

APPENDIX F-VEGETATION MANAGEMENT PRACTICES

This appendix evaluates the general appropriateness of various vegetation management practices, with a major focus on silvicultural systems and prescriptions. This appendix recommends practices that meet NFMA regulations for manipulating vegetation to regenerate stands to desirable native species, usually of the pre-harvest forest types. This appendix was prepared for compliance with 36 CFR 219.15

Silvicultural Systems

There are three silvicultural systems used to create desired conditions and provide regulated and sustainable yield of wood products.

The EVEN-AGED SILVICULTURAL SYSTEM is a planned sequence of treatments for tending, harvesting, and re-establishing a stand designed to maintain trees composed of a single age class in which the range of tree ages is usually 20 percent of rotation. This system creates a mosaic of single age class stands across the forestlands suitable for producing forest products, where collectively on the suitable forest land, all age classes are present and maintained. When a stand reaches the desired product objective, usually expressed as the rotation (the time frame for growing the product objective for a given set of environmental conditions) or the specific wood product(s), harvesting is scheduled to remove all or most all of the merchantable trees (from which the desired wood products can be produced) in a stand. Whether all or some of the merchantable trees are harvested is dependent upon the regeneration method chosen to accomplish the management area objectives. Regeneration, designed to replace desirable tree species, takes place within five years after the final harvest.

The TWO-AGED SILVICULTURAL SYSTEM is a planned sequence of treatments for tending, harvesting, and re-establishing a stand and maintaining trees of two distinct age classes. The trees in each distinct age class could have tree ages that span up to 20 percent of the rotation. This system creates a mosaic of two-age class stands across the forestlands suitable for timber production, where collectively on the suitable forestland, all age classes are present and maintained. When one age class of the stand reaches the desired product objective, usually expressed as a rotation, harvesting is scheduled to remove that age class, usually the older age class. In a stand, all merchantable trees (from which wood products can be produced) in the older age class are scheduled for harvest. The resulting stand may be two-aged or tend toward an uneven-aged condition as a consequence of both an extended period of regeneration established and the retention of reserve (green) trees that may represent older age classes. When trees in one of the age classes have reached the desired product objective or rotation, that part of the stand is harvested. This harvest regenerates a new age class of desirable tree species to perpetuate the two-aged stand structure within five years of the removal of an age class.

The UNEVEN-AGED SILVICULTURAL SYSTEM is a planned sequence of treatments for tending, harvesting, and re-establishing a stand and maintaining trees of three or more

distinct age classes. Because this system creates a multi-aged stand structure, rotations are not applicable as a management tool. Instead, periodic inventories of the multi-aged stands provide information about the site's productivity, the species present, their size and growth. From this inventory information, product objectives can be determined, as well as the period of time it takes to grow a marketable volume on a sustainable basis. Additionally, the periodic inventory provided information about the distribution of age classes in the uneven-aged stand. This distribution information is used to plan needed stand improvement practices that adjust the number of trees in each age class to a desired distribution, thus permitting the sustainable production of the product objective. Trees selected for harvest can be dispersed individual trees (i.e., single tree selection) or small groups of trees (i.e.; group selection). The system generally maintains a high forest cover across the land while providing a sustained yield of forest products and the orderly growth and development of desired trees with a variety of diameter and ages.

Application of Silvicultural Systems

The selection of which silvicultural system and regeneration method to use is based on the condition of the existing forest stand and the desired condition of the management area of which the stand is a part.

During the period from about 1880 through 1930, much of the lands now managed as the OSFNFs were logged and sometimes burned or badly eroded. Some of the Forests were created from abandoned farmland. Today, these lands have healed and been rejuvenated as a result of Federal investments in tree planting, fire suppression, timber stand improvement, and time. The resultant growth of oak dominated and southern yellow pine forests consist of essentially even-aged stands. Since becoming National Forest System lands, some stands have been managed for wood production.

