TIMBER ANALYSES
Suitability, Sale Program, & Silvicultural Systems

APPENDIX D

INTRODUCTION

This appendix describes the analysis of lands suitable and not suitable for timber production, the Allowable Sale Quantity (ASQ), Total Timber Sale Program, and describes conditions where different silvicultural systems could be used.

TIMBER SUITABILITY ANALYSIS

During forest land and resource management planning, the Forest Service is required to identify lands unsuited for timber production (16 USC 1604(k); 36 CFR 219.14). This identification process involves three stages of analysis. Stage I analysis identifies lands tentatively suitable for timber production. Stage II analysis is designed to explore the financial aspect of varying intensities of timber management on lands identified as tentatively suitable for timber production from Stage I. Stage III analysis identifies lands as unsuited for timber production under the alternative selected in the revised Forest Land and Resource Management Plan.

STAGE I: PHYSICAL SUITABILITY

The first stage of the timber suitability analysis addresses the administrative and physical suitability of the land to be managed for the production of timber. The analysis involves these categories:

- Lands that do not meet the definition of forest land.
- Lands that have been administratively or congressionally withdrawn from timber production by an act of Congress, the secretary of agriculture, or the chief of the Forest Service.
- Forest lands incapable of producing industrial wood.

Table D-1. Stage I-Acres Tentatively Suitable for Timber Production

Classification	Acres
Total National Forest Land	723,300
Non-forest Land (includes water)	(12,000)
Forest Land	711,300
Forest Land-withdrawn for existing, designated wilderness	(57,800)
Forest Land-incapable of producing industrial wood	(3,400)
Forest Land-irreversible damage likely to occur; not restockable	(4,300)
Forest Land-inadequate information	(200)
Tentatively Suitable Forest Lands	645,600

TIMBER SUITABILITY ANALYSIS

STAGE II: FINANCIAL ANALYSIS

STAGE III: IDENTIFICATION OF SUITABLE ACRES

TIMBER SALE PROGRAM

- Lands where technology is not available to ensure timber production from the land without irreversible soil and water resource damage.
- Lands where there is no reasonable assurance that they can be adequately restocked.
- Lands where there is inadequate information, primarily due to recent acquisition.

Table D-1 displays the determination of those lands on the Jefferson National Forest tentatively suitable for timber production.

STAGE II: FINANCIAL ANALYSIS

The second stage analysis is designed to explore the financial efficiency of different timber intensities on the lands identified as tentatively suitable for timber production in Stage I. It does not identify any lands as unsuitable for timber production. Stage III analysis considers the results of these financial efficiencies in making the final determination of lands suited for timber production.

STAGE III: IDENTIFICATION OF SUITABLE ACRES

The third stage analysis is accomplished during the formulation of alternatives. Several criteria were used during this stage to identify lands in this category:

- Based upon consideration of multiple-use objectives for the alternative, the land is proposed for resource uses that preclude timber production. However, in some management prescriptions that are classified as unsuitable for timber production, timber harvest may occur to meet the desired condition of other resources.
- Other management objectives for the alternative limit timber production activities to the point where management requirements set forth in 36 CFR 219.27 cannot be met.
- The lands are not cost-efficient, over the planning horizon, in meeting forest objectives, which includes timber production.

Table D-2 on the facing page shows the results of the Stage III analysis.

TIMBER SALE PROGRAM

The Allowable Sale Quantity (ASQ) is defined as the maximum amount of timber that may be sold on lands suitable for timber production during a decade of implementing the Forest Plan (FSH 2409.13). The ASQ plus volume produced on lands unsuitable for timber production through achievement of desired conditions or salvage operations comprise the total Timber Sale Program. Table D-3 displays a breakdown of the ASQ and Total Timber Sale Program for the first decade of the Revised Plan. The ASQ is a decadal ceiling, there are no constraints on the amount of volume that can be sold annually on the Forest.

