NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

WINDBREAK/SHELTERBELT ESTABLISHMENT

(Ft.)

CODE 380

Slash pine and red cedar at Florida Dep. Agric. and Consumer Services foundation grove in Dundee.

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.
- 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 (including plant pathogens), chemicals, and odors.
- Delineate property and field boundaries.
- Improve irrigation efficiency.
- Increase carbon storage in biomass and soils.
- Reduce energy use.

Conservation practice standards are reviewed and periodically updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service State Office or visit the electronic Field Office Technical Guide.

CONDITIONS WHERE PRACTICE APPLIES

Apply this practice on any areas where linear plantings of woody or herbaceous perennial 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 needs to accomplish the purpose and function intended within a 20-year period.

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

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

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

Refer to Florida NRCS Conservation Practice Standard Tree/Shrub Establishment, Code 612, and Florida NRCS Windbreak/Shelterbelt Guidance for more information on planting trees and shrubs, and refer to Florida NRCS Plants for Conservation Alternatives List [FOTG Sect. II (g) (1)] for acceptable woody and perennial herbaceous materials for the state.

Base spacing between individual plants on the required growing space for plant type and species, to accommodate maintenance equipment, and to ensure the desired plant architecture (e.g., characteristics of the stem(s), branches and canopy) required for a specific purpose is achieved.

Orient windbreak as close to perpendicular to the troublesome wind as possible.

The length of the windbreak needs to be sufficient to protect the site including consideration for “end effect” and change of wind direction.

Do not plant trees or shrubs where they will interfere with structures and above or belowground utilities.

Provide moisture conservation or supplemental watering during plant establishment and growth when 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.

Impact to cultural resources, wetlands, and Federal and State protected species shall be evaluated and avoided or minimized to the extent practical during planning, design and implementation of this conservation practice in accordance with established National and Florida NRCS policy, General Manual (GM) Title 420-Part 401, Title 450-Part 401, and Title 190-Parts 410.22 and 410.26; National Planning Procedures Handbook (NPPH) FL Supplements to Parts 600.1 and 600.6; National Cultural Resources Procedures Handbook (NCRPH); and The National Environmental Compliance Handbook (NECH).

Additional Criteria to Reduce Wind Erosion and Protect Growing Plants

Use current, approved, wind erosion technology to determine the interval between windbreaks. Use soil loss tolerance (T) or other planned soil loss objective to determine the maximum planting interval width. Other practices in the conservation management system need to be accounted for when calculating windbreak intervals.

For wind erosion control, temporary measures need to be installed to supplement the windbreak until it is fully functional.

Sites, fields, and plants are protected within an area 10 times H on the leeward (downwind) side and two times H on the windward (upwind) side of the windbreak.

Use species that will be taller, when mature, than the crop being protected.

Additional Criteria to Provide Shelter for Structures, Livestock, and People

For wind protection, the minimum barrier density needs to be 65 percent during the months of most troublesome wind, and the

area to be protected needs to fall within a downwind distance of 10 times H.

Prevent drainage of livestock waste from the livestock area from flowing into the windbreak.

Additional Criteria for Noise Screens

Noise screens need to be at least 65 percent dense during the time of the year when noise is a problem and to be as tall and as close to the noise source as practical.

The length of the noise screen needs to be twice as long as the distance from the noise source to the receiver.

For high-speed traffic noise, the barrier needs to be 65 feet or wider. For moderate speed traffic noise, the barrier needs to be not less than 20-feet wide.

Select species that are tolerant to noxious emissions, sand and gravel depositions.

Additional Criteria for Visual Screens

Visual screens need to be located as close to the observer as possible with a density, height, and width sufficient to block the view between the area of concern and the sensitive area.

Additional Criteria to Improve Air Quality by Reducing and Intercepting Air Borne Particulate Matter (Including Plant Pathogens), Chemicals, and Odors

The windbreak interval needs to be less than or equal to 10 times H depending on site conditions and related supporting conservation practices.

Windbreak density windward (upwind) of the problem source (i.e., particulate, odor, pathogen, etc.) needs to be greater than 50 percent to reduce the air flow across particulate source area.

Windbreak density leeward (downwind) of the problem source needs to be greater than 65 percent to intercept particulates.

