

**NATURAL RESOURCES CONSERVATION SERVICE  
NEVADA CONSERVATION PRACTICE SPECIFICATION  
WINDBREAK/SHELTERBELT ESTABLISHMENT**

(Feet)

**Code 380**

### **I. SCOPE**

The work shall consist of site preparation, planting and maintaining suitable species to establish a windbreak/shelterbelt. The location and layout shall be shown on the conservation plan map.

### **II. GENERAL**

Determine and document suitability of soils for the planting by referring to the soil survey and by on-site investigations. For a list of adapted tree and shrub species and their expected 10 and 20 year heights, determine the geographic area (Major Land Resource Area), soil group and effective moisture subgroup from the Windbreak Suitability Soil Groups for Nevada (WISG).

Application of this practice in Nevada requires planning and installing an appropriate irrigation system. Planners are referenced to standards and specifications for IRRIGATION SYSTEM TRICKLE (Code 441), SPRINKLER (Code 442) or SURFACE & SUBSURFACE (Code 443).

### **III. MATERIALS**

Only viable planting stock grown from locally adapted seed or vegetative material should be planted. Planting stock should be maintained in good condition from the time received until planted. This will include, but is not limited to, unpacking, storage, heeling-in, transport to the planting site, and keeping plants protected and moist until and during planting.

Plant materials will be:

- documented
- appropriate for the purpose of the planting

- based on the criteria listed in the practice standard.

Plant materials will be adapted to site conditions indicated by the appropriate windbreak soil group and MLRA. Exceptions will be documented to indicate the suitability of the plant material to the site conditions.

- Seeding stock shall not be less than 1/4" in caliper 1" above the root collar. Shoot to root ratio must not exceed 4:1 and 2:1 is recommended.
- Bare root stock should be received in packaging material that allows for gas exchange and retention of humidity. Bare root or containerized stock must be kept moist but not wet prior to planting.

#### **Storage**

Bare root seedling dormancy must be maintained prior to planting. If planting activities cannot begin within 2 weeks of receipt of bare root stock, long term storage becomes necessary.

**Long term** storage of bare root stock is achieved with refrigeration.

- Store elevated at temperatures of 33 to 36 degrees F.
- Avoid root contact with ice.
- Root orientation should be uniform to facilitate watering.
- Keep stock moist but not wet.

**Short term** storage of bare root stock should not exceed 10 days and should be avoided if at all possible. Outdoor storage of seedlings will not help preserve dormancy. The best solution to short term storage is being prepared to plant when the stock is received.

- Utilize areas that will help preserve dormancy and moist conditions of the stock and provide protection from the elements.
- Above ground storage can be accomplished with a heel-in bed. Form a trench with a 30 to 45 degree backslope. Lay stock against backslope and backfill 1 - 2" above roots. Carefully tamp soil over roots.
- Keep plant stock moist but not wet.

Containerized stock presents less of a storage challenge due to the protection the container offers to the plants root system.

- Long term storage requires refrigeration between 33 and 36 degrees F.
- Keep soil medium moist.

Utilize areas that will help preserve dormancy and moist conditions of the stock and provide protection from the elements.

#### IV. DESIGN CRITERIA

##### General Criteria

**The interval between windbreaks shall be determined using current, approved wind erosion technology such as the Wind Erosion Prediction System (WEPS).**

Avoid creating blind corners at road intersections; do not plant closer than 30 feet from the edge of the right-of-way. On the windward side of a road, the nearest tree row should be no closer than 50 feet from the edge of the right-of-way.

On slopes less than 6%, plant field windbreaks at right angles to the prevailing winds, consistent with cropping and ownership pattern.

On slopes greater than 6%, plant field windbreaks on the contour, consistent with the cropping and ownership patterns, and as close to right angles to prevailing winds as possible.

If possible, place windbreaks on the windward side of ridge tops instead of the top of the ridge.

