

Forest Stand Improvement (Acre) 666

DEFINITION

The manipulation of species composition, stand structure and stocking by cutting or killing selected trees and understory vegetation.

PURPOSES

- Increase the quantity and quality of forest products by manipulating stand density and structure
- Timely harvest forest products
- Initiate forest stand regeneration
- *Development of renewable energy systems*
- Reduce wildfire hazard
- Improve forest health by reducing the potential of damage from pests and moisture stress
- Restore natural plant communities
- Achieve or maintain a desired native understory plant community for special forest products, grazing, and browsing
- Improve aesthetic and recreation values
- Improve wildlife habitat
- Alter water yield
- Increase carbon storage in selected trees

CONDITIONS WHERE PRACTICE APPLIES

All forest land.

This standard is not applicable for Alley Cropping (311), Multi-story Cropping (379), Windbreak/Shelterbelt Establishment (380) operation and maintenance, or Windbreak/Shelterbelt Renovation (650).

CRITERIA

General Criteria Applicable to All Purposes

Plan this practice to be compatible with the harvest-regeneration strategy, e.g. Uneven-aged management systems (single-tree selection, group selection, coppice selection, etc.) or even-aged management (clear-cut, seed-tree, shelterwood, coppice, etc.).

Separate stands with different cover types or timber types into separate management units (stands) and plan them individually. Use Michigan Natural Features Inventory (MNFI) Natural Community Descriptions, Michigan Department of Natural Resources forest cover types, or other generally accepted classification systems to delineate management unit boundaries.

Base all management decisions on a thorough and current forest inventory and the intended purpose. Crop tree inventories, fixed area plot inventories, and point sampling methods are examples of forest inventories. Refer to Michigan Forestry Technical Note # 29 for information on conducting a forest inventory. Additional information can be found in Forestry Handbook (Wenger, ed., 1984) and the NRCS National Forestry Handbook. At a minimum, the inventory must be adequate to generate basal area (for even- or uneven-aged stands) or average diameter at breast height (DBH) and average spacing/trees per acre (for even-aged stands).

Base forest stand improvement choices on the following selection criteria:

- *Tree and forest health*
- *Tree size, position and spacing*
- *Crown size, position, and condition*
- *Bole quality*
- *Species*
- *Species diversity*

Plan post-treatment basal appropriately for community/cover type. See Forest Stand Improvement (666) Job Sheet for more information.

Kill unwanted trees, shrubs, and vines by any of the following means:

- Cutting
- Girdling
- Frilling
- Stem injection of herbicides
- Foliar or basal bark spraying of herbicides

If needed, supplement mechanical cutting, girdling, or frilling with an application of herbicide to increase mortality and decrease stump sprouting.

Consult NRCS Michigan eFOTG, Section II – H. Water Quality and Quantity, Windows Pesticide Screening Tool (WIN-PST) to review leaching and runoff potential, persistence, and toxicity ratings of pesticides. Follow all label precautions.

Time tree cutting to avoid a buildup of insect or disease populations.

*Conduct tree cutting in forest stands that contain oak species only during dormant seasons, October 1 through March 1, to reduce chance of infection to the residual stand by oak wilt disease (*Ophiostoma fagacearum*).*

Perform forest stand improvement activities in such a way as to minimize soil erosion, compaction, rutting, damage to remaining vegetation, and hydrologic conditions, and other site resources.

Limit damage to the site by:

- Using directional felling compatible with skid trail layout
- Aligning cut tree stems for efficient skidding
- Cutting out forks and large branches
- Limiting trails to less than 15% of the site
- Logging when soils are dry or frozen
- Using the lowest-impact equipment available
- Using well-organized access trails

Refer to the Forest Trails and Landings (655) conservation practice standard for more information about trail establishment and maintenance.

Comply with applicable laws and regulations, including Michigan's Best Management Practices (BMPs) for forestland contained in "Sustainable Soil and Water Quality Practices on Forest Land," published by the Michigan Department of Natural Resources, 2009.

Protect all forestland from livestock grazing.

Retain a minimum of 2 large (>12" DBH) active den trees per acre, if possible.

Retain or create a minimum of 2 large (>12" DBH) snags per acre, if possible.

Treat slash and debris such that they do not present an unacceptable fire, safety, environmental, or pest hazard and will not interfere with the intended purpose or other management activities.

If burning is used to reduce slash and other debris on-site, follow the Prescribed Burning (338) Conservation Practice Standard.

Additional Criteria to Increase the Quantity and Quality of Forest Products (Intermediate Thinning Treatments)

For management of, or conversion to, uneven-aged stands (hardwoods, conifers, or mixed forest types), perform Forest Stand Improvement when basal area is greater than 110 sq. ft. per acre. Remove 20 to 33% of the basal area, ensuring that residual basal area is no lower than 75 sq. ft. per acre to regenerate shade tolerant species, e.g., sugar maple, and no lower than 60 sq. ft. per acre to regenerate shade intolerant or intermediate species, e.g., red oak.