The National Forest Management Act (NFMA) and its Federal Regulation require the identifying of forestlands to be used for producing sustainable yields of wood products, thus the need to identify 1) which lands and 2) which silvicultural system are to be used. Although conceptually possible, the random application of mixing uneven-aged, two-aged, and even-aged stands is not practical over the present predominantly even-aged forest. Even though the production of wood products is an objective, equally important objectives are wildlife habitats, water quality, and aesthetics. Even-aged, two-aged, and uneven-aged management practices each create different vegetation conditions and stand structures, and have different practices and objectives which have limitations when protecting the forest resources is of primary concern. Likewise, each species of tree has unique requirements insofar as light requirements, site productivity, and soil moisture in order to regenerate adequately and grow to maturity. Thus, the silvicultural system chosen must also consider the needs of the desirable tree species occupying the site or the species we wish to regenerate. This revised Forest Plan operates under the principle of management area and silviculture prescriptions, where portions of the Forests have similar environmental conditions, management emphasis, and/or specific multiple resource objectives. Therefore, uneven-aged, two-aged, and even-aged silvicultural system practices will not be applied

individually to intersperse the silviculture systems, but rather to portions of management area where they simultaneously contribute to accomplishing other renewable resource objectives and are appropriate for the desirable tree species to be regenerated or tended.

Prescription Applications

When management alters vegetation, the methods, timing, and intensity of the practices determine the level of benefits that can be obtained from the affected resources. It is not practical to attempt to describe all the conditions and reasons for manipulating vegetative conditions. Reasons range from improving forest health to eliminating hazards for public safety. Site-specific implementation of the forest plan is the appropriate place for determining which management practice(s) to use for achieving a specific project objective.

The desired future condition description for each management area should be used as the primary objective; however, there is some flexibility of silviculture prescription application based on site index values. Table F-1 identifies which silviculture prescriptions are appropriate for use in each management area based on site indices. Table F-2 gives a brief description of those silviculture prescriptions. A detailed description of each silviculture prescription follows Table F-2. On lands with site indices 50 and below, savanna and woodland prescriptions will be used. On lands with site indices ranging from 60 to 70 the emphasis of the management area will guide prescription selection. On lands with site indices greater than 80, prescriptions that allow for higher basal area densities will be used.

Table F-1: Silviculture Prescription Allocation by Management Area.

Management Areas	Site Index 50 and below	Site Index 60-70	Site Index 80 and above	All Site Indices
1.A Designated Wilderness				
1.B Recommended Wilderness Additions				
1.C Designated Wild and Scenic Rivers				
1.D Recommended Wild and Scenic Rivers				
1.E Experimental Forests				
1.F Research Natural Areas				
1.G Special Interest Areas				
1.H Scenic Byway Corridors	103,104,114	104,105,106, 108, 114	104,105,106, 108, 114	

***Silviculture Rx #110 should be the only Rx used in primary and secondary Indiana Bat Zones regardless of site index values.**

***Silviculture Rx #115 should be used under Forest-wide Standard FW14 guidance and only on a limited basis.**

Table F-1: Silviculture Prescription Allocation by Management Area. (Continued)

Management Areas	Site Index 50 and below	Site Index 60-70	Site Index 80 and above	All Site Indices
2.A Ozark Highlands Trail				
2.B State Parks				
2.C Developed Recreation Areas				
2.D Upper Buffalo Dispersed Recreation Area	103,104,114	100,101,105, 107, 108,113	100,101,105,107, 108,109,113	
2.E Wedington Unit Urban Recreation Area	103,104,114	104,114	100,101,105, 107, 108,109,113	
2.F Indian Creek Dispersed Recreation Area	103,104,114	100,101,105, 107, 108,113	100,101,105,107, 108,109,113	
3.A Pine Woodland	103,104,114	104,114	100,101,105,107, 108,109,113	
3.B Oak Woodland	103,104,114	104,114	100,101,105,107, 108,109,113	
3.C Mixed Forest	103,104,114	100,101,105, 107, 108,113	100,101,105,107, 108,109,113	
3.D Oak Decline Restoration Areas	103,104,114	108	108,109	
3.E High Quality Forest Products	103,104,114	109	109	
3.F Old Growth Area	103,104,114	102	100,102,108,109	
3.G Crowley’s Ridge Upland Hardwood, St. Francis NF				111
3.H Mississippi River Bottomland Hardwood, St. Francis NF				112
3.I Riparian Corridors				106
3.K Wildlife Emphasis Area	103,104,114	100,101,104, 105,107,113, 114	100,101,105,107, 108,109,113	