Isolation strips will be maintained on all plantings for a minimum of 8 feet or the width of the cultivation equipment plus 4 feet. Minimize fire hazards by keeping isolation

strips clear of crop residues, weeds, and trash. An isolation strip is prescribed to protect the planting from fire and exclude grass and weeds to help control rodent invasion. Planners are referenced to standard and specifications for FIREBREAK (Code 394).

Incorporate existing features like farm access roads as isolation strips whenever possible.

Subsequent belts should be placed 660 feet apart or 10 to 20 times the expected height of the belt at 20 years of age.

In MLRAs 23, 24, 25, 26, and 28B where buildings, roads, fences, feedlots or other establishments are to be within protected area, the windbreak will be placed at least 100 to 150 feet upwind to minimize snow drift problems.

Where space permits, extend windbreaks 50 feet beyond areas to be protected to minimize eddying effects.

Avoid creating frost pockets with field windbreak plantings. Where danger of frost can be a problem, prune lower limbs of the plantings to allow for adequate air movement.

In areas where blowing snow and/or sand are problems, windbreaks should be located at least 100 feet away from the area to be protected.

Avoid creating wind tunnels by crossing the windbreak with roads, ditches, or driveways set at oblique angles to the wind.

Leave enough room at each row end for cultivation equipment to make turns.

**Plantings will be protected for the life of the windbreak from damaging agents such as livestock, wildlife, insects, and disease. A fence is required where livestock are present.**

Planners will refer to practice standards and specifications for FENCE (Code 382) and ACCESS CONTROL (Code 472).

##### **Number of Rows based on Primary Objective**

The minimum number of rows recommended will vary from one row in areas where wind protection is the only concern to 3 to 5 rows where high winds, noise, and snowdrift

problems are common or where wildlife is important. In areas where only wind protection is needed, a single row of evergreens can provide the required density and protection. However, since trees and shrubs are subject to insect and disease problems, the recommended minimum design is two to three rows. To minimize impacts from insects or disease, each row should be a different species.

A five row windbreak using different species and adequate spacing provides the most effective protection. One row, well developed, is better protection than 3 rows with inadequate spacing.

<b>Farmstead and Feedlot Windbreak</b>
<ul style="list-style-type: none"> <li>• Target 65% density</li> </ul>
<ul style="list-style-type: none"> <li>• Minimum – twin row (area needing wind protection only)</li> </ul>
<ul style="list-style-type: none"> <li>• Maximum – two to five rows (area needing both wind and snow protection)</li> </ul>

<b>Field Windbreak</b>
<ul style="list-style-type: none"> <li>• Target 35-50% density</li> </ul>
<ul style="list-style-type: none"> <li>• Minimum – one row</li> </ul>
<ul style="list-style-type: none"> <li>• Maximum – twin row to three rows</li> </ul>

<b>Living Snow-fence</b>
<ul style="list-style-type: none"> <li>• Target 50% density</li> </ul>
<ul style="list-style-type: none"> <li>• Minimum – one row</li> </ul>
<ul style="list-style-type: none"> <li>• Maximum – twin row to five rows</li> </ul>
<ul style="list-style-type: none"> <li>• Trip rows are also recommended</li> </ul>

<b>Noise Barrier; Screen; Wildlife Windbreak</b>
<ul style="list-style-type: none"> <li>• Target 65% or more density</li> </ul>
<ul style="list-style-type: none"> <li>• Minimum – twin row</li> </ul>
<ul style="list-style-type: none"> <li>• Maximum – as many rows (up to 8) as room permits</li> </ul>

### Row Arrangement

The arrangement of species in plantings should follow these general guidelines. Shrubs, short trees, and slower growing trees should be located in the outer rows. They should not be positioned between two taller growing species. Placing them in the outer rows

assures them of adequate light and allows room for plant development.

Acceptable composition is listed in the following tables from windward to leeward in order of preference.