For even-aged hardwood stands, perform Forest Stand Improvement when basal area is greater than 110 sq. ft. per acre. Remove 20 to 33% of the basal area, ensuring that residual basal area is no lower than 75 sq. ft. per acre.

For even-aged conifer stands, perform Forest Stand Improvement when average tree spacing is less than D+4 or crown is less than one third of the total tree height. Increase average tree spacing to D+6, if possible, but do not remove more than half the trees in one treatment.

See Forest Stand Improvement (666) Job Sheet for more information.

Additional Criteria to Harvest Forest Products and to Initiate Forest Stand Regeneration

Use a harvest-regeneration system appropriate for the growth characteristics and shade tolerance of the species and forest cover type to be regenerated:

- *For uneven-aged systems, follow guidance in previous section.*
- *For management of, or conversion to, even aged system, including pine plantations and aspen stands, use even-aged harvest-regeneration strategies, e.g., shelterwood, seed tree harvests, and clearcutting.*

If natural regeneration is not likely, or is not present two years after the harvest, initiate reforestation. Refer to the Tree/Shrub Establishment (612) Conservation Practice Standard.

Additional Criteria to Develop Renewable Energy Systems

Manage intensity and frequency of biomass removals to prevent long-term negative impacts to the stand.

Harvest the biomass in a manner that will not compromise the other intended purpose(s) and functions.

Additional Criteria to Reduce Wildfire Hazard

Reduce stocking rates of trees to minimize crown-to-crown spread of fire.

Remove “ladder” fuels to minimize the *risk* of crown fires.

Further treat or eliminate slash accumulations next to roads and trails.

Reduce or eliminate species with high volatility.

For additional wildfire risk and damage reduction, refer the Firebreak (394) Conservation Practice Standard.

Additional Criteria to Improve Wildlife Habitat

Manage for a variety of native tree species and stocking rates that meet desired wildlife and pollinator species’ food and cover requirements.

Create and/or maintain 2 to 5 snags per acre (12” DBH+), and 2 to 5 den trees per acre (12” DBH+), if possible, depending on the requirements of the desired wildlife species.

Create and/or maintain adequate down woody material to meet requirements of desired wildlife.

Minimize improvement actions that disturb seasonal wildlife activities.

Refer to the Early Successional Habitat Development/Management (647), Rare and Declining Habitat Management (643), Upland Wildlife Habitat Management (645), and Wetland Wildlife Habitat Management (644) Conservation Practice Standards

to further develop and manage wildlife-related activities.

Additional Criteria to Increase Carbon Storage in Selected Trees

Manage for tree species and stocking rates that have higher rates of growth and potential for carbon sequestration.

CONSIDERATIONS

Use of a professional forester (Conservation District forester, professional consulting forester, etc.) to mark and layout practice will generally yield better results. This should be considered especially for large or complex sites.

The U.S. Forest Service North Central Research Station’s “Manager’s Handbook” series of publications provide excellent type-specific guidance for a variety of cover types. Search for “Manager’s Handbook” here:

<http://www.ncrs.fs.fed.us/pubs/search.asp>.

Silvicultural objectives and harvest-regeneration strategies may change over time and may be limited by prior management.

The extent, timing, size of treatment area, or the intensity of the practice should be adjusted to minimize cumulative effects (onsite and offsite), e.g., hydrologic and stream alteration, habitat fragmentation, nutrient cycling, biodiversity and visual resources.

To encourage regeneration of oaks and other species with intermediate shade tolerance, consider group selection to permit more sunlight to reach the forest floor.

Cut material can be arranged into 3 to 4 brush piles per acre to provide additional wildlife cover.

While potentially detrimental to tree health, 1 to 2 grapevines per acre can increase available wildlife food.

Time the practice to minimize disturbance of seasonal pollinator and wildlife activities.

Landowners should secure a written contract with any service provider that specifically describes the extent of activity, duration of activity, liability and

responsibilities of each party and amount and timing of payments for services provided.

Slash, debris and other vegetation (biomass) removed during stand improvement may be used to produce energy. Management alternatives should consider the amount of energy required to produce and convert the biomass into energy with the amount produced by the biomass. Wildlife and sustainability requirements should also be considered.

Control invasive or noxious woody vegetation.

Advise clients of their wildfire control responsibilities and consider the development of a wildfire control plan including “defensible” space, access routes, fire-season water source, and location of wildfire control facilities.

Timing of treatment and retention of dead or dying trees will minimize impacts on nesting wildlife.

Thinning of pine stands during the growing season (especially during dry periods) without proper treatment of logging slash, may subject the stand to increased risk of attack by bark beetles (*Dendroctonus spp.* and *Ips spp.*).

In stands with beech bark disease, scout for and retain potentially resistant trees.

PLANS AND SPECIFICATIONS

Specifications for applying this practice shall be prepared for each site and recorded using Michigan NRCS Forest Stand Improvement (666) Job Sheet or narrative statements in the conservation plan or forest management plan.