Table D-3. ASQ and Total Timber Sale Program for the First Decade

Total Allowable Sale Quantity	38.5 MMCF
Total Non-Scheduled Volume	1.2 MMCF
Total Timber Sale Program	39.7 MMCF

Table D-2. Stage III-Land Classified as Suitable for Timber Production

Classification		Acres
Tentatively Suitable Forest Land – from Stage 1 Analysis		645,600
Land Withdrawn for Other Resource Purposes as Unsuitable for Timber Harvest:	Custodial Management (0B)	(3,500)
	Recommended Wilderness Study Areas (1B)	(25,200)
	Eligible Wild, Scenic and Recreational River (2C's)	(5,300)
	Appalachian National Scenic Trail Corridor (4A)	(30,700)
	Geologic and Paleontogical Areas (4C1)	(1,500)
	Botanical and Zoological Areas (4D)	(4,700)
	Cultural and Heritage Areas (4E1a)	(200)
	Scenic Areas (4F)	(1,000)
	Special Areas – Hoop Hole, Mount Rogers Crest Zone, Whitetop Mountain, Whitetop Laurel Creek, North Fork of Pound and portions of North Creek (4K's)	(25,900)
	Special Use Areas (5A, 5B, 5C)	(4,100)
	Old Growth Areas (6A, 6B, 6C)	(31,300)
	Scenic Byway Corridors (7A)	(1,800)
	Concentrated Recreation Zones (7D)	(6,000)
	Dispersed Recreation Areas (7E1)	(19,600)
	Pastoral Landscapes (7G)	(3,700)
	Peaks of Otter Salamander Primary Habitat Conservation Area (8E2a)	(2,400)
	Indiana Bat Primary Cave Protection Areas (8E4a)	(900)
	Reference Watersheds (9A2)	(<100)
	Aquatic Habitat Areas (9A4)	(6,500)
	Rare Communities (9F)	(7,400)
	Maintenance and Restoration of Upland and Bottomland Hardwoods (9G1)	(100)
	Remote Backcountry Areas (12A, 12B, 12C)	(110,800)
	Semi-Primitive Lands within Suitable Prescriptions	(4,300)
	Riparian Habitat within Suitable Prescriptions	(39,300)
Economically inefficient lands[1]		(50,500)
Total Suitable Land		**258,900**

[1] Economically inefficient lands include all Site Index 40 lands and those Site Index 50 lands that are steep (defined by land classes 540 and 800-899), with the exception of those having a forest type of 48, 56, 53, and 81 (northern red oak-hickory-yellow pine, chestnut oak, white oak-northern red oak-hickory, and sugar maple-beech-yellow birch).

VEGETATION MANAGEMENT PRACTICES

SILVICULTURAL SYSTEMS

VEGETATION MANAGEMENT PRACTICES

This section evaluates the usefulness of various vegetation management practices, with a major focus on silvicultural systems used to manage vegetation in management areas suitable for timber production. This appendix recommends practices that meet NFMA regulations for manipulating vegetation to regenerate stands to desirable native species, usually of the pre-harvest forest type. This Appendix was prepared for compliance with 36 CFR 219.

SILVICULTURAL SYSTEMS

There are three silvicultural systems used to provide regulated and sustainable yield of wood products for local wood processing facilities on the Jefferson National Forest.

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% 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 aged classes are present and maintained. When the 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), but may also be expressed as 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 prescription objectives. Regeneration, designed to replace desirable tree species, takes place within 5 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% 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 forest land, all aged 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 5 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 in three or more 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. This time frame is used to determine a cutting cycle for producing periodic yields of desired wood products. Additionally, the periodic inventory provides 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 continuous

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.

BASIS FOR ALLOCATION OF SILVICULTURAL SYSTEMS

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

During the period from about 1880 through 1930, much of the lands now managed as the Jefferson National Forest were logged and sometimes burned or badly eroded. Some of the Forest was created from abandoned farmland. Today, these lands have healed and been rejuvenated as a result of Federal investment in tree planting, fire suppression, timber stand improvement, and time. The resultant growth of predominately upland oak, cove hardwood, white pine-hemlock, 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 and its Federal Regulations require the identifying of forest lands to be used for producing sustainable yields of wood products, thus the need to identify (1) which lands and (2) which silvicultural systems 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 predominately 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 levels, 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 Plan operates under the principle of management areas and management prescriptions, where portions of the Forest have similar environmental conditions, management emphasis and/or specific multiple resource objectives. Therefore, uneven-aged, two-aged and even-aged silvicultural system's practices will not be applied individually to intersperse the silvicultural systems, but rather to portions of Management Prescriptions where they simultaneously contribute to accomplishing other renewable resource objectives and are appropriate for the desirable tree species to be regenerated or tended.