***Silviculture Rx #110 should be the only Rx used in primary and secondary Indiana Bat Zones regardless of site index values.**

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Table F-2. Silviculture Prescription Descriptions

Rx#	Accomplishes MA Emphasis	Type of System	TSI Treatment	Thinning Residual BA	Harvest Rotations	Regen. Residual BA/TPA
100	*	Even-Aged	@ 20 yrs to 300 TPA	70 BA	@ 90-110 yrs	20 BA
101	*	Uneven-Aged	n/a	n/a	harvest 1/6 of stand every 20 yrs	n/a
102	3.F	Even-Aged	@ 20 yrs to 300 TPA	70 BA	@ 130-200 yrs	20 BA
103	3.B	Even-Aged	@ 10 yrs to 300 TPA	20 BA	@ 180-200 yrs	20 BA
104	3.B	Even-Aged	@ 10 yrs to 300 TPA	40 BA	@ 140-160 yrs	20 BA
105	*	Uneven-Aged	n/a	n/a	harvest every 10 yrs to 60 BA	n/a
106	3.I	Two-Aged	@ 10 yrs to 300 TPA	60-80 BA	@ 120-140 yrs	20 BA
107	3.C	Even-Aged	@ 20 yrs to 300 TPA	70 BA	@ 80-110 yrs	12 TPA
108	3.D	Even-Aged	@ 20 yrs to 300 TPA	70-80 BA	@ 90-110 yrs	20 BA
109	3.E	Even-Aged	@ 15 yrs to 300 TPA	80 BA	@ 90-110 yrs	20 BA
110	*	Even-Aged	@ 10 yrs to 300 TPA	Follow FW Standards	@ 140-160 yrs	Follow FW Standards
111	3.G	Even-Aged	@ 20 yrs to 300 TPA	70 BA	@ 80-120 yrs	20 BA
112	3.H	Even-Aged	@ 20 yrs to 300 TPA	70 BA	@ 80-120 yrs	20 BA
113	3.C	Even-Aged	@ 20 yrs to 300 TPA	60 BA	@ 90-110 yrs	20 BA
114	3.A	Even-Aged	@ 20 yrs to 300 TPA	50 BA	@ 120-150 yrs	20 BA
115	*	Even-Aged	@ 10 yrs to 300 TPA	70 BA	@ 70-90 yrs	0 BA

***These prescriptions meet multiple management areas' goals and objectives.**

Silviculture Prescription Descriptions

The following prescriptions reflect the silvicultural harvests and follow-up treatments that best met the intent of the management areas desired future conditions. In most cases, the names used are not the names of recognized SAF silvicultural systems but reflect a series of activities used to produce desired conditions.

100 - Shelterwood - The purpose of this prescription is to maintain and regenerate pine or hardwood forest types by the shelterwood silvicultural system. Typically, these stands will be commercially thinned to maintain 70 sq ft of basal area and be regenerated at 90 to 110 years of age. In the first phase of the shelterwood, remove 70 percent of the overstory. Site preparation can include manual, chemical, fire and planting to establish the new stand. Chemical or manual release will often be necessary. In the second phase of the shelterwood, remove the remaining overstory. Execute prescribed burning every 3 to 5 yrs. throughout the rotation. Between the first and second stage of the shelterwood, adequate regeneration should be present to re-stock the stand with 300+ trees/acre. If natural regeneration is not adequate, planting may be necessary. Delay burning in the regenerated stand for 10 years to give regeneration time to become established. TSI the regenerated stand at 10 yrs. Harvest to 300 trees per acre (TPA) and commercial thin at regular intervals to maintain forest health and promote free to grow conditions.