<b>FIVE ROW WINDBREAK</b>	
1	Shrubs
2	Medium ht. deciduous/conifer trees
3	Tall deciduous/conifer trees
4	Tall deciduous/conifer trees
5	Medium deciduous/conifer trees

<b>FOUR ROW WINDBREAK</b>	
1	Shrubs
2	Medium deciduous/conifer trees
3	Tall deciduous/conifer trees
4	Medium deciduous/conifer trees

<b>THREE ROW WINDBREAK</b>	
1	Shrubs
2	Medium or tall deciduous/conifer trees
3	Medium or tall deciduous/conifer trees

<b>TWO ROW - Option 1</b>	
1	Medium height conifer trees
2	Tall conifer trees

<b>TWO ROW - Option 2</b>	
1	Dense shrubs
2	Tall conifer trees

<b>ONE ROW</b>	
	Tall conifer trees

### Plant Spacing

#### Between-row Spacing Guidelines

Between-row spacing for multiple row windbreaks is generally 8 to 24 feet depending on growth form and equipment that will be used to maintain the windbreak. If more than one row is used in a field windbreak, the spacing between the rows will generally be from 10 to 20 feet for shrub rows, and a minimum of 20 feet for tree rows. Plan the row spacing to fit the operator's equipment, adding a minimum of 4 feet to the width of the cultivation equipment.

### Within-row Spacing Guidelines

Within-row spacing can vary according to species used and type of planting. Actual spacing should, in part, reflect the physical shape or form of the species selected. Spacing in windward rows should be at the narrower spacing listed.

Spacing within row (single or multiple)	
Small shrubs (<10' tall)	3 to 6 feet
Large shrubs (>10' tall)	5 to 8 feet
Medium deciduous/conifer (<25' tall) trees	6 to 12 feet
Tall deciduous/conifer (>25' tall) trees	10 to 16 feet
Spruce trees	12 to 16 feet

Spacing within row (twin-row density)	
Small shrubs (<10' tall)	3 to 5 feet
Large shrubs (>10' tall)	5 to 8 feet
Juniper trees	5 to 8 feet
Medium deciduous/conifer (<25' tall) trees	6 to 10 feet
Tall deciduous/conifer (>25' tall) trees	8 to 14 feet

## V. SITE PREPARATION

Planting sites shall be properly prepared. Planners are referenced to the standard and specifications for Tree/Shrub Site Preparation (Code 490).

### Control of Competing Vegetation

Grasses and weeds will compete for available water, nutrients and light more aggressively than tree/shrub seedlings and must be controlled prior to planting.

#### Agricultural Sites

- 1) Apply contact herbicide late spring/early summer prior to planting the following spring.
- 2) Plow and summer fallow.
- 3) Disk and incorporate pre-emergent herbicide early spring of planting year.
- 4) Plant in the spring.

### Wildland Sites

Scalp a 3-foot radius circle around each planting site down to bare mineral soil. A 6 foot wide strip may be prepared to accept a row planting down the middle.

### Installation of Irrigation System

The irrigation system will be installed in accordance with the standards and specifications for the chosen irrigation practice.

### Moisture Requirements

Standard recommendations on watering rates will vary with soil types, variations in weather conditions and individual species requirements. The following provides general watering guidelines:

- Establishment Year 2-4 gals/week
- 2<sup>nd</sup> Growing Season 5-6 gals/week
- 3<sup>rd</sup> Growing Season 7-8 gals/week
- Mature plant 9+ gals/week

Use of weed barrier fabric may reduce irrigation requirements by as much as 50 percent or more.

Discontinue irrigation approximately one month prior to the normal date of the first killing frost in the fall to allow plants to harden for winter. Once a killing frost has occurred, one last irrigation application will be beneficial to help provide moisture for winter root growth. A late fall irrigation application is especially beneficial to conifers which continue transpiration through the winter. During dry winters, water once a month to allow plants to emerge healthier and requiring less water in the spring.

### Layout and Staking

Rows will be laid out and staked prior to planting activities. The complexity introduced by multi-row arrangements with curves and/or corners in tandem with planting and/or cultivating equipment considerations make this a requirement.

## VI. PLANTING METHODS

Machine planting or hand planting with any tool that is adapted to the planting stock and site conditions may be used.