The initial uneven-aged silvicultural system screening criteria included areas of tentatively suitable forest land that had:

- at least a stand of 100 acres to provide a sufficient total volume harvested in any single entry to allow for an economically viable sale
- slopes from 0% to 30% to minimize the potential damage to the soil and water resource due to the greater number of temporary roads, skid roads, and skid trails required to implement uneven-aged management, as well as to facilitate the economic viability of the timber sale; and
- existing system roads in place for the same reasons identified above.

Uneven-aged regeneration methods are also allowed on lands that do not meet the above criteria when site-specific project objectives include canopy gap creation, scenic enhancement, or restoration/enhancement of old growth forest conditions. Note that frequent entries to maintain an uneven-aged condition in these situations may not be practical due to physical and/or economic limitations.

VEGETATION MANAGEMENT PRACTICES

BASIS FOR ALLOCATION OF SILVICULTURAL SYSTEMS

Management Prescriptions that met the criteria established for using the uneven-aged silvicultural system as discussed above include portions of Management Prescriptions 4, 6, 7, 8, 9, and 11 (refer to the Standards pertaining to each Management Prescription to identify the specific areas). The uneven-aged silvicultural system may be used to achieve the desired future conditions in these Management Prescriptions. Other Management Prescriptions were considered, but not selected, because the uneven-aged silvicultural system would not or was less effective in achieving the desired condition.

For management areas that specify using uneven-aged silvicultural system for a given vegetation community, frequent entries are planned into the same area, usually 5-20 year cutting cycles (cutting cycle lengths are a function site productivity for the desired species). Since, on a given harvest entry, only a small portion of a stand's tree density is harvested, the cutting cycles generally result in lower per acre volumes and possible lower total volume, thus reducing the total stumpage value for the harvested products (timber sale revenues are returned to the U.S. Treasury). Rubber-tired skidders are the predominant equipment used on the NFS lands and are capable of skidding the longer distances necessary with the lower marked volume and value removed per acre as compared to even-aged and two-aged silvicultural systems. The repeated exposure of mineral soil every 5 to 20 years as the skid trails are reused is a concern. However, with limiting uneven-aged silvicultural systems to terrain under 20%, a more dispersed skidding pattern can be prescribed, avoiding much of the exposure of mineral soil than would occur on steeper terrain over 20% slope. The visual impact of the bladed skid trails on the ground would be less on the gentler slopes.

In a given entry, the uneven-aged silvicultural system removes a small number of stand's total trees. On slopes over 20%, the maneuverability of a rubber-tired skidder is reduced. This reduced maneuverability—where unmarked trees are to be left undamaged—greatly increases the physical damage to those trees. On gentle slopes, equipment mobility is less restricted, thus less damage occurs to residual trees. Additionally, the less damage means less agents that cause rot being introduced through bole damage, resulting in reduced future yields and value from the stand.

The uneven-aged silvicultural system requires road access over a larger area than even-aged management to harvest an equal volume during each entry. These roads have to be constructed (where existing access is lacking) at the first entry and then reopened during each subsequent entry at a 5 to 20 year cutting cycle. Selecting areas where most of the roads are already in place reduces the need for new roads. In most cases where access exists, only dispersed skid trails and some landings are needed.

The final criterion was to provide an efficient means of regulating a sustained yield of forest products from areas where uneven-aged silvicultural system would be applied. This meant determining where land meeting the other criteria could be consolidated into large, contiguous areas. Even with the 100-acre minimum size constraint, the analysis revealed a large number of interspersed potential areas throughout the Forest. When the smaller scattered parcels were eliminated, the remaining lands could be allocated to several large, contiguous areas of the Forest, thereby providing for the application of cost effective uneven-aged silvicultural system.

On all other suitable land, where uneven-aged silvicultural system criteria are not applicable, two-aged and even-aged silvicultural system become the viable silvicultural systems.