101 - Group Selection - The purpose of this prescription is to create an uneven-aged stand by creating openings throughout the canopy. This is to be done by creating block patches on 1/6th of the stand every 20 years. Opening sizes will vary between three to five acres, scattered across the landscape. Thin between the groups to 60 sq ft of basal area to encourage oak reproduction. Openings are likely to need herbicide site preparation and planting of 80 to 100 oak seedlings per acre. A follow-up release treatment of herbicide will be necessary 1 to 3 years following harvest.

102 - Old Growth - The purpose of this prescription is to create old growth conditions. Thin existing stands to maintain approximately 70 sq ft of basal area per acre. Favor long lived trees such as white oak and shortleaf pine. The final harvest of shelterwood will occur between 130 and 200 years of age. In the first phase of the shelterwood, remove 70 percent of the overstory. In the second phase, 10 years later, remove the remaining overstory. Execute prescribed burning every three to five years throughout the life of the stand to control understory vegetation and maintain an herbaceous component. A pool of advanced oak regeneration should be in place by the time the overstory is removed. Delay burning in the regenerated stand for 10 years to give the oaks time to become established and then begin a fire regime with a 3- to 5-year return interval.

103 - Oak Savanna - The purpose of this prescription is to create an oak savanna condition on low sites with a crown closure of 20 to 39 percent. The target basal area per acre to be maintained is 20 sq ft throughout the rotation of the stand. This prescription uses pre-commercial thins, commercial thins, non-commercial thins, fire, or herbicide to achieve its desired condition. The final harvest of shelterwood will occur between 180 to 200 years of age. In the first phase of the shelterwood, remove 70 percent of the overstory. In the second phase, 10 years later, remove the remaining overstory. Execute prescribed burning every three to five years throughout the life of the stand to control understory vegetation and maintain an herbaceous component. A pool of advanced oak regeneration should be in place by the time the overstory is removed. Delay burning in the regenerated stand for 10 years to give the oaks time to become established and then begin a fire regime with a 3- to

5-year return interval. TSI the regenerated stand at 10 years to 300 trees per acre and maintain 20 sq ft of BA when the stand reaches 40 years of age. Harvest the regenerated stand at 180 to 200 years.

104 - Oak Woodland – The oak woodland condition as defined by this plan consists of a hardwood forest with 40 to 60 percent crown closure in trees 40 years and older. The target basal area to be maintained throughout the rotation is 40 sq ft. This prescription uses pre-commercial thins, commercial thins, non-commercial thins, fire, or herbicide to achieve its goal. The final harvest of shelterwood will occur between 140 and 160 years of age. In the first phase of the shelterwood, remove 90 percent of the overstory. In the second phase, 10 years later, remove the remaining overstory. Execute prescribed burning every three to five years throughout the life of the stand to control understory vegetation and maintain an herbaceous component. A pool of advanced oak regeneration should be in place by the time the overstory is removed. Delay burning in the regenerated stand for 10 years to give the oaks time to become established and then begin a fire regime with a 3- to 5-year return interval. TSI the regenerated stand at 10 years to 300 trees per acre and maintain a basal area per acre of 40 sq ft when the stand reaches 40 years of age. Harvest the regenerated stand at 140 to 160 years.

105 - Single Tree Selection – The purpose of this prescription is to create an uneven-aged age class distribution by establishing three or more distinct age classes, each age class being separated by 20 years or more through a series of thinnings spaced 10 years apart. The goal of the prescription is to create an uneven-aged condition following an inverse “j” shaped curve (distribution of number of trees over dbh [diameter at breast height]). Thins occur every 10 years to 50 sq feet of BA. Regeneration is established in skid trails and disturbed areas and initial burns create favorable seedling establishment. However, repeat burns are not done due to damage to new seedlings. Planting and/or natural regeneration are viable options for regenerating the stand. Single tree selection requires herbicide use to be effective both during the site-prep phase and again to release new seedlings. Typically, single tree selection is only viable in shortleaf pine.

