FOREST STAND IMPROVEMENT

Oklahoma Conservation Practice Job Sheet 666 01

Landowner_____

BEFORE – Over-crowded pine stand results in stunted, slow growing, unproductive forests.

AFTER - Hand thinning to create appropriate spacing will result in a healthy productive forest.

WHAT IS A FOREST STAND IMPROVEMENT?

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

PURPOSE

- Increase the quantity and quality of forest products by manipulating stand density and structure.
- Timely harvest of forest products.
- Development of renewable energy systems.
- Initiate forest stand regeneration.
- Reduce wildfire hazard.
- Improve forest health 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.

WHERE THE PRACTICE APPLIES

This practice applies to all forest land.

WHERE TO GET HELP

For assistance with this practice, contact your local Natural Resources Conservation Service or your local Conservation District office.

APPLYING THE PRACTICE

The harvest-regeneration strategy will be identified for all planned forest improvement harvesting:

- Uneven-aged management systems (e.g., single-tree selection, group selection, selection due to sprouting ability)
- Even-aged management (e.g., clear-cut, seed-tree, shelterwood, sprouting ability)

Forest stand improvement choices will be based on relative tree position in the stand, crown position, crown condition, tree health, stem quality, and species.

Stocking guidelines shall contain recommendations in terms of basal area, spacing or trees per acre by species and size class distribution.

The method, felling direction and timing of tree cutting for harvesting shall protect site resources, e.g., residual trees, wetlands, cultural resources, improvements and utilities.

Time tree cutting to avoid buildup of insect or disease populations (mid Oct through March). Felling direction must be compatible with trail layout. Forest stand improvement activities shall be performed to minimize soil erosion, compaction, rutting, and damage to remaining vegetation and maintain hydrologic conditions.

Comply with applicable laws and regulations, including the Oklahoma Forestry Best Management Practices.

PRECOMMERCIAL THINNING

Precommercial thinning is often performed on young over-crowded timber stands to ensure an optimum growth rate in the residual stand by manipulating the stocking rate before the trees reach merchantability.

Precommercial thinning methods include:

- Mechanical release
- Chemical release
- Prescribed burning

MECHANICAL RELEASE

Pine trees may be removed mechanically by use of a rotary mower, bulldozer, skid steer with cutter, disk, roller chopper or by use of hand tools such as machete, axe, brush hook or chain saw. Equipment used will depend upon the size of the trees, the size of the area to be treated, site conditions, and the economic limitations of the landowner.

Mechanical precommercial thinning in hardwood stands shall be accompanied with herbicide use. Mechanical removal of unwanted hardwood trees alone will cause sprouting instead of death of the trees and will result in a thicker stand after treatment.

CHEMICAL RELEASE

Chemical herbicides may be applied to a forest stand to remove undesirable trees.

Guidance for selection of the proper herbicide, rates, and timing of the application will be obtained from recommendations by the Oklahoma Cooperative Extension Service.

Timing of the chemical application is often critical. There are differences in the susceptibility of the various target species to different herbicides which influence the proper timing of application.

Chemical herbicides can be applied by various methods including:

- Stem injection
- Frill
- Girdling
- Basal spray
- Stump cut
- Foliar spraying
- Soil application

Stem Injection
Herbicide injection can be used to select individual medium-to-large size trees for treatment. Tree Injectors or Hypo-Hatchets are used to inject the appropriate dosage of herbicide through cuts in the bark of the tree.

Frill
Use a hand axe, hatchet, machete, or similar device to make a series of single overlapping hacks (frills) or cuts, at a downward angle, completely around the tree stem as close to the ground as feasible. Cuts should penetrate through the bark into the living cambium tissue and produce a cupping effect to hold the herbicide. Spray or paint the injured surface with herbicide using enough volume to wet the treated areas.

Girdling
Girdling involves using a chainsaw to “ring” the tree by making a continuous one inch deep cut all the way around the tree at waist height. This method is generally used to control trees larger than 5 inches in diameter. Apply herbicide within 30 minutes to the fresh cut. Cutting two rings approximately 6” apart is also effective, without herbicide.