REGENERATION METHODS AND STAND IMPROVEMENT PRACTICES

Regeneration methods are the practice by which forest stands of desirable species are established at an adequate stocking level so that they may be sustained for a specific purpose(s), be it the production of wood products, the production of specific habitat for viable wildlife populations, or a combination of both. Depending on the management area emphasis and desired condition, the selected silvicultural system and regeneration method will result in a uneven-aged stand (used to achieve uneven-aged forest conditions), a two-aged stand (used to achieve 2 distinct age classes), or an even-aged stand (used to achieve even-aged forest conditions). Silvicultural systems are a means of manipulating vegetation to help achieve a Management Prescription's desired condition.

Table D-4. Silvicultural Regeneration Methods within Each of Three Silvicultural Systems

EVEN-AGED stands	TWO-AGED stands	UNEVEN-AGED stands
Regeneration Method:	**Regeneration Method:**	**Regeneration Method:**
1. clearcutting	1. clearcutting with reserves	1. group selection
2. seed tree	2. coppice with reserves	2. single tree selection
3. shelterwood	3. seed tree with reserves	
	4. shelterwood with reserves	
Stand Improvement practices:	**Stand Improvement practices:**	**Stand Improvement practices:**
1. thinning	1. thinning	1. thinning
2. release & weeding	2. release & weeding	2. release & weeding
3. prescribed burning	3. prescribed burning	3. prescribed burning
4. improvement cutting	4. improvement cutting	4. improvement cutting
5. salvage cutting	5. salvage cutting	5. salvage cutting
6. sanitation cutting	6. sanitation cutting	6. sanitation cutting

The Information contained in the following two references provides the scientific explanation for applying silvicultural systems for vegetation manipulation of the forest types on the Jefferson National Forest.

*The Scientific Basis for Silvicultural and Management Decisions in the National Forest System***. Russell M. Bums, General Technical Report WO-55, September 1989.**

- Silviculture of Northeastern Hardwoods, The Pine Group, pg 21-22, the White Pine forest cover type and the Eastern Hemlock forest cover type
- Silviculture of Southern Pines, Oak-Pine types, pg 34-35
- Silviculture of Eastern Hardwoods, pg 9-17

*Silvicultural Systems for the Major Forest Types of the United States***. Russell M. Burns, Agriculture Handbook #445-19M.**

- Oak-Hickory, pg 116-120 and pg 141-144 (Appalachian Mixed Hardwood)
- Northern Hardwoods, pg 121-127
- Pitch Pine, pg 135-136
- Virginia Pine, pg 167-169
- Eastern White Pine including Eastern Hemlock, pg 131-134
- Oak-Pine, pg 172-174
- Yellow Poplar, pg 180-182

The specific portions of the above listed publications are included by reference and should be read in conjunction with this appendix to provide comprehensive analysis of vegetation practices applicable to appropriate management areas that allow vegetative manipulation.

Table D-5. Relationship of Community Type and Major Forest Community Type as analyzed in the Revised Jefferson National Forest Land and Resource Management Plan and associated Environmental Impact Statement and Eastern Forest Cover Type as presented in the Silvicultural Systems for the Major Forest Types of the United States