- Seedlings will be protected from desiccation when transporting them to planting sites up to the moment of planting.
- Plant seedlings in early spring as soon as the soil is frost-free while soil moisture conditions are optimum.
- Planting holes must be of sufficient size and depth to insure that roots go straight into the ground in more or less natural form. The root collar shall be no more than 1 inch below the soil surface.
- Pack soil firmly around planted stock to avoid air pockets.
- Planners are referenced to the standard and specifications for TREE/SHRUB ESTABLISHMENT (Code 612).

## VII. MAINTENANCE

**The following actions shall be carried out to insure that this practice functions as intended throughout the practice lifespan. These actions include normal repetitive activities in the application and use of the practice as well as repair and upkeep of the practice.**

### General

Maintain an isolation strip at least 8 feet wide. Minimize fire hazards by keeping isolation strips clear of crop residues, weeds, and trash.

Replace all dead seedlings annually for at least 2 years after the initial planting.

Replant with the same species or one that is suitable to the soils and is compatible with the original planting.

Periodic applications of nutrients may be needed to maintain plant vigor. Planners are referenced to the standard and specifications for NUTRIENT MANAGEMENT (Code 590).

### Vegetation Management

Competing vegetation will be controlled for a 1.5 foot minimum radius (3 foot diameter)

around each plant for at least 3 years after planting. Control may be achieved by chemical or mechanical means or by mulching or by some combination of these techniques.

Chemical control of competing vegetation utilizes herbicides that in most cases can also cause seedling mortality. Application of chemicals shall be in accordance with all Federal, state and local laws and regulations.

Mechanical control can be achieved with common farm equipment or by hand.

- Several cultivations are required during each of the first 3 or 4 growing seasons.
- Cultivate to a depth of 2 to 4 inches only.
- Planners are referenced to the standards and specifications for BRUSH MANAGEMENT (Code 314), HERBACEOUS WEED CONTROL (Code 315), INTEGRATED PEST MANAGEMENT (Code 595) and MULCHING (Code 484).

### Pest Management

Planning will include preparing estimates of animal populations which have the potential of causing damage on site. Use sightings of gopher mounds, animal trails, frequency of scat, and evidence of browsing on native plants to help determine the degree of plant protection needed. Planners are referenced to the standard and specifications for INTEGRATED PEST MANAGEMENT (Code 595).

### Tree Protection

Individual tree protection methods may be required under some circumstances. A wide assortment of tree shelters exists and includes solid tubes, flat sheets and plastic meshes. Chicken wire can also be used.

**Chicken wire.** One-inch mesh chicken wire will be shaped to form a cylinder a minimum of 5 inches in diameter and 18 inches high. Secure chicken wire to a 1"x2"x24" wooden stake with 18 inches extending above the ground with 2 evenly spaced staples or tie wires. The chicken wire will be flush with the ground. The barrier must be removed when the trunk diameter is within 1/2 inch of the chicken wire diameter.

**Rigid polypropylene - mesh tube.** Tubes will consist of a diamond pattern mesh with a minimum 30 mil strand diameter. Tubes will be a minimum of 5 inches in diameter and 18 inches high. Fasten tubes to a 1"x2"x24" wooden stake with 18 inches extending above the ground with one staple or a tie wire. Tubes will be flush with the ground.

### **Pruning**

Pruning windbreaks should be discouraged unless the health of the windbreak or safety is at risk. Planners are referenced to the standard and specifications for TREE/SHRUB PRUNING (Code 660).

### **REFERENCES**

Ogle, D., L. St. Loren, and C. Stange. 2011. Tree and Shrub Planting, Care and Management. TN Plant Materials No. 43. USDA-NRCS. Boise, ID., Salt Lake City, UT. 35 pp.

Townsend, L.R., D.C. Schen, P. Murphy, M.L. Hanson. 1993. Tree and Shrub Planting Handbook. A Guide for Conservation Plantings in Utah and Nevada. Utah Division of State Lands and Forestry, Salt Lake City, UT.