NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD AND SPECIFICATIONS

FOREST STAND IMPROVEMENT

(Acre)
CODE 666

DEFINITION

To manipulate species composition and stocking by cutting or killing selected trees and understory vegetation.

PURPOSE

- To improve or sustain timber production.
- To improve understory aesthetics, wildlife habitat, or recreation.
- To harvest forest products.
- To facilitate forest stand regeneration.

CONDITION WHERE PRACTICE APPLIES

On forestland where competing vegetation hinders development and stocking of preferred tree and understory species or where some of the stand will be cut or killed for intended purposes.

CRITERIA

General Criteria Applicable to All Purposes

All management decisions shall be based on a woodland inventory.

Soil erosion, displacement, hydrologic impact and damage to remaining vegetation will not exceed acceptable levels. Minimize disturbances such as rutting, soil compaction, excessive disturbance to the litter layer, and the addition of fill material.

Limit damage to the site by:
- using directional felling
- aligning cut boles for efficient skidding
- cutting out forks and large branches
- limiting trails on less than 15% of the site
- logging when the soil is dry or frozen
- using smallest size equipment possible
- using well-organized access trails

The method, felling direction, and timing of tree cutting shall facilitate efficient and safe tree removal.

Slash, debris and vegetative material left on the site after treatment will not present a fire or pest hazard or interfere with the intended purpose.

Mechanical cutting, girdling, and frilling should be followed by a suitable herbicide application to increase mortality and reduce stump sprouting.

Kill unwanted trees, shrubs, and vines by any of the following means:
- cutting
- girdling
- frilling
- stem injection
- basal bark spray

When choosing herbicides, review leaching, runoff potential, setback requirements, persistence, and toxicity ratings of chemical formulations. Use the safest available herbicide. Pesticides used improperly can be injurious to man, animals, and plants. *Follow all label directions and label precautions.*

Section II-(iii)-C, Forest Land Interpretations of the Field Office Technical Guide should be used in determining desirable tree species and estimating potential site productivity.

Protect the area from grazing.

Protect riparian zones, unique areas, and structures. Leave a strip of existing woody vegetation, a minimum 50 feet wide, along any non-woodland border. This strip will provide wind protection for the remaining stand, provide food and cover for wildlife, improve visual aesthetics, and protect water quality. Some light forest stand improvement work can be done in this strip. Where riparian protection is needed, follow RIPARIAN FOREST BUFFER (391).

Release cuttings should generally be done before the stand is 15 years old or as soon as the need becomes apparent. Cut or deaden:

- cull and "wolf" trees (may be retained for wildlife)
- undesirable species
- damaged trees
- diseased trees
- surplus sprouts

Comply with applicable laws and regulations.

Additional Criteria to Improve or Sustain Timber Production

All stands:
Start thinning no earlier than age 15 to 20 years. Additional thinning can occur at 10-15 year intervals, up until three-fourths of the rotation age is reached.

Keep improvement cuttings light enough (maintain at least 60% stocking) to restrict the growth of any undesirable species, to maintain full site utilization, to reduce sunscald damage and to reduce epicormic *(a shoot sprouting from a dormant bud on the stem of a tree)* branching and basal sprouting.

Base thinning choices on:

- relative tree position
- crown position
- crown condition
- tree health
- bole quality
- species

For stands with an average DBH of 6 inches or more, use the following table as a guide for residual stocking after thinning:

Stand Diameter (inches)	Spacing (feet)	Basal Area (sq. ft.)	Trees/ Acre (no.)
	Hardwood		
6	13	55	258
8	16	60	170
10	19	65	121
	Pine		
6	12	60	304
8	14	75	222
10	16	90	170

With all thinning, provide 3 to 5 feet of crown growing space on two or three sides of residual trees (5 to 10 feet for black walnut).

Thin stands below 6 inches DBH to a 10-foot spacing.

Strip or row thinning is possible in plantations with straight rows. Remove one-third of the stand or every third row.

Pine stands:
Where root rot (Fomes annosus) may be a problem, restrict thinning to the summer months to minimize infection. Treat cut stumps with borax.

Prescribed fire may be used to:

- remove undesirable hardwoods;
- reduce fuel build-up;
- expose mineral soil for improved germination.