Forest Community Type [1]	Major Forest Communities [2]	Eastern Forest Cover Type [3]	Forest Types from the Continuous Inventory of Stand Conditions (CISC) database
Northern Hardwood Forest	Mesic Deciduous	Northern Hardwoods	Sugar maple-Beech-Yellow birch (CISC 81)
Conifer-Northern Hardwood Forest	Eastern Hemlock and White Pine	Eastern White Pine including Eastern Hemlock	White pine (CISC 3) White pine-Hemlock (CISC 4) Hemlock (CISC 5) Hemlock-Hardwood (CISC 8) White pine-Cove hardwood (CISC 9) White pine-Upland hardwoods (CISC 10)
Mixed Mesophytic Forest	Mesic Deciduous	Appalachian Mixed Hardwoods & Yellow Poplar	Cove hardwood-White pine-Hemlock (CISC 41) Yellow poplar (CISC 50) Yellow polar-White oak-Red oak (CISC 56) Black walnut (CISC 82)
River Floodplain and Eastern Riverfront Forest	Mesic Deciduous	Bottomland Hardwoods	Sweetgum-Yellow poplar (CISC 58) River birch-Sycamore (CISC 72) Cottonwood (CISC 73) Sugarberry-American elm-Green ash (CISC 63) Beech-Magnolia (CISC 69) Willow (CISC 74) Sycamore-Pecan-American elm (CISC 75)
Dry-Mesic Oak Forest	Oak and Oak Pine	Oak - Hickory	Post oak-Black oak (CISC 51) White oak-Red oak-Hickory (CISC 53) White oak (CISC 54) Northern red oak-Hickory (CISC 55)
Dry and Xeric Oak Forest; Woodland and Savanna	Oak and Oak Pine	Oak - Hickory	Chestnut oak (CISC 52) Scrub oaks (CISC 57) Scarlet oak (CISC 59) Chestnut oak-Scarlet oak (CISC 60)
Xeric Pine & Pine-oak Forest & Woodland	Pine and Pine Oak	Eastern Red Cedar & Pitch Pine & Longleaf Pine & Shortleaf Pine & Virginia Pine	Eastern redcedar-Hardwoods (CISC 11) Shortleaf pine-oaks (CISC 12) Pitch pine-oaks (CISC 15) Virginia pine-oaks (CISC 16) Table Mountain pine-Hardwoods (CISC 20) Longleaf pine (CISC 21) Virginia pine (CISC 33) Pitch pine (CISC 38) Table Mountain pine (CISC 39) Eastern red cedar (CISC 35) Black locust (CISC 88)
Dry and Dry-Mesic Oak-Pine Forest	Oak and Oak Pine	Oak - Pine	Upland hardwoods-Yellow pine (CISC 42) Oaks-Eastern red cedar (CISC 43) Southern red oak-Yellow pine (CISC 44) Chestnut oak-Scarlet oak-Yellow pine (CISC 45) Bottomland hardwoods-Yellow pine (CISC 46) White oak-Black oak-Yellow pine (CISC 47) Northern red oak-Hickory-Yellow pine (CISC 48)
Montane Spruce-fir Forest	High-Elevation Spruce Fir	Eastern Spruce - Fir	Fraser fir (CISC 6) Red spruce-Fraser fir (CISC 7) Red spruce-Northern hardwood (CISC 17)

[1] - per *Guidance for Conserving and Restoring Old Growth Forest Communitites on National Forests in the Southern Region*.
[2] - per *Chapter 3 of the Jefferson National Forest Land and Resource Management Plan Draft Environmental Impact Statement*.
[3] - per *Silvicultural Systems for the Major Forest Types of the United States*.

Table D-6 summarizes the range of feasible applications of silvicultural regeneration methods that can be used to manipulate vegetation on land suitable for timber production in the Forest Community Types on the Jefferson National Forest. Any of the following methods can be applied to manipulate vegetation when based on site specific project analysis and disclosure in an environmental analysis document.

Community Type	Even-aged Silvicultural System			Uneven-aged Silvicultural System	
	Clearcut	Seed Tree	Shelterwood	Group Selection	Single tree Selection
Northern Hardwood Forest	RC	NR	RC	RC	RC
Conifer-Northern Hardwood Forest (White Pine Forest Types)	RC	NR	R	P	P
Conifer-Northern Hardwood Forest (Eastern Hemlock Forest Types)	NR	NR	RC	P	R
Mixed Mesophytic Forest	R	NR	RC	P	NR
River Floodplain and Eastern Riverfront Forest	R	NR	RC	P	NR
Dry-Mesic Oak Forest	R	NR	RC	P	NR
Dry and Xeric Oak Forest; Woodland and Savanna	R	NR	RC	P	NR
Xeric Pine & Pine-oak Forest & Woodland	R	RC	NR	NR	NR
Dry and Dry-Mesic Oak-Pine Forest	RC	RC	RC	P	NR
Montane Spruce-fir Forest	NR	NR	RC	P	R