106 - Shelterwood with Reserves - The purpose of this prescription is to regenerate pine or hardwood by the shelterwood silvicultural system. However, this system differs from the typical shelterwood systems in that the overstory is not removed until the first commercial thin or is left in place indefinitely. This prescription is to be used in visually sensitive areas and along riparian corridors. Typically these stands will be commercially thinned 2 or more times and regenerated at 120 to 140 years of age. A series of commercial thins to 60 to 80 sq ft will be carried out throughout the rotation. In the first phase of the shelterwood, remove 70 percent of the overstory. Site preparation can include manual, chemical, fire, and planting to establish the new stand. Chemical or manual release will often be necessary. Execute prescribed burning every three to five years throughout the rotation. Between the first and second stages of the shelterwood, adequate regeneration should be present to restock the stand with 300+ trees/acre, planting may be necessary. Delay burning in the regenerated stand for 10 years to give regeneration time to become established. TSI the

regenerated stand at 10 years and commercial thin at regular intervals to maintain forest health and promote free to grow conditions.

107 Seed Tree - The purpose of this prescription is to regenerate pine by the seed tree silvicultural system. Regular thinnings designed to maintain 70 sq ft of basal area should be done throughout the rotation. Regenerate the stand at 80 to 110 years. In the first phase of the seed tree, remove 90 percent of the overstory. Site preparation can include manual, chemical, fire, and planting to establish the new stand. Chemical or manual release will often be necessary. In the second phase of the shelterwood, remove the remaining overstory. Execute prescribed burning every three to five years throughout the rotation. Between the first and second stages of the shelterwood, adequate regeneration should be present to re-stock the stand with 300+ trees/acre, planting may be necessary. Delay burning in the regenerated stand for 10 years to give regeneration time to become established. TSI the regenerated stand at 10 years and commercial thin at regular intervals to maintain forest health and promote free to grow conditions.

108 Oak Decline – The purpose of this prescription is to restore stands impacted by the red oak borer epidemic of 1999–2001 to their original stand composition of red oak/white oak/hickory. Many of the stands heavily impacted by the red oak borer have little overstory left and little, if any, advanced oak regeneration. This prescriptions' goal is to reduce stand density to shelterwood levels promoting long lived species such as white oak and leaving healthy red oak for acorn production. Site preparation techniques will encompass burning, chemical and manual felling of competing vegetation along with the planting of large red and white oak seedlings. In some areas, pine may also be planted. Once regeneration becomes established, discontinue burning for 10 years to encourage oak reproduction. TSI the regenerated stand at 10 years and thin the regenerated stands at regular intervals to maintain 70 to 80 sq ft of basal area per acre. Harvest the regenerated stand through a shelterwood cut at 90 to 110 years.

109 High Quality Forest – The purpose of this prescription is to maintain a higher basal area per acre forcing trees to self prune. This self pruning will result in higher quality logs yet still maintain a healthy forest. Maintain a basal area of 80 sq ft throughout the rotation. Harvest with a 2-stage shelterwood between 90 and 110 years In the first phase of the shelterwood, remove 70 percent of the overstory. In the second phase, remove the remaining overstory. Intensive silvicultural techniques such as chemical site preparation, mechanical site preparation, and planting of oak or pine seedlings may be necessary where there is no advanced regeneration in place. Chemical release may be necessary. Commercial thin the regenerated stand and maintain 80 sq ft of basal area.

110 Indiana Bat – The purpose of this prescription is to maintain or enhance the habitat for the Indiana Bats. Commercial thin on a regular basis to 30 sq ft of BA per acre and harvest at 140 to 160 yrs. with a 2-step shelterwood. In the first phase of the shelterwood, remove 70 percent of the overstory. In the second phase, remove the remaining overstory. Follow guidelines set forth in the FW standards for Indiana Bat management. Begin prescribed burning in these areas and repeat on a 3- to 5-year schedule. Following the shelterwood

harvest, adequate oak regeneration should be present to re-stock the stand with 300+ trees/acre. Delay burning in the regenerated stand for 10 years to give the oaks time to become established. Upon regeneration establishment, resume burning and commercial thinning.

