

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD AND SPECIFICATIONS**

ALLEY CROPPING

(Acre)

CODE 311

DEFINITION

Trees or shrubs planted in a set or series of single or multiple rows with agronomic, horticultural crops or forages cultivated in the alleys between the rows of woody plants.

PURPOSES

- Improve or optimize the economic viability of the operation.
- Improve inter-crop quality and quantity.
- Reduce excess surface water runoff and erosion.
- Improve utilization and recycling of soil nutrients.
- Reduce excess subsurface water or control water table depths.
- Provide food and cover habitat for wildlife.

CONDITIONS WHERE PRACTICE APPLIES

On all lands where crops or forages are grown and improvement of the economic or environmental conditions is desired.

CRITERIA

General Criteria Applicable to All Purposes

The location, layout, species and density of the trees and shrubs will accomplish the purpose and intended function for both the agronomic, horticultural, or forage crop as well as the trees or shrubs. Plant species selection will be based on the following:

- Combinations of inter-crops and woody plants shall be compatible and complementary, and provide the products

and crops that meet landowner objectives and financial goals.

- Inter-crops shall be adapted to the climatic region and the soil resource, marketable and suited to the landowner's equipment and management capabilities.
- Inter-crop sequence and woody species selection shall be determined using an acceptable nutrient balance procedure. Select crops, forages and woody species to maximize the utilization and recycling of soil nutrients, livestock manure's and plant residues and to maintain soil organic matter content.
- Inter-crops and woody plants shall be selected for compatible rooting depths and water requirements not to exceed available soil water.
- Select pest resistant plant varieties.
- Avoid selecting tree or shrub species that provide habitat to animal, bird, and insect species or diseases considered being pests of the accompanying crop or forage.

The distance between the sets of trees or shrubs will be adequate for the inter-crops in the alleys and erosion control and water quality needs of the site.

A planned conservation management system should be developed for the treatment unit.

Soil erosion will be controlled by vegetative or other means until the alley cropping design is fully functional.

Follow acceptable planting dates and use care in handling and planting the seed or seedlings.

Only viable and high quality planting stock or seed of adapted woody species will be used for establishing the tree or shrub rows.

Conservation practice standards are reviewed periodically. To obtain a current version of this standard contact the Natural Resources Conservation Service.

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March 1999**

Site preparation shall be sufficient for establishment and growth of selected species and appropriate for the site.

Additional Criteria to Reduce Excess Surface Water Runoff and Erosion

A herbaceous strip (follow guidelines in CONTOUR BUFFER STRIPS - 332) will be developed immediately upslope and parallel to each woody planting row set.

Use multi-row woody planting sets.

Tree or shrub rows will be oriented on the contour to control water erosion or perpendicular to the prevailing wind erosion direction to control wind erosion or wind damage.

Additional Criteria to Reduce Excess Subsurface Water or Control Water Table Depths

Choose woody species that are deep rooting and have rapid growth rates such as hybrid poplar, cottonwood, black willow, green ash, and silver maple.

Use multi-row woody planting sets.

Additional Criteria to Provide Food and Cover for Wildlife Habitat

Maximize plant diversity. Use multi-row woody planting sets with plants of different sizes, growth forms, and densities.

Maximize wildlife food availability. Leave edge rows between the woody planting and inter-crop for wildlife food. Use plants with food-bearing capabilities.

CONSIDERATIONS

Inter-crops and tree/shrub varieties selected should be tolerant to herbicides that will be used in the management of the crops, forages, trees or shrubs.

Spacing between the rows of trees or shrubs may be adjusted, within the limits listed above, to accommodate equipment widths, turn-rounds and maintenance needs of the woody planting.

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

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High value trees or shrubs and inter-crops should be selected to maximize economic returns.

PLANS AND SPECIFICATIONS

Specifications for applying this practice shall be prepared for each site and recorded using approved specification sheets, job sheets, and narrative statements in the conservation plan, or other acceptable documentation.

OPERATION AND MAINTENANCE

The trees, shrubs, and inter-crops will be inspected periodically and protected from adverse impacts including insects, diseases, damaging wildlife activity, or competing vegetation. The trees or shrubs will also be protected from fire and livestock damage.

All other specified maintenance measures and techniques of tree/shrub establishment will be continued until plant survival and establishment are assured. This includes replacement of damaged, dead and dying trees or shrubs and control of undesirable competing vegetation.

Any removals of tree or shrub products and use of fertilizers, pesticides, and other chemicals shall be conducted in a manner that maintains the intended purpose.

The type, use and timing of maintenance equipment will be appropriate to accomplish operation and maintenance tasks while not damaging or degrading the site, existing crop species, and soil conditions.

After the fifth year following establishment, woody lateral roots may need to be pruned. See interim standard WOODY ROOT PRUNING (747).

PRACTICE SPECIFICATIONS

Site Preparation

Use FOREST SITE PREPARATION (490), General Specifications for guidance.

