competing vegetation by:

Strip tilling with tillage equipment;

Chemical treatment of the planting strip; or

Chemical or mechanical spot treatments.

If cover is non-weedy cropland:

Plant in stubble without prior preparation; or

Lightly disk the area to evenly distribute crop residues.

All spot or strip treatments shall be four to five feet in diameter or width.

Fall site preparation prior to spring planting is preferred. A fall seeding of oats may be used where needed to control soil erosion.

All chemicals will be used in accordance with label guidelines. If chemicals are handled or applied improperly or if unused portions are not disposed of safely, they may be injurious to humans, domestic animals, desirable plants, and fish or wildlife.

Planting. Refer to Tree/Shrub Establishment (612) for planting guidelines.

REFERENCES

Windbreak Technology, Elsevier Science Publishers B.V., 1988.

Farmstead Shelterbelts, Minnesota Extension Service; CD-BU-0468, 1988.

Windbreaks for Wildlife, Kansas State University, 1985.

Plants/People/And Environmental Quality, U.S. Dept of Interior, 1972.

Tree Planting: Establishment and Care, Iowa State University Extension, 1997.

Manual of Woody Landscape Plants, Stipes Publishing Company, 1983.