Community Type	Two-aged Silvicultural System			
	Clearcut w/ Reserves	Seed Tree w/ Reserves	Coppice w/ Reserves	Shelterwood w/ Reserves
Northern Hardwood Forest	R	NR	RC	RC
Conifer-Northern Hardwood Forest (White Pine Forest Types)	RC	NR	NR	R
Conifer-Northern Hardwood Forest (Eastern Hemlock Forest Types)	NR	NR	NR	RC
Mixed Mesophytic Forest	R	NR	R	RC
River Floodplain and Eastern Riverfront Forest	R	NR	R	RC
Dry-Mesic Oak Forest	R	NR	R	RC
Dry and Xeric Oak Forest; Woodland and Savanna	R	NR	R	RC
Xeric Pine & Pine-oak Forest & Woodland	RC	RC	NR	NR
Dry and Dry-Mesic Oak-Pine Forest	RC	RC	RC	RC
Montane Spruce-fir Forest	NR	NR	NR	RC

Codes Used in Table D-6: Range of Regeneration Methods
- R = recommended
- RC = recommended with conditions
- P = possible
- NR = not recommended

RECOMMENDED (R) means that the silvicultural regeneration method has been reliable in creating conditions favorable for establishing regeneration of the desired species and to maintain growth of the desirable species using natural regeneration site preparation treatments.

RECOMMENDED WITH CONDITIONS (RC) means that for the silvicultural regeneration method to be reliable, some specific condition must either exist prior to cutting, some limits will apply to the regenerated species, or some special treatment is needed after cutting to obtain and maintain desirable species.

VEGETATION MANAGEMENT PRACTICES

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POSSIBLE (P) means the silvicultural practice is not reliable in creating conditions favorable for regenerating the desired species, unless significant alteration of the species composition, growth or sustainability is acceptable. For example, using single tree selection in the Oak-Hickory type will not perpetuate oaks or other intolerant species in the same proportion as currently exists in the even-aged forest stands of the Forest.

If the loss of oaks and the shift to a forest of more shade tolerant species is compatible with the Desired Future Condition of any management area, then single tree selection is a possible silvicultural practice.

NOT RECOMMENDED (NR) means the silvicultural system is not reliable in creating conditions favorable for establishing desired regeneration and to maintain growth of the desirable species using standard or special treatments.

Justification For Codes Selected In Silvicultural Practices Table

The following summarizes the information presented in the two cited references.

- For NR- not recommended, the reason for not recommending the method of cut.
- For RC- recommended with conditions, the specific condition necessary that allows the method of cut to be recommended.
- For P- possible, the likely alteration in species composition, growth or sustainability if the method of cut is applied.

Tables D-7 through D-14 display the justification for the range of silvicultural regeneration methods disclosed in Table D-6.

Table D-7. Even Aged Silvicultural System Justification for Not Recommended (NR)

Community Type	Regeneration Method	Reason For Not Recommending
Northern Hardwood Forest	Seed Tree	Natural seeding ability produces sufficient seedlings for adequate advance reproduction; density of seed trees is not sufficient to affect proportion of tolerant/intolerant species. Risk of windthrow of residual stems.
Conifer-Northern Hardwood Forest (White Pine Forest Types)	Seed Tree	Good seed crops only occur infrequently on a 3-10 year cycle; remaining trees subject to windthrow.
Conifer-Northern Hardwood Forest	Clearcut	Too much sunlight and dry conditions for seedling development;
	Seed Tree	Density of seed trees is not sufficient to affect proportion of tolerant/intolerant species. Risk of windthrow of residual stems.
Mixed Mesophytic Forest	Seed Tree	Plentiful seed Is present on the site or will be blown in from adjacent stands. Risk of windthrow.
River Floodplain and Eastern Riverfront Forest	Seed Tree	Plentiful seed Is present on the site or will be blown in from adjacent stands. Risk of windthrow.
Dry-Mesic Oak Forest	Seed Tree	Heavy seed is poorly distributed and slow growing seedlings are not able to compete with other vegetation; light seeded species have abundant seed on the site or available nearby.
Dry and Xeric Oak Forest; Woodland and Savanna	Seed Tree	Heavy seed is poorly distributed and slow growing seedlings are not able to compete with other vegetation; light seeded species have abundant seed on the site or available nearby.
Xeric Pine & Pine-oak Forest & Woodland	Shelterwood	Does not provide sufficient sunlight to reach forest floor for seed germination and seedling development.
Montane Spruce-fir Forest	Seed Tree	Too much sunlight and dry conditions for seedling development. Risk of windthrow.
	Clearcut	Too much sunlight and dry conditions for seedling development.