Planting Methods

Use TREE/SHRUB ESTABLISHMENT (612) for guidance. Control competing vegetation for

a minimum of 3 feet on either side of the woody row.

Woody Species Selection

Base plant selection on soil types, site characteristics, site limitations, landowner objectives, projected canopy characteristics, and sunlight and moisture requirements for the inter-crop. Tables 1a, 1b, and 1c list selected woody species that may have potential as an alley cropping choice. Other species may be used providing they meet the selection criteria list above.

See WILDLIFE UPLAND HABITAT MANAGEMENT (645) for additional woody species recommendations.

Spacing/Layout

See TREE/SHRUB ESTABLISHMENT (612) for within row spacing guidance. When multiple row woody planting sets are used, stagger row plantings.

Use the CONTOUR BUFFER STRIPS (332) standard as a guide for determining the spacing distance between woody plant rows when erosion control is a concern.

When erosion control is not a concern, spacing distance between woody plant rows should be based on landowner management objectives, tree and shrub environmental requirements, light requirements and growth periods of the inter-crops in the alleys, and machinery width needs.

Table 1c. Examples of potential hardwood tree species for use in alley cropping

<i>Common Name</i>	<i>Upland</i>	<i>Bottom Land</i>	<i>Wood Products</i>	<i>Biomass/ fuelwood</i>	<i>Food Products¹</i>	<i>Wildlife Food</i>	<i>Leaf² Initiation</i>	<i>Leaf Drop³</i>	<i>Canopy Shade</i>	<i>Comments</i>
Basswood	X		X				early	mid	full	Wood used for carving
Black locust	X			X			mid	mid	light	Excellent fuelwood
Black walnut	X	X	X		X	X	late	early	light	Deep well-drained sites
Bur oak	X	X	X			X	late	late	full	Drought and flood tolerant
Chestnut	X		X		X	X	mid	mid	medium	Use disease resistant varieties
Ginko	X				X		late	mid	light	Herbal/medicinal uses
Green ash	X	X	X				mid	mid	medium	Adapted to a wide range of sites
Honey locust	X	X		X		X	mid	early	light	Use thornless variety
Hybrid poplar	X	X	X	X			mid	early	light	Rapid growth; deep rooting
N. red oak	X		X			X	late	late	full	Widely used for wood products
Paulownia	X	X	X	X			early	early	medium	Wood prized in the orient
Pecan		X	X		X	X	mid	mid	medium	Use native stock for grafting
Sugar maple	X		X		X		early	mid	full	Maple syrup and quality wood
Sycamore		X	X	X			late	mid	medium	Tolerates wet sites
White oak	X		X			X	late	late	full	Fine hardwood; deep rooting
Yellow poplar	X	X	X				mid	mid	medium	Fast growing

1 Includes fruits, nuts, jellies, jams, wine, syrup, honey, herbals, etc.

2 Start of leaf growth. **Early:** by mid-April; **Mid:** mid-April to May 1; **Late:** after May 1.

3 Begin of leaf drop. **Early:** before mid-October; **Mid:** mid-October to Nov 1; **Late:** after November 1.

Table 1a. Examples of potential shrub/small tree species for use in alley cropping

<i>Common Name</i>	<i>Upland</i>	<i>Bottom Land</i>	<i>Human Products</i>	<i>Wildlife Food</i>	<i>Showy Flowers</i>	<i>Plant size (feet)</i>	<i>Comments</i>
American plum	X	X	X	X	X	15 to 20'	Jellies, preserves, and wine
Apple/pear/cherry	X		X		X	Variable	Use commercial varieties
Blackberry/ Raspberry	X		X	X		6 to 8'	Use commercial varieties
Blueberry	X		X	X	X	6 to 8'	Use commercial varieties
Crabapple	X	X		X	X	20 to 25'	Jellies, preserves
Hazelnut	X		X	X		3 to 10'	Sweet nuts
Pawpaw	X	X	X	X		Up to 30'	Large, edible, nutritional fruit
Serviceberry	X			X	X	20 to 30'	Excellent for wildlife
St. John's Wort	X		X		X	Up to 6'	Herbal remedies; nectar source
Witch hazel		X	X			Up to 30'	Numerous medicinal uses

Table 1b. Examples of potential conifer species for use in alley cropping

<i>Common Name</i>	<i>Wood Products</i>	<i>Christmas Trees</i>	<i>Wildlife Food & Habitat</i>	<i>Nursery Material</i>	<i>Windbreak Value</i>	<i>Comments</i>
Concolor fir		X		X	X	Beautiful foliage color
E. redcedar	X	X	X		X	Adaptable to a wide range of sites Alternate host for cedar-apple rust
Loblolly pine	X					Tolerates wet sites
Shortleaf pine	X		X			Only native pine. Tolerates dry sites
White pine	X	X		X	X	Needs well-drained sites.