

**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 or sets of linear plantings.

PURPOSES

- To reduce soil erosion from wind.
- To protect plants from wind related damage.
- To alter the microenvironment for enhancing plant growth.
- To manage snow deposition.
- To provide shelter for structures, livestock, and recreational areas.
- To enhance wildlife habitat by providing travel corridors.
- To provide living noise screens.
- To provide living visual screens.
- To provide living barriers against airborne chemical drift.
- To delineate property and field boundaries.
- To improve irrigation efficiency.
- To enhance aesthetics.
- To increase carbon storage.

CONDITIONS WHERE PRACTICE APPLIES

On any areas where linear plantings of woody plants are desired and 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 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 suitable and adapted to the soils, climate and site conditions.

Site preparation shall be sufficient for establishment and growth of selected species, not contribute to erosion, and be appropriate for the site.

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

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

The planting will be protected from adverse impacts such as livestock damage or fire.

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.

For optimal carbon storage, select plants that are adapted to the site to assure strong health and vigor and plant the full stocking rate for the site

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resource Conservation Service.

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.

Comply with applicable federal, state and local laws and regulations during the installation, operation, and maintenance of this practice.

Additional Criteria To Reduce Wind Erosion; Protect Growing Plants

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

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

The wind erosion control system should consider temporary measures to supplement the windbreak until it is fully functional.

Additional Criteria To Provide Shelter For Structures And Livestock

The planting 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.

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 all times of the year, 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, and 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.

Additional Criteria For Providing or Enhancing Wildlife Habitat or Travel Corridors.

Plant species selection shall benefit targeted wildlife species.

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 as tall as the sprinkler heads.

The barrier shall not interfere with the operation of the irrigation system

CONSIDERATIONS

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

To enhance aesthetics use evergreen species or species with features such as showy flowers, brilliant fall foliage, or persistent colorful fruits

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.

All plantings should compliment 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 is a hazard, it should be controlled by supporting practices.

Wildlife needs should be considered when selecting tree or shrub species.

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

Consideration should be given to adverse offsite effects.

Plants established in cropping systems should have root systems that do not affect crop growth and/or spread from root sprouts

PLANS AND SPECIFICATIONS

Specifications for this practice shall be prepared for each site. Specifications shall be recorded using approved specifications sheets, job sheets, narrative statements in the conservation plan, or other acceptable documentation.

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):

Replacement of dead trees or shrubs will be continued until the barrier is functional.

Vegetative competition will be controlled.

Supplemental water will be provided as needed.

Thin or prune the barrier 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 also be protected from fire and damage from livestock and wildlife.

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

SPECIFICATION GUIDE

The degree of wind erosion is dependent directly on the physical character and condition of the soil. Only dry soils are moved. Wet or damp soils are not appreciably affected. The structure of soil in an air-dry state is the index to its erodibility. There are three types of soil movement in the process of wind erosion, usually operating simultaneously: (1) saltation - movement of particles in short bounces on the ground, (2) suspension - fine dust particles carried suspended in air, and (3) surface creep - movement of large particles on the ground by both wind and bombardment by smaller particles.

A. Location and Distance Between Windbreaks

1. Calculate the area of distance sheltered. Determine the future height of the windbreak and its alignment to the prevailing wind. The formula of $10H$ (10 x height of barrier) is used to determine distance sheltered. When the windbreak is aligned near to right angles (0-22 degrees) to the wind, the sheltered distance decreases as angle of wind hitting the break increases.
2. Try to locate windbreaks along farm boundaries, field boundaries, public roads, private roads, or ridge tops. In open fields, plant windbreaks at right angles to prevailing wind.

Effective Height of Barrier	Prevailing Wind Angle	
	0-22	60
Feet	Distance Feet	Sheltered Feet
80	800	400
65	650	325
50	500	250
35	350	175
20	200	100
10	100	35

When slopes facing the wind are over two percent, use the following correction factors to determine distance sheltered:

% Slope Facing Wind- Along Wind Direction	Barrier Height Correction Factor
3	0.77
4	0.72
5	0.67
6	0.62

Example: A 65-foot barrier with 60 degrees alignment on land with a 4 percent slope will provide a sheltered distance on 234 feet ($325 \times 0.72 = 234$ feet).