To control windborne plant pathogens such as citrus canker (http://edis.ifas.ufl.edu/pdffiles/CG/CG04000.pdf), windbreaks need to be planted on all sides of the susceptible crop. Windbreak density needs to be between 50 and 70 percent (one to two rows of evergreen trees or bunch type bamboo, or a combination of one row of trees and a row of shrubs adapted to soils where groves are located). Species selections should be compatible with pesticides used in citrus production. Additionally, field sizes (blocks) within windbreak plantings cannot exceed 20 acres. (See Florida NRCS Conservation Practice Standard Windbreak/Shelterbelt, Code 380, Guidance for specifications for citrus canker control).

Trees and shrubs selected need to have foliar and structural characteristics that optimize the interception, adsorption, and absorption of airborne pathogens, 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. In general, within a growth rate class (e.g., slow, medium, or fast) hardwoods will sequester more pounds of carbon per tree per year than conifers. Examples of hardwood trees with:

- slow growth rate - American holly (*Ilex opaca*) and flowering dogwood (*Cornus florida*);
- medium growth rate - southern magnolia (*Magnolia grandifolia*) and water oak (*Quercus laurifolia*); and a
- fast growth rate - live oak (*Quercus virginiana*) and black cherry (*Prunus serotina*).

Examples of conifers with:

- slow growth rate - balsam fir (*Abies balsamea*) and European black pine (*Pinus negra*);
- medium growth rate - Eastern red cedar (*Juniperus virginiana*) and Virginia pine (*Pinus virginiana*); and
- fast growth rate - longleaf pine (*Pinus palustris*) and baldcypress (*Taxdium distichum*).

More information on trees commonly grown in the United States and their age and growth rate dependant expected carbon sequestration rates can be found in Tables 1 and 2 of the

Department of Energy, Energy Information Administration publication "Method for Calculating Sequestration by Trees in Urban and Suburban Situations (ftp://ftp.eia.doe.gov/pub/oiaf/1605/cdrom/pdf/sequester.pdf).

Plant at the appropriate stocking rate for the site, and manage the planting to maximize above and below ground biomass production.

Additional Criteria for Providing or Enhancing Wildlife Habitat

Select plant species that benefit targeted wildlife species.

Make sure the size of the planting is adequate for targeted wildlife species.

Additional Criteria for Improving Irrigation Efficiency

For sprinkler irrigation systems, the windbreak needs to be taller than spray height.

Plant the barrier so that it does not interfere with the operation of the irrigation system.

CONSIDERATIONS

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

Consider the impact upon landowner's or public's view of the landscape when designing and locating a windbreak or shelterbelt.

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

Avoid using plants that may be alternate hosts to undesirable pests.

All plantings should complement natural features.

Orient tree or shrub rows on or near the contour where water erosion is a concern. Where water erosion is a hazard, additional supporting practices may need to be installed.

Consider wildlife and pollinator when selecting tree or shrub species. Species diversity, including the use of native species, is beneficial. Additionally, a shelterbelt can used as a travel corridor to connect existing patches of wildlife habitat.

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

Windbreaks for pathogen, 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.

In cropping systems, select windbreak and shelterbelt species that minimize adverse affects on crop growth (e.g., shade, allelopathy, competing root systems, or root sprouts).

PLANS AND SPECIFICATIONS

Specifications for applying this practice need to 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.

Specifications need to minimally have:

- purpose of windbreak/shelterbelt;
- location, size, and width;
- site preparation specifics including type and amount of soil amendments;
- species selection, seeding or planting rates, planting dates, care and handling of seed and/or planting material, and planting method;
- method of browse or grazing control; and
- an operation and maintenance plan.

OPERATION AND MAINTENANCE

The following actions need to 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):

- Replace dead trees or shrubs as need until the windbreak/shelterbelt is functional.
- Provide supplemental water as needed.

- Thin or prune the barrier to maintain its function. (See NRCS Conservation Practice Standards Windbreak/ Shelterbelt Renovation, Code 650, and Tree/Shrub Pruning, Code 660, for more information.)
- Inspect trees and shrubs periodically and protect from adverse impacts including insects, diseases or competing vegetation. Protect plants from fire and damage from livestock and wildlife.
- Periodic applications of nutrients may be needed to maintain plant vigor.

REFERENCES

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