

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

WINDBREAK/SHELTERBELT ESTABLISHMENT

(Ft.)

CODE 380

DEFINITION

Linear plantings of single or multiple rows of trees or shrubs or sets of linear plantings.

PURPOSES

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

CONDITIONS WHERE PRACTICE APPLIES

On any areas where linear plantings of woody plants are desired and suited.

CRITERIA FOR ALL PURPOSES

1. The location, layout and density of the planting will accomplish the purpose and function intended within a 20-year period. Refer to Section IV, FOTG, Appendix B - Tree/Shrub Recommendations for site suitability and planting density.
2. 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. Refer to Section IV, FOTG, Appendix B - Tree/Shrub Recommendations for site suitability and plant height.
3. Species must be adapted to the soils, climate and site conditions. Refer to Section IV, FOTG, Appendix B - Tree/Shrub Recommendations for site suitability.
4. Species shall be suited for the planned practice purpose(s). Refer to Section IV, FOTG, Appendix B - Tree/Shrub Recommendations for purpose suitability.
5. Site preparation shall be sufficient for establishment and growth of selected species, not contribute to erosion, and be appropriate for the site.
6. Only viable, high quality, and adapted planting stock or seed will be used.
7. The planting shall be done at a time and manner to insure survival and growth of selected species.
 - a. Southern Ohio (South of I-70) - Late winter or spring as soon as the ground thaws to April 15th.
 - b. Northern Ohio (North of I-70) - Late winter or spring as soon as the ground thaws to April 30th.

8. 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. Refer to Section IV, FOTG, Appendix B - Tree/Shrub Recommendations for plant spacing between rows and in-row..
9. 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.
10. Avoid planting trees or shrubs where they will interfere with structures and above or below ground utilities.
 - a. Where subsurface drains (tile lines) cross through a hardwood windbreak, sealed conduit should be installed a minimum of 100 feet from rows of large spreading trees and 75 feet from small to medium sized trees and shrubs. Conifers normally do not interfere with drains but invading native tree species can interfere.
 - b. Tree and shrub rows are to be 8 feet or more from fences, utility lines, property lines, and roads. An exception would be where joining landowners agree to establish windbreaks on property line.
 - c. To prevent snowdrift problems the leading edge of a windbreak on the north or west side of a road will be no closer than 75' from the edge of the road. Where these specifications differ from State or County regulations, the State or County regulations will be followed if more restrictive.
 - d. The windward row of the windbreak will not be closer than 75 feet to the windward side of any building, road, feedlot, or area where snow drifts cannot be tolerated. Where the landowner has made a decision the drifting snow can be tolerated on improvements, plans must be accompanied with a written explanation of potential snow drifting and icing hazards.
11. Moisture conservation or supplemental watering shall be provided for plant establishment and growth where natural precipitation is too low for the selected species.
12. 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

1. The windbreak will be oriented as close to perpendicular to the troublesome wind as possible. West and Southwest winds are the predominant winds in Ohio. However, property lines, other windbreaks, tillage operations, field layout and natural features on the landscape should be taken into account in the design. When taking these situations into account, the windbreak can be designed to be oriented on the most beneficial side even though these are not perpendicular to the prevailing wind.
2. 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.
3. For wind erosion control, temporary measures will be installed to supplement the windbreak until it is fully functional.
4. 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.
5. Field windbreaks will be a minimum of one row. Additional rows can be added for benefits such as wildlife habitat, and beautification.

- a. Single row windbreaks provide the maximum benefits for erosion control, snow spreading and crop yield increases for the investment. They have less value for wildlife habitat, dead trees result in gaps and they are more subject to insect and disease problems than multi-row windbreaks.
- b. Multi-row windbreaks provide good wildlife habitat, seldom develop gaps, and the additional rows protect and support each other for a healthier, faster growing windbreak than a single row. At the same time, the multi-row windbreaks take more land out of production, are more expensive, will concentrate snow in drifts creating wet areas when they melt and are so dense that the soil on the lee side will stay wet much longer than soil down wind from a single row windbreak.
- c. Existing fencerows with trees or shrubs of suitable size, shape, and density can be considered as a row of a planned windbreak if it is in a desirable location and fits with design requirements.
- d. Twin-row high-density designs consist of two closely spaced rows of tree or shrubs having the same growth rates, row characteristics, and life span.