B. Natural Shelterbelts

When clearing forested land for agriculture, consider leaving shelterbelts of native trees to provide wind erosion protection and wildlife travel lanes and escape cover. Natural shelterbelts offer immediate wind protection.

Shelterbelts of 33 feet to 330 feet in width offer effective wind protection as well as wildlife escape cover and habitat and also can produce marketable timber products. The distance sheltered by natural shelterbelts should be calculated using same methods described in Section A above.

C. Species

1. Consider the potential growth and future economic value of plants and trees, the plant's usefulness as food

and cover for wildlife, and the appearance or beauty of the windbreak in the landscape. Coniferous evergreens such as pine and eastern redcedar give year-round protection and are excellent for windbreaks.

2. Plant species adapted to the soil-site conditions. (See Field Office Technical Guide Section II-F-2 Woodland Suitability Group). Species shown below are suggested.
3. Tree species to plant should be selected from the following:

<u>Trees and Shrubs</u>	<u>Average Effective Height</u>
Loblolly pine (<u><i>Pinus taeda</i></u>)	70-90
Slash pine (<u><i>Pinus elliotii</i></u>)	70-90
Eastern redcedar (<u><i>Juniperus virginiana</i></u>)	45-55
Arizona cypress (<u><i>Cupressus arizonica</i></u>)	40-60
California privet <u>1/</u> (<u><i>Ligustrum ovalifolium</i></u>)	15-30
Leyland Cypress	40-50
Japanese privet (<u><i>Ligustrum japonicum</i></u>)	8-12
Glossy ligustrum (<u><i>Ligustrum lucidum</i></u>)	8-10
Chinese photinia (<u><i>Photinia serrulata</i></u>)	15-20
Bush honeysuckle <u>2/</u> (<u><i>Lonicera Maackii</i></u>)	8-12
Autumnolive <u>2/</u> (<u><i>Elaeagnus umbellata</i></u>)	8-12
Shrub lespedeza <u>3/</u> (<u><i>Lespedeza bicolor</i></u>)	8-12

- 1/ There are several suitable varieties of ligustrum; estimate height for variety used.
- 2/ Not evergreen, but normally fully leafed by critical wind erosion period.
- 3/ Not evergreen - should be planted in combination with evergreens.

D. Spacing and Arrangement

1. Plant two or three rows of trees

with rows six feet apart (or space rows wide enough to permit mowing).

2. Pines should be no more than eight feet apart in the row; redcedar and Arizona cypress: 5-6 feet.
3. Stagger each tree in the row between the trees of adjacent rows.
4. Where shrubs are used, plant a belt of them no less than four feet wide on the windward side of the field to be protected.
5. Plant privet at least four feet apart in the row.
6. Plant shrub lespedezas in rows two feet apart with individual plants 28 inches apart in the row.

E. Site Preparation

Prepare a suitable planting site by eliminating competing vegetation. Sod land should be broken, worked thoroughly, and fallowed if necessary.

F. Methods of Planting

1. Mechanical tree planters may be used where soil erosion conditions and slope permit.
2. Hand planting - Use a planting bar (dibble) or a mattock where it is impractical to use a machine planter. Planting bars work very well in lighter sandy soils.

G. Culture

Reducing competition from weeds, grass or brush is important for the survival and growth of the windbreak seedlings. Competition can be reduced by:

1. Mow between rows annually for at least two years after establishment if equipment is available. Plant so spacing between rows will permit passage of farm tractor mowers.

2. Spraying vegetative competition with approved herbicide.

3. Mulching.

H. Protection and Maintenance Requirements

1. Protect from fire and grazing damage by domestic livestock.
2. Replace dead trees and shrubs with the same species the first year following planting.

I. Wind erosion can also be reduced by using the following practices:

1. Stripcropping.
2. Crop residue use.
3. Mulching.
4. Minimum tillage.
5. Critical area planting.