Specifications will include, but are not limited to:

- *Purpose(s) of treatment*
- *Map indicating location of practice*
- *The harvest-regeneration strategy:*
 - *Uneven-aged management (e.g., single-tree selection, group selection, coppice selection)*
 - *Even-aged management (e.g., clear-cut, seed-tree, shelterwood, coppice)*
- *Pre-treatment and post-treatment basal area (for even- or uneven-aged stands) or*

average DBH and spacing/trees per acre (for even-aged stands)

- *Number, species, and size class of trees to be removed*
- *The method, timing, and type of equipment to be used*
- *Mitigation measures, e.g., slash and debris disposal to mitigate wildfire or pest hazards*
- *Operation and Maintenance requirements*

OPERATION AND MAINTENANCE

Periodic inspections during and after treatment activities are necessary to ensure that purposes are achieved and resource damage is minimized, e.g., assessment of insects, disease and other pests, storm damage, and damage by trespass. The results of inspections shall determine the need for additional treatment under this practice.

For treatments intended to initiate forest stand regeneration, inspect the site after 2 years to determine if natural regeneration is adequate. If not, initiate artificial regeneration using Tree/Shrub Establishment (612).

Forest Stand Improvement may be needed at 5 to 15 year intervals, depending on site type and site quality.

REFERENCES

- Gilmore, D.W. and B.J. Palik. 2005. A Revised Manager's Handbook for Red Pine in the North Central Region. USDA-Forest Service, North Central Research Station, General Technical Report NC-264. St. Paul, MN.
http://www.ncrs.fs.fed.us/pubs/gtr/gtr_nc264.pdf
- Heiligmann, Randall B. 1997. Controlling Undesirable Trees, Shrubs, and Vines in your Woodland. Ohio State University Extension Publication F-45. Columbus, OH.
<http://ohioline.osu.edu/for-fact/0045.html>
- Kidd, R.P. and M.R. Koelling. 1991. Improving Hardwood Timber Stands. Michigan State University Extension Bulletin E-1578. East Lansing, MI.
<http://forestry.msu.edu/msaf/ForestInfo/MSUElibrary/E1578 ImprHdwd.PDF>
- Michigan Department of Natural Resource and Michigan Department of Environmental Quality. 2009. Sustainable Soil and Water Quality Practices on Forest Land. Lansing, MI.
http://www.michigan.gov/documents/dnr/IC4011_SustainableSoilAndWaterQualityPracticesOnForestLand_268417_7.pdf
- Michigan Society of American Foresters. 2008. Forest Management Guidelines for Michigan: Silvicultural Systems.
<http://michigansaf.org/Business/MSAFguide/SilvSystems.htm>
- Neumann, D. and G. Peterson. 2001. Northern Hardwood Forest Management. Michigan State University Extension Bulletin E-2769.
<http://forestry.msu.edu/extension/extdocs/E2769.pdf>
- Perkey, A.W., B.L. Wilkins, and H.C. Smith. 1994. Crop Tree Management in Eastern Hardwoods. USDA-Forest Service, NE Area S&PF. Publication NA-TP-19-93.
http://www.na.fs.fed.us/pubs/ctm/ctm_index.html
- Sander, I.L. 1977. Manager's Handbook for Oaks in the North Central States. USDA-Forest Service, North Central Forest Experiment Station, General Technical Report NC-37. St. Paul, MN.
<http://www.ncrs.fs.fed.us/pubs/viewpub.asp?key=102>
- Sargent, M.S. and K.S. Carter, ed. 1999. Managing Michigan's Wildlife: A Landowners Guide. Michigan United Conservation Clubs, East Lansing, Michigan.
http://www.michigandnr.com/publications/pdfs/huntingwildlifehabitat/Landowners_Guide/index.htm
- Stefano, S. S.R. Craven, R.L. Ruff, D.F. Covell, and J.F. Kubisiak. 2001. A Landowner's Guide to Woodland Forest Management with emphasis on the roughed grouse. Bulletin G3578. Board of Regents of the University of Wisconsin System. Madison, WI.
<http://basineducation.uwex.edu/woodland/OWW/Pubs/UWEX/G3578.pdf>
- Tubbs, C.H. 1977. Manager's Handbook for Northern Hardwoods in the North Central States. USDA-Forest Service, General Technical Report NC-39. St. Paul, MN.
http://www.ncrs.fs.fed.us/pubs/gtr/gtr_nc039.pdf
- Tubbs, C.H., R.M. DeGraaf, M. Yamasaki, and W.M. Healy. 1987. Guide to Wildlife Tree Management in New England Northern Hardwoods. USDA-Forest Service, Northeastern Forest Experiment Station, GTE-NE-118. Bromall, PA.
<http://www.treesearch.fs.fed.us/pubs/4165>
- Wenger, K.F., ed. 1984. Forestry Handbook, Second Edition. Society of American Foresters publication Number SAF 84-11. John Wiley and Sons, Inc. New York, NY.
- Wisconsin Department of Natural Resources. 2009. Herbicides for Forest Management. Madison, WI.
<http://dnr.wi.gov/forestry/Fh/weeds/herbicides.htm>