Additional Criteria To Manage Snow Deposition

1. The windbreak will be oriented as close to perpendicular to the snow-bearing wind as possible. West and Southwest winds are the predominant winds in Ohio. However, property lines, other windbreaks, tillage operations, field layout and natural features on the landscape should be taken into account in the design. When taking these situations into account, the windbreak can be designed to be oriented on the most beneficial side even though these are not perpendicular to the prevailing wind.
2. For snow distribution across a field, the windbreak density (during expected snow-producing months) shall not be less than 25 percent nor greater than 50 percent. The interval between barriers will not exceed 20H.
3. For snow accumulation, the minimum barrier density, during expected snow-producing months, will be 50 percent.
4. Windbreaks will be located so that snow deposition will not pose a health or safety problem or obstruct human, livestock, or vehicular traffic. To prevent snowdrift problems the leading edge of a windbreak on the north or west side of a road will be no closer than 75' from the edge of the road. Where these specifications differ from State or County regulations, the State or County regulations will be followed if more restrictive.
5. Where water erosion and/or runoff from melting snow is a hazard, it shall be controlled by supporting practices.

Additional Criteria To Provide Shelter For Structures, Livestock, and Recreational Areas

1. The planting will be oriented as close to perpendicular to the troublesome wind as possible.
2. For wind protection, the minimum barrier density will be 65 percent during the months of most troublesome wind and the area to be protected will fall within a leeward distance of 10H.
3. Minimum requirements for a primary farmstead and feedlot windbreak will be 3 rows of plants of which at least one tree row must be an evergreen conifer and at least two rows must be trees. An exception would be in cases of severe space limitation a twin-row high density design would meet minimum requirements.

Examples of row arrangement:

- (1) Three rows of evergreen trees (3 rows).
 - (2) One row of shrubs on the windward side and then 2 rows of evergreen trees (3 rows).
 - (3) One row of shrubs on the windward side, next a row of narrow-crowned evergreen trees, and then two rows of normal-crowned evergreen trees (4 rows—this is a preferred design for Ohio).
 - (4) One row of shrubs both sides of the windbreak with one row of deciduous trees and one row of evergreen trees in the middle (4 rows). The evergreen trees should be on the windward side.
 - (5) One row of evergreen shrubs on the windward side, next a row of evergreen trees in the middle, and then a row of deciduous trees (3 rows).
 - (6) One row of shrubs on both sides with 2 or more rows of trees in the middle.
 - (7) Twin row high density conifer trees having same growth rate, shape and life span.
4. Minimum requirements for optional windbreaks, which can also be designed as living snow fences, are one row of shrubs or trees. Can only be used in conjunction with a primary windbreak and on the north, northeast, east, southeast, and south sides or as a living snow fence 30' to 75' to the windward and parallel to the primary windbreak. A living snow fence on the windward side of a primary windbreak can be counted as a row and the leading edge of a primary windbreak for design purposes.
5. Directional Orientation.
- a. Minimum for primary windbreak: one leg, as perpendicular to prevailing damaging winds as practical.
 - b. Preferable for primary windbreak: two legs, L-shaped or curved as viewed from above with one leg as perpendicular to the prevailing wind as possible.
 - c. Optional for addition to primary windbreak: one or more legs, oriented as needed to provide protection from winds and blowing snow from directions other than prevailing winds.
 - d. Existing fencerows with trees or shrubs of suitable size, shape, and density can be considered as a row of a planned windbreak if it is in a desirable location and fits with design requirements.
 - e. Minimum length of main leg of primary windbreak is 100 feet long and extends 50 feet beyond area needing protection.
6. Drainage of snowmelt from the windbreak shall not flow across the livestock area.
7. Drainage of livestock waste from the livestock area shall not flow into the windbreak.

Additional Criteria For Noise Screens

1. 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.
2. The length of the noise screen shall be twice as long as the distance from the noise source to the receiver.
3. 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.

4. 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.

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

1. Plant species selection shall benefit targeted wildlife species.
2. Design dimensions of the planting shall be adequate for targeted wildlife species.

