NATURAL RESOURCES CONSERVATION SERVICE
MONTANA CONSERVATION PRACTICE STANDARD

WINDBREAK/SHELTERBELT ESTABLISHMENT (FEET)

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.
- Reduce energy use.
- Increase carbon storage in biomass and soils.

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.

SPECIES SELECTION

Species must be adapted to the soils, climate and site conditions. **See Montana Field Office Technical Guide (FOTG), Section II, Conservation Tree/Shrub Suitability Groups (CTSG) for a detailed listing of species suited to the soils and environmental factors at the site.**

Species shall be suited for the planned practice purpose(s).

No plants on the Federal or state noxious weeds list shall be planted.

WINDBREAK DESIGN

The windbreak will be **located on the windward side of the area to be protected and** oriented as close to perpendicular to the troublesome wind as possible.

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. **Height may be estimated based on:**

1. **Documented heights found in the Montana Field Office Technical Guide (FOTG), Section II, Conservation Tree/Shrub Suitability Groups (CTSG); or,**

2. **Performance of the individual species in nearby areas or similar sites.**

NOTE: This type of font **(AaBbCcDdEe 123..)** indicates NRCS National Standards.
This type of font (AaBbCcDdEe 123..) indicates Montana Supplement.

The length of the windbreak will be sufficient to protect the site including consideration for the "end effect" and changes in wind direction.

SPACING

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.

SITE PREPARATION

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

Refer to **Field Office Technical Guide (FOTG), Section IV,** Tree/Shrub Site Preparation **(Code** 490**) practice standard** for preparing site conditions for plant establishment**.**

CARE, HANDLING, AND SIZE FOR WOODY PLANTING STOCK

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

PLANTING

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

Refer to **Field Office Technical Guide (FOTG), Section IV,** Tree/Shrub Establishment **(Code** 612**) practice standard** for further guidance on planting trees and shrubs.

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

MULCHES, FABRIC, AND TREE MATS

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

Geo-textile fabric, tree mats, and other appropriate organic mulch materials may be used for vegetation control and moisture conservation for new plantings on all sites.

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 **(i.e., herbaceous wind barriers, residue management, snow fences, etc.)** will be installed to supplement the windbreak until it is fully functional.

Sites, fields, and plants are protected **from wind erosion** 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.

Field windbreaks to reduce wind erosion will consist of two or more rows. The density for a field windbreak should be 40-60 percent. This would be equivalent to a single row of conifer and a single row of deciduous.

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 **(roughly the equivalent to single row of deciduous trees)**. The interval between barriers will not exceed 20H.

For snow accumulation, the minimum barrier density, during expected snow-producing months, will be 50 percent **and the leeward row will be at least 100 feet from the area to be protected**.

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.

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 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.

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.

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.

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.

Refer to the Field Office Technical Guide (FOTG), Section IV, Irrigation System, Micro-irrigation (Code 441) practice for designing a drip irrigation system for the windbreak/shelterbelt practice.

CONSIDERATIONS

Slopes greater than 15 percent are generally considered unsuitable for windbreak plantings. Windbreaks can be planted on steeper slopes, but special precautions need to be taken to control water erosion.

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

Plantings of less than five rows should have a different species in each row unless soil conditions limit the choice of species.

Selection of plants for use in windbreaks should favor species or varieties tolerant to herbicides used in the area.

Obtain the history of pesticides applied at the site to be planted and what limitations they may impose prior to planting. Also consider pesticide drift from adjoining cropland.

Plants that may be alternate hosts to undesirable pests should be avoided.

All plantings should complement 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 from melting snow is a hazard, it should be controlled by supporting practices.

Wildlife and pollinator 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.

Consider the invasive potential when selecting plant species.

A shelterbelt can be used as a travel corridor to connect existing patches of wildlife habitat.

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 are a hazard, it should be controlled by supporting practices.

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

Visual screens shall be utilized to reduce neighbors' views of animal production and waste facilities, which may lead to reduced odor complaints associated with visual stimulus of olfactory senses. When using trees and shrubs for greenhouse gas reductions, prediction of carbon sequestration rates should be made using current, approved carbon sequestration modeling technology.

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).

When designing and locating a windbreak or shelterbelt, consider the impact upon the landowner's or public's view of the landscape.

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.

As a minimum, the Windbreak/Shelterbelt Establishment practice will have the following components in its plan and specifications:

- **A narrative that describes the producer's goals and objectives. Identify why the practice is needed and feasible.**
- **An environmental assessment of the planned practice that includes the potential impacts on soil, water, animals, plants, air and humans.**
- **An alternatives narrative that identifies and describes several methods that could be used to address the resource issue. Also identifying the producer-selected method.**
- **The Montana Windbreak/Shelterbelt Establishment practice job sheet and specification.**

- **Plan map and soil map of site with location of practice on the map.**
- **Operations and maintenance instructions.**

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 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.

REFERENCES

Montana State University, Windbreaks for Montana–a landowner's guide. July 1986. MSU Extension Service Bulletin 366, Bozeman, Montana.

USDA, Natural Resources Conservation Service, Montana Field Office Technical Guide (FOTG), Section II, Conservation Tree/Shrub Suitability Groups.

Bentrup, Gary. 2008. Conservation buffers: design guidelines for buffers, corridors, and greenways. Gen. Tech. Rep. SRS-109. Asheville, NC: Department of Agriculture, Forest Service, Southern Research Station.

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