



## Natural Resources Conservation Service

### CONSERVATION PRACTICE STANDARD

## FOREST FARMING

### CODE 379

(ac)

#### DEFINITION

Managing or establishing stands of trees or shrubs in coordination with the management and/or cultivation of understory plants or nontimber forest products.

#### PURPOSE

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

- Increase plant/tree community diversity—including native species—as well as their compatibility with each other and the site
- Improve crop diversity by growing mixed but compatible crops having different heights on the same area
- Improve soil health by maintaining or increasing soil organic matter
- Improve terrestrial habitat
- Increase carbon storage in biomass and soils

#### CONDITIONS WHERE PRACTICE APPLIES

On all lands where trees, shrubs, and woody or nonwoody crops can be grown in combination.

#### CRITERIA

##### General Criteria Applicable to All Purposes

Livestock will be excluded on land where this practice is implemented.

Forest farming, also known as multi-story cropping, uses combinations of overstory and understory woody and/or nonwoody plant species based on compatibility and complementarity. Select plants based on their adaptation to the climatic region, light requirements, and soil characteristics. Provide supplemental water as needed in areas where natural precipitation is insufficient for establishment of selected plants.

Design each canopy level individually to ensure that objectives for healthy and productive plantings are achieved within each level. Select plants and cultural practices that maintain and/or improve soil organic matter content. Select species that enhance habitat for beneficial insects, including pollinators, and do not provide habitat for pests of accompanying crop(s) and trees.

Determine the desired overstory canopy density using the following tree or shrub management objectives:

- Light requirements and growth period of the managed crops in the understory
- Erosion control needs

- Machinery widths and turning areas, where applicable

Refer to criteria in NRCS Conservation Practice Standard (CPS) Tree-Shrub Site Preparation (Code 490) and/or Tree-Shrub Establishment (Code 612) for site preparation, planting, and tending selected tree and shrub species. Where woody residue requires treatment prior to planting, use NRCS CPS Woody Residue Treatment (Code 384). NRCS CPS Access Control (Code 472) may be used to temporarily exclude animals, people, vehicles, and equipment until plants are established.

Orient ground-level vegetation on or near contours to ensure areas or sites prone to surface water runoff and erosion are protected. Use mulch as needed to cover bare areas and place planting beds on contours.

#### **Additional Criteria for Improving Soil Health by Maintaining or Increasing Soil Organic Matter**

Select overstory species based on rooting patterns to increase differentiation of tree, shrub, and crop rooting depth. Limit soil disturbance, to the extent possible, during establishment of the forest farming system and during cultivation of understory crops. Retain thinning and pruning material on-site.

Select species with traits that facilitate increased nutrient cycling and boost organic matter, such as vigorously re-sprouting species for coppicing, species with nitrogen fixation capability, or those that shed large quantities of biomass. Establish management systems that provide frequent biomass inputs to the forest floor, such as a coppice rotation or regular pruning.

Incorporate unused residues from pruning, coppicing, or harvesting back into the soil by mulching or processing into biochar before reapplication to the greatest extent feasible. Refer to CPS 384 for treatment of woody residues.

#### **Additional Criteria for Increasing Carbon Storage in Biomass and Soils**

Where practical adjust plant spacing and species selection to increase above and belowground productivity for increased carbon capture and storage. Select tree species with high carbon storage potential.

Manage without tillage, where possible, to reduce impacts on soil organic matter. Limit the use of petroleum-based herbicides and fertilizers.

### **CONSIDERATIONS**

Select crop, tree, and/or shrub varieties based on their tolerance to agricultural chemicals that may be applied at the site or on adjacent lands. To reduce vulnerability to species-specific pests and enhance pollinator and wildlife needs, consider incorporating multiple crop, tree, and/or shrub species, especially native species. To minimize agricultural chemical effects, use NRCS CPS Pest Management Conservation System (Code 595) and to manage insects, diseases, and competing vegetation during establishment of the trees, shrubs, and plants.

Use high value trees, shrubs, and understory crops to maximize economic returns. Selecting plants that are culturally or historically significant to the locality may help address client objectives. Consider pruning requirements, response to coppicing, and life cycle when choosing tree and shrub species.

Use of nitrogen fixing species in the overstory and/or understory may help meet part of a crop's nitrogen requirement.

To enhance carbon storage, select plant species that are adapted to the site to assure health and vigor. Use prescribed or appropriate tree density to maximize aboveground and belowground biomass production. Plant residue and woody debris from management may be able to provide a resource for energy production, be used as biochar feedstock or used onsite to enhance soil health.

For areas with frequent or periodic high to severe winds, consider management of edge canopy densities to protect from damaging winds.

For operations following USDA's National Organic Program (NOP), manage resource concerns according to both NRCS and NOP regulations.

## PLANS AND SPECIFICATIONS

Prepare site-specific details to implement forest farming in accordance with this standard and the selected purposes for using this practice. At a minimum, provide—

- Field map with location of forest-farmed area
- Objectives and purposes for choosing forest farming
- A design for the desired overstory, midstory, and understory canopy density and composition using the following tree or shrub management objectives:
  - Light requirements and objectives of all crops and their compatibility
  - Site-specific planting requirements for all plants (e.g., establishment dates, methods, seeding rates, spacing)
  - Height potential and crown width of each species and placement adjacent to different species

## OPERATION AND MAINTENANCE

Inspect trees, shrubs, and crops periodically and protect from adverse impacts including insects, diseases, or competing vegetation. Protect planted trees or shrubs from damage or injury from humans, machinery, and agricultural chemicals as well as from fire, livestock, or wildlife.

Establish and implement a schedule for periodic pruning, coppicing or crop rotation as applicable to specific species or functional groups.

Continue all other specified maintenance measures until plant survival and establishment are assured. This includes replacement of dead and dying trees or shrubs, pruning of dead or damaged branches for safety reasons, periodic pruning of selected branches for control of product quality, and control of undesirable competing vegetation.

Adhere consistently to the intended purpose(s) of the practice during any removal of tree or shrub products, use of agricultural chemicals, and maintenance operations. Avoid damaging the site and soil.

## REFERENCES

- Bentrup, G. 2008. Conservation Buffers: Design Guidelines for Buffers, Corridors, and Greenways. General Technical Report SRS-109. USDA Forest Service, Southern Research Station, Asheville, NC. <https://www.fs.usda.gov/nac/buffers/index.html>.
- Bentrup, G., J. Hopwood, N.L. Adamson, and M. Vaughan. 2020. Temperate Agroforestry Systems and Insect Pollinators: A Review. *Forests* 10 (11):981. <https://www.mdpi.com/1999-4907/10/11/981/pdf>.
- Chamberlain, J.L., M.R. Emery, and T. Patel-Weynand. 2018. Assessment of Nontimber Forest Products in the United States Under Changing Conditions. General Technical Report SRS-232. USDA Forest Service, Southern Research Station, Asheville, NC. <https://www.fs.usda.gov/treesearch/pubs/56484>.
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- Thomas, M.G. and D.R. Schumann. 1993. Income Opportunities in Special Forest Products: Self-help Suggestions for Rural Entrepreneurs. Agriculture Information Bulletin AIB-666, USDA Forest Service, Washington, D.C. <http://www.fpl.fs.fed.us/documnts/usda/agib666/agib666.htm>.