Refer to PRESCRIBED BURNING (338) for additional guidance. A prescribed burn plan shall be prepared.

Additional Criteria to Improve Wildlife Habitat

Rotate forest stand improvements through a stand so that various stages of plant succession will be established.

Secondary Objective

If wildlife enhancement is a secondary objective, do the following:

Leave or establish 3 snags and 3 den trees per acre, ranging in size from 6 to 20 inches DBH.

Leave 2 to 4 vines per acre. Favor trees with vines that will be left as den trees or oak species greater than 10 inches DBH.

Create 2 or 3 brush piles per acre with material from forest stand improvement work.

Primary Objective

If wildlife enhancement is a primary objective, do the following:

Perform heavier thinning (less than 60% stocking) to encourage fuller crown development, earlier seed production, and heavier herbaceous plant development.

Favor hard-mast producers (oak, hickory, pecan and walnut) and conifers.

Leave or establish 7 snags and 7 den trees per acre, ranging in size from 6 to 20 inches DBH.

Leave 4 to 6 vines per acre. Favor trees with vines that will be left as den trees or oak species greater than 10 inches DBH.

Create 3 to 4 brush piles per acre with material removed during improvement work. Hinged, partially cut "living" brushpiles should be included to provide long-lived shelter.

Low intensity prescribed fires may be used to improve/increase green browse for wildlife. Refer to PRESCRIBED BURNING (338) for additional guidance. A prescribed burn plan shall be prepared.

For additional management guidelines refer to WILDLIFE UPLAND HABITAT MANAGEMENT (645).

Additional Criteria to Improve Aesthetics and Recreation

This activity is strongly influenced by subjective values and interests. Direct forest stand improvements toward:

- opening vistas
- installing trails
- increasing vegetation diversity (shape, texture, color, size)
- removing safety hazards near pedestrian use areas (snags, large dead limbs, etc.)
- creating visual screens

For additional guidelines refer to RECREATION AREA IMPROVEMENT (562) and RECREATION TRAIL AND WALKWAY (568).

CONSIDERATIONS

These specifications are intended to help identify and determine basic forest stand improvement activities. Consult a professional forester for assistance in field implementation of complex sites.

Pine stands with known occurrences of root rot should be considered high risk stands.

Forested wildlife corridors can minimize fragmentation effects.

Forest stand improvement activity for timber production is generally not justified on poor sites (below site index 55 if managing for oaks; or site index 45 if managing for shortleaf pine).

Forest stand improvement activity can impact water quality by causing a temporary increase in erosion rates and sediment yield.

If chemicals are used to control vegetation, the potential for surface and/or ground water contamination exists. Seek guidance from experienced pesticide advisors such as university extension or certified crop specialists.

PLANS AND SPECIFICATIONS

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

OPERATION AND MAINTENANCE

Operation and maintenance requirements are not applicable for this practice

REFERENCES

Forestry Handbook, Second Edition; Society of American Foresters; 1984.

Increased Woodland Products through Timber Stand Improvement; Agricultural Guide 5150; University of Missouri Extension Division; 1984.

Managers Handbook for Oaks in the North Central States; General Technical Report NC-37; North Central Forest Experiment Station, Forest Service, USDA; 1977.

Managers Handbook for Black Walnut; General Technical Report NC-38; North Central Forest Experiment Station, Forest Service, USDA; 1977.

Managing Shortleaf Pine in Missouri; Station Bulletin 875; Agricultural Experiment Station, University of Missouri; 1969.

Managing Forests to Maintain Populations of Gray and Fox Squirrels; Technical Bulletin 5; Illinois Department of Conservation; 1987.

The Practice of Silviculture; David M. Smith; John Wiley & Sons, Eighth Edition; 1986.

Snag and Den Tree Management; Timber and Wildlife Benefits on Private Land-No.5; Missouri Conservation Commission; 1985.

Working with Your Woodland-A Landowner's Guide; Beattis, Thompson, and Levin; University Press of New England; 1983.

Central Hardwood Notes. Jay Hutchinson, Editor. USDA Forest Service. North Central Forest Experiment Station; 1989.