111 Crowley's Ridge – The purpose of this prescription is to regenerate upland hardwood stands growing on Crowley's Ridge of the St Francis NF to oak and discourage the yellow poplar. Maintain a basal area of 70 sq feet through regular commercial thinnings discriminating against yellow poplar where feasible. Integrate with a fire regime that returns every 7 to 10 years. Harvest the stands at 80 to 120 years of age with a 2-stage shelterwood. In the first phase of the shelterwood, remove 70 percent of the overstory. In the second phase, remove the remaining overstory. Once regeneration becomes established, discontinue burning for 10 years to encourage oak reproduction. After 10 years, begin prescribed burning in these areas and repeat on a 7- to 10- year schedule. Intensive silvicultural techniques such as herbicide use and planting of oak seedlings may be necessary to establish the stands where there is no advanced regeneration in place. Chemical release may be necessary.

112 Bottomland Hardwoods – The purpose of this prescription is to maintain and regenerate bottomland stands of oak, hickory, pecan, sycamore, willow oak, bald cypress, and other associated species. These areas need to be carefully thinned to avoid raising the water table and thus inundating new seedlings and perhaps killing the overstory trees. Commercial thins should be designed to maintain 70 sq feet or higher basal area. Final regeneration will occur with a 2-stage shelterwood between yrs. 80 and 120 years. In the first phase of the shelterwood, remove 70 percent of the overstory. In the second phase, remove the remaining overstory. Fire is not a silvicultural technique in these areas. Intensive silvicultural techniques such as herbicide use and planting of oak seedlings may be necessary where there is no advanced regeneration in place. Chemical release may be necessary.

113 Mixed Forest –The purpose of this prescription is to provide for a stand condition that is a transition between woodland and high quality and best meets Management Area 3.C. desired future conditions Typically, these stands will be commercially thinned 2 or more times and regenerated at 90 to 110 years of age. Regular thinnings designed to maintain 70 sq ft of basal area should be done. In the first phase of the shelterwood, remove 70 percent of the overstory. Site preparation can include manual, chemical, fire, and planting to establish the new stand. Chemical or manual release will often be necessary. In the second phase of the shelterwood, remove the remaining overstory. Execute prescribed burning every 3-5 years throughout the rotation. Between the first and second stage of the shelterwood, adequate regeneration should be present to re-stock the stand with 300+ trees/acre, planting may be necessary. Delay burning in the regenerated stand for 10 years to give regeneration time to become established. TSI the regenerated stand at 10 years and commercial thin at regular intervals to maintain forest health and promote free to grow conditions.

114 Pine Bluestem – The purpose of this prescription is to create a woodland condition in shortleaf pine. Maintain 50 sq feet of basal area in pine throughout the rotation through a series of commercial thinnings. Execute prescribed burn every three to five years to control the understory vegetation and create an herbaceous component. Harvest the stands with a 2-stage shelterwood between 120 and 150 years. In the first stage of the shelterwood, harvest 70 percent of the basal area. Once natural regeneration is established, remove the overstory. Delay burning for 10 years following regeneration establishment. TSI the regenerated stand at 10 years to 300 trees per acre and then maintain stocking at 50 sq ft of basal area through regular commercial thins.

115 Clearcut - Maintain a minimal basal area of approximately 70 sq ft per acre throughout the rotation through regular commercial thinnings. Harvest when stands are between 70 and 90 years of age. Conduct site preparation with chemical, fire, or mechanical means. Plant or obtain natural regeneration. Timber Stand Improvement (TSI) the regenerated stand at age 10 to 300 TPA and then begin commercial thinning, when practical, to maintain an average of 70 sq ft of BA. The introduction of fire should begin at age 10 with a return interval of three to five years. This prescription should be used under FW standard FW74 guidance and only on a limited basis.