Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

WINDBREAK/SHELTERBELT ESTABLISHMENT

CODE 380

(ft)

DEFINITION

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

PURPOSE

This practice is used to accomplish one or more of the following purposes–

- 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. 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.

The maximum design height (H) for the windbreak or shelterbelt is the expected height of the tallest row of trees or shrubs at age 20 for the given site.

Spacing between individual plants is 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.

Provide moisture conservation or supplemental watering for plant establishment and growth where natural precipitation is too low for the selected species.

Refer to Kansas Forestry Technical Note KS-9, for further guidance on planting trees and shrubs.

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

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

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

No plants on the federal or state noxious weeds list will be planted.

Additional Criteria to Reduce Wind Erosion and Protect Growing Plants

Determine the interval between windbreaks 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(s). Calculations will 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 H on the leeward side and 2 times the design 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 during expected snow-producing months, windbreak density will be between 25 percent and 50 percent. The interval between barriers will not exceed 20H.

For snow accumulation, during the snow-producing months, the minimum windbreak density will be greater than 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.

Utilize supporting conservation practices to control water erosion and runoff from melting snow.

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.

Prevent livestock waste from livestock areas from flowing into the windbreak.

Protect livestock areas from snowmelt runoff.

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

Locate visual screens 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

Establish windbreak intervals less than or equal to 10H depending on site conditions and related supporting conservation practices.

To reduce airflow into the source area, maintain greater than 50 percent windbreak density on the windward side of the problem source (i.e., particulate, chemical, or odor).

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

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

Additional Criteria for Increasing Carbon Storage in Biomass and Soils

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

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

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

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

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

When designing the location of 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.

Avoid plants that may be alternate hosts to undesirable pests.

Complement natural landscape features with plant selections.

Orientate tree or shrub rows on or near the contour where water erosion is a concern. Where water erosion and/or runoff from melting snow is a hazard, implement supporting practices.

Consider wildlife and pollinator needs when selecting or siting tree or shrub species. Consider species diversity, including the use of native species.

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

Windbreaks for odor and chemical control increase in effectiveness as the amount of foliage available for intercept increases. Multiple rows and wide plantings offer greater interception potential than do smaller plantings.

When using trees and shrubs for greenhouse gas reductions and the prediction of carbon sequestration rates, utilize current, approved, carbon sequestration modeling technology.

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 affects to crop growth (e.g., shade, allelopathy, competing root systems, or root sprouts).

Consider the invasive potential when selecting plant species.

PLANS AND SPECIFICATIONS

Specifications for applying this practice shall 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

Carry out the following actions 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 also be protected from fire and damage from livestock and wildlife.

Periodic applications of nutrients may be needed to maintain plant vigor. Noxious plants will be controlled in accordance with state law.

REFERENCES

Bentrup, Gary. Conservation Buffers: Design Guidelines for Buffers, Corridors, and Greenways. General Technical Report SRS-109, September 2008. Asheville, North Carolina. United States Department of Agriculture, Forest Service Southern Research Station. 110 p.

Brandle, J.R. etal. 1988. Windbreak Technology. Agriculture. Ecosystems. Environment. Vol. 22-23.