Table D-8. Even Aged Silvicultural System Justification for Recommended with Conditions (RC)

Community Type	Regeneration Method	Conditions for Recommendation
Northern Hardwood Forest	Clearcut	Size of harvest unit will control proportion of tolerant and intolerant species that regenerate; pre-commercial treatments are needed to achieve the desired species composition.
	Shelterwood	Adequate advanced regeneration is not established.
Conifer-Northern Hardwood Forest (White Pine Forest Types)	Clearcut	Sufficient white pine advanced reproduction exists in the understory.
Conifer-Northern Hardwood Forest (Eastern Hemlock Forest Types)	Shelterwood	Have old stands and/or drier site, lacking sufficient hemlock advanced reproduction; two or three cuts may be required.
Mixed Mesophytic Forest	Shelterwood	Will remove overstory within five years to prevent severe reduction in height and diameter growth.
River Floodplain and Eastern Riverfront Forest	Shelterwood	Will remove overstory within five years to prevent severe reduction in height and diameter growth.
Dry-Mesic Oak Forest	Shelterwood	Adequate advanced regeneration is not established.
Dry and Xeric Oak Forest; Woodland and Savanna	Shelterwood	Adequate advanced regeneration is not established.
Xeric Pine & Pine-oak Forest & Woodland	Seed Tree	When non-serotinous cones are present.
Dry and Dry-Mesic Oak-Pine Forest	Clearcut	Have to use intensive control of hardwood competition after harvest to maintain a pine component.
	Seed Tree	Have to use intensive control of hardwood competition after harvest to maintain a pine component.
	Shelterwood	Have to use intensive control of hardwood competition after harvest to maintain a pine component.
Montane Spruce-fir Forest	Shelterwood	Adequate advanced regeneration is not established.

Table D-9. Two-Aged Silvicultural System Justification for Not Recommended (NR)

Community Type	Regeneration Method	Reason For Not Recommending
Northern Hardwood Forest	Seed Tree w/ Reserves	Natural seeding ability produces sufficient seedlings for adequate advance reproduction; density of reserve trees is not sufficient to affect proportion of tolerant / intolerant species. Risk of windthrow of residual stems.
Conifer-Northern Hardwood Forest (White Pine Forest Types)	Seed Tree w/ Reserves	Good seed crops only occur infrequently on a 3-10 year cycle; reserve trees subject to windfall.
	Coppice w/ Reserves	Pines rarely if ever stump-sprout.
Conifer-Northern Hardwood Forest (Eastern Hemlock Forest Types)	Clearcut w/ Reserves	Too much sunlight and dry conditions for seedling development; reserve trees do not provide enough shade.
	Seed Tree w/ Reserves	Too much sunlight and dry conditions for seedling development; reserve trees do not provide enough shade.
	Coppice w/ Reserves	Too much sunlight and dry conditions for seedling development; reserve trees do not provide enough shade. Conifers rarely, if ever, sprout.
Mixed Mesophytic Forest	Seed Tree w/ Reserves	Plentiful seed Is present on the site or will be blown in from adjacent stands. Risk of windthrow.
River Floodplain and Eastern Riverfront Forest	Seed Tree w/ Reserves	Plentiful seed Is present on the site or will be blown in from adjacent stands. Risk of windthrow.
Dry-Mesic Oak Forest	Seed Tree w/ Reserves	Heavy seed is poorly distributed and slow growing seedlings are not able to compete with other vegetation; light seeded species have abundant seed on the site or available nearby.
Dry and Xeric Oak Forest; Woodland and Savanna	Seed Tree w/ Reserves	Heavy seed is poorly distributed and slow growing seedlings are not able to compete with other vegetation; light seeded species have abundant seed on the site or available nearby.
Xeric Pine & Pine-oak Forest & Woodland	Shelterwood w/ Reserves	Does not provide sufficient sunlight to reach forest floor for seed germination, seedling development, and sapling growth.
	Coppice w/ Reserves	Pines rarely if ever stump-sprout.
Montane Spruce-fir Forest	Seed Tree w/ Reserves	Too much sunlight and dry conditions for seedling development. Risk of windthrow.
	Coppice w/ Reserves	Conifers rarely if ever stump-sprout.
	Clearcut w/ Reserves	Too much sunlight and dry conditions for seedling development.