Additional Criteria For Improving Irrigation Efficiency

1. For sprinkler irrigation systems, the windbreak shall be as tall as the sprinkler heads.
2. The barrier shall not interfere with the operation of the irrigation system.

CONSIDERATIONS

1. To enhance aesthetics use evergreen species or species with features such as showy flowers, brilliant fall foliage, or persistent colorful fruits.
2. Selection of plants for use in windbreaks should favor species or varieties tolerant to herbicides used in the area.
3. Plants that may be alternate hosts to undesirable pests should be avoided.
4. All plantings should complement natural features.
5. 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.
6. Wildlife 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.
7. Consideration should be given to adverse offsite effects.
8. 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 applying this practice shall be prepared for each site and recorded using approved job sheets, technical notes, narrative statements in the conservation plan, or other acceptable documentation. The minimum documentation required for this practice is outlined on the last page of this standard.

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):

1. Replacement of dead trees or shrubs will be continued until the barrier is functional.
2. Supplemental water will be provided as needed.
3. Thin or prune the barrier to maintain its function.
4. 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.
5. Periodic applications of nutrients may be needed to maintain plant vigor.
6. Fence only if necessary to protect windbreak from livestock grazing and trampling damage (Refer to Use Exclusion 472 and Fencing 382).
7. Cultivate, mow, and/or use pesticides to control weeds, grass, and other encroaching plants for at least three growing seasons.
8. To protect plantings from fire, mow, and if necessary, remove fire prone, material from the windbreak or maintain a cultivated, 8-foot wide isolation strip on each side of the windbreak.
9. Protect from insects and disease by frequent inspection and spraying with proper pesticide as needed.
10. Protect the trees and shrubs from animal and environmental damage as needed by using screen wire, tree wrap, tree shelters, repellents, or by mowing or cultivating around the trees to remove the cover.
11. Do not use hay or straw mulch for weed and grass control around trees and shrubs.
12. Windbreak trees and shrubs must be protected from barnyard and feedlot runoff water.
13. Protect trees and shrubs from pesticide drift.

REFERENCES

National Standard Windbreak/Shelterbelt Establishment (380)
National Agroforestry Center web site: <http://www.unl.edu/nac/> (Windbreaks)

Practice Documentation For:	<i>Windbreak/Shelterbelt Establishment - 380</i>
The following documentation must be in the case folder or engineering subfolder.	
Practice Planning	
<ol style="list-style-type: none"> 1. Is the practice part of a conservation plan? 2. Have the purpose(s) for the practice been identified? 3. Is the location of the practice identified on a map or plan drawing? 	
Practice Design	
<p>Have the following design criteria been addressed?</p> <ol style="list-style-type: none"> 1. Location, layout and density of the planting to accomplish the purpose and function. 2. The maximum design height (H) for the windbreak or shelterbelt. 3. Adapted species for the soils, climate and site conditions. 4. Species shall be suited for the planned practice purpose(s). 5. Site preparation. 6. Time and method of planting. 7. Number of rows. 8. For wind erosion purposes, the direction and spacing between windbreaks. 9. In row and between row spacing for each species. 10. Compliance with applicable federal, state and local laws and regulations during the installation, operation, and maintenance of this practice. 11. Linear feet of windbreak planned. 	
Practice Installation / Application	
Does the practice meet the minimum criteria for the planned purpose(s)?	
<p>Have the following criteria been documented in the assistance notes or practice jobsheet?</p> <ol style="list-style-type: none"> 1. Species planted. 2. Planted spacing in row and between rows. 3. For wind erosion purposes, the spacing and direction of windbreaks 4. Quality of the planting. 5. Linear feet planted. 	
Practice Deficiencies	
If applicable, have the practice deficiencies been communicated with the decisionmaker?	
Practice Maintenance	
<p>Have the following maintenance actions been communicated to the decisionmaker?</p> <ol style="list-style-type: none"> 1. Replacement of dead trees or shrubs will be continued until the barrier is functional. 2. Thin or prune the barrier to maintain its function. 3. Inspect trees and shrubs to protect from adverse impacts of insects, diseases or competing vegetation. 4. Protect trees or shrubs from fire and damage from livestock and wildlife. 	
Other Comments:	