Basal Spray
Basal spray, or sometimes referred to as basal bark application, is a technique used to deaden small trees less than 6" in diameter. A herbicide mixture is applied, with a backpack sprayer, to the lower 12" to 18" of the tree trunk, thoroughly wetting the stem on all sides to the ground line (root collar). Spray until there is runoff noticeable at the ground line, but not to the point of runoff into the surrounding soil.

Stump Cut
Spray the sides and cut surface of freshly cut stumps with the herbicide, within 30 minutes of cutting. The cambium (outer wood next to the bark) area is the most vital area to wet.

Foliar Spraying
Spraying herbicides can be done aerially (fixed-wing aircraft, helicopter) or by ground broadcast application (sprayers attached to backpacks, ATV’s, tractors, skidders, or other ground equipment). This is one of the fastest methods of hardwood brush control in pine stands.

Soil Applications
Herbicide treatment to individual stems can also be accomplished through soil application of chemical formulations. The chemicals percolate into the soil

during rainfall events and are absorbed by the tree's root system. Surrounding trees may also be damaged by this treatment due to this washing action.

PRESCRIBED BURNING

Prescribed burning is often used in pine stands to remove undesirable hardwood species and other ground vegetation that compete with the crop trees.

Prescribed burning is an excellent tool used to promote the development of historical plant communities in oak/hickory or oak/pine savannah forests, by mimicking the natural fire regimes as closely as possible.

COMMERCIAL THINNING/CUTTING

Cutting in merchantable forest stands is periodically done to concentrate growth onto crop trees, to reduce susceptibility to disease and insects, to salvage low quality or suppressed and dying trees, or to improve growth of ground cover for grazing by livestock or wildlife. These measures include:

- Intermediate thinning
- Harvest/regeneration cuts
- Salvage cuts/Sanitation cuts

It is important to plan harvest treatments and proceed with practice installation carefully to avoid damage to the site. It may take years for the forest to recover from improper harvesting practices.

INTERMEDIATE THINNING

Commercial harvesting in merchantable forest stands is done periodically to increase growth on crop trees. Cuts which manipulate conditions in a merchantable stand during the time period between regeneration/establishment and final harvest of the trees are called intermediate thinnings. This type of thinning is generally done to improve the spacing, quality, and species composition of the stand to attain the intended purpose of the practice. Intermediate treatments should be an integral part of the management plan to ensure the health and productivity of the forest.

Residual stocking rates are based on the following guides to indicate the space required by a tree to maintain growth and vigor between cuttings:

- Tree spacing
- Basal area
- Cutting cycle

Tree Spacing
In pine stands, the D + X method for thinning is a good rule to use when expressing the growing space required by a tree for normal growth over a given number of years. "D" represents the DBH (diameter breast height) of the average residual tree and "X" is an added constant to allow normal growing space to a leave tree. In most cases "X" will be "6" for pine. "X" varies with the average stand diameter for hardwoods.

Basal Area
Basal area is the cross-sectional area of tree trunks per acre, expressed in square feet. Stands should be thinned to the desired basal area or spacing according to the species and DBH. A normal rule of thumb for intermediate thinning in pine stands is to thin to a basal area of 60-80.

Cutting Cycle
A cutting cycle is the length of time between cuts on the same area. In general, this cycle is the time it takes the average tree diameter to increase by 2 inches for pine and 4 inches for hardwoods.

HARVEST/REGENERATION CUTS

Harvest and regeneration cuts are made when the forest stand has reached economic and/or physiological maturity. The harvest method used will determine the regeneration option available to the landowner to establish a new stand. It is more feasible for the landowner to determine the preferred regeneration method and use an appropriate harvest system to facilitate that method.

There are four basic harvesting/regeneration systems which include:

- Seed Tree Cuts
- Shelterwood Cuts
- Clear Cuts
- Selection Cuts

Harvest methods fall into two general categories: those encouraging regeneration of even-aged forest stands, and those resulting in uneven-aged stands. Even-aged stands are created through use of seed tree cuts, shelterwood cuts and clear cuts. Uneven aged stands result from selection cuts.

Seed Tree Cuts
This method consists of leaving enough seed-producing trees scattered over the area to ensure adequate stocking. The seed trees are later removed to eliminate shading effects when the seedlings are 2 to 3 years old.

Seed trees should be dominant trees of good form and quality with seed-producing capabilities, which are at least 9 to 10 inches in diameter. They shall be well-distributed over the area to be regenerated.

Shelterwood Cuts

Shelterwood cuts are similar to seed tree cuts, but more trees are left to regenerate the stand and to serve as a canopy shelter for the germinating seedlings.

Leaving more trees after the initial harvest helps suppress the development of competing vegetation, and it also reduces the risks associated with poor seed crops during regeneration efforts.

Clear Cuts
Clearcutting removes all merchantable trees in the stand in one cut. This method is used when nearly all the desirable trees in the stand are mature and a new stand of shade-intolerant tree species such as pines or oaks can be established either through natural seeding/sprouting or through planting. This type of regeneration harvest is often followed by site preparation practices when seedling planting is used to establish the next stand.

Selection Cuts
Selection harvesting involves periodic cutting of selected trees from all merchantable diameter classes. This harvesting method maintains an uneven-aged stand.

Slow-growing, poor quality, or undesirable trees will be cut, and the best trees will be left to improve quality and growth.

Harvest tree selection will be done either by targeting single individual trees or by removing a group of trees to create openings or gaps in the forest canopy. The openings provide freedom from competition for the natural establishment of shade-intolerant tree species. In this manner, a diversity of age and size class is maintained.

SALVAGE/SANITATION CUTTING

Salvage cutting is the removal of trees damaged by insects, disease, ice, tornadoes, fire, and other disasters to obtain economic gain before tree value is lost.

Sanitation cutting is the removal of trees attacked by insect or disease. The cutting is done to stop the infestations and is usually not expected to bring high economic benefits to the owner due to the emergency considerations of the operation.

These cuts usually remove trees in the oldest and largest size category. This removal is important in maintaining the health and productivity of the stand.

MAINTAINING THE PRACTICE

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.

The stand should be re-examined approximately 10 years after the application of this practice. To encourage continuation of the desired vertical structure, the stand may require a commercial thinning within 10 to 15 years, depending on site quality

Forest Stand Improvement– Job Sheet

Landowner_____ Designed by_____Date_____

Purpose: *(check all that apply)*	
☐ *Increase quan. & qual. of forest products*	☐ *Timely harvest of forest products*
☐ *Development of renewable energy systems*	☐ *Initiate forest stand regeneration*
☐ *Reduce wildfire hazard*	☐ *Reduce damage from pests & moisture stress*
☐ *Restore natural plant communities*	☐ *Achieve a native understory plant community.*
☐ *Improve aesthetic & recreation values*	☐ *Improve wildlife habitat*
☐ *Alter water yield*	☐ *Increase carbon storage*

Design *(Precommercial Thinning)**:***

Field No.	Species to be removed	Method*	Before and After				Technique**
			Trees/ac.	Spacing (ft)	Basal Area	DBH	

*Mechanical; Chemical; Prescribed Burning
**Mower, chainsaw, stem injection, frill, basal spray, etc.

Design *(Commercial Thinning)**:***

Field No.	Species to be harvested	Mgmt. System*	Intermediate Thinning			Harvest/ Regeneration Cut**	Residual Seed Trees/Ac	Residual BA/Spacing
			Spacing (ft)	Basal Area	Cutting Cycle			

*Intermediate Thinning; Harvest/Regeneration Cut; Salvage/Sanitation Cut.
** Seed tree; Shelterwood; Clear; Selection.

***Additional Notes*:**

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Forest Stand Improvement– Job Sheet

If needed, an aerial view or a side view of the practice can be shown below. Other relevant information, complementary practices and measures, and additional specifications may be included.

Scale 1"=_____ ft. (NA indicates sketch not to scale: grid size=1/2" by 1/2")

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