Table D-10. Two-Aged Silvicultural System Justification for Recommended with Conditions (RC)

Community Type	Regeneration Method	Conditions for Recommendation
Northern Hardwood Forest	Coppice w/ Reserves	Size of harvest unit will control proportion of tolerant and intolerant species that regenerate; pre-commercial treatments are needed to achieve the desired species composition.
	Shelterwood w/ Reserves	Adequate advanced reproduction is lacking.
Conifer-Northern Hardwood Forest (White Pine Forest Types)	Clearcut w/ Reserves	Adequate advanced reproduction is present.
Conifer-Northern Hardwood Forest (Eastern Hemlock Forest Types)	Shelterwood w/ Reserves	Have old stands and/or drier site, lacking sufficient hemlock advanced reproduction; two or three cuts may be required.
Mixed Mesophytic Forest	Shelterwood w/ Reserves	Will remove overstory within five years to prevent severe reduction in height and diameter growth.
River Floodplain and Eastern Riverfront Forest	Shelterwood w/ Reserves	Will remove overstory within five years to prevent severe reduction in height and diameter growth.
Dry-Mesic Oak Forest	Shelterwood w/ Reserves	Adequate advanced reproduction is present.
Dry and Xeric Oak Forest; Woodland and Savanna	Shelterwood w/ Reserves	Adequate advanced reproduction is present.
Xeric Pine & Pine-oak Forest & Woodland	Clearcut w/ Reserves	When non-serotinous cones are present.
	Seed Tree w/ Reserves	When non-serotinous cones are present.
Dry and Dry-Mesic Oak-Pine Forest	Clearcut w/ Reserves	Have to use intensive control of hardwood competition after harvest to maintain a pine component
	Seed Tree w/ Reserves	Have to use intensive control of hardwood competition after harvest to maintain a pine component
	Coppice w/ Reserves	Have to use intensive control of hardwood competition after harvest to maintain a pine component
	Shelterwood w/ Reserves	Have to use intensive control of hardwood competition after harvest to maintain a pine component
Montane Spruce-fir Forest	Shelterwood w/ Reserves	Adequate advanced regeneration is not established.

Table D-11. Uneven-Aged Silvicultural System Justification for Not Recommended (NR)

Community Type	Regeneration Method	Reason For Not Recommending
Mixed Mesophytic Forest	Single Tree Selection	Shade intolerant species will not develop satisfactorily under fully stocked stand.
River Floodplain and Eastern Riverfront Forest	Single Tree Selection	Shade intolerant species will not develop satisfactorily under fully stocked stand.
Dry-Mesic Oak Forest	Single Tree Selection	Shade intolerant species will not develop satisfactorily under fully stocked stand.
Dry and Xeric Oak Forest; Woodland and Savanna	Single Tree Selection	Shade intolerant species will not develop satisfactorily under fully stocked stand.
Xeric Pine & Pine-oak Forest & Woodland	Group Selection	Shade intolerant species will not develop satisfactorily, even small openings create too much shade.
	Single Tree Selection	Shade intolerant species will not develop satisfactorily under fully stocked stand.
Dry and Dry-Mesic Oak-Pine Forest	Single Tree Selection	Shade intolerant species will not develop satisfactorily under fully stocked stand.

Table D-12. Uneven-Aged Silvicultural System Justification for Recommended with Conditions (RC)

Community Type	Regeneration Method	Conditions for Recommendation
Northern Hardwood Forest	Group Selection	Desirable species are less shade tolerant species and larger openings are required.
	Single Tree Selection	Desirable species are shade tolerant species.

Table D-13. Uneven-Aged Silvicultural System Justification for Possible (P)

Community Type	Regeneration Method	Conditions for Recommendation
Conifer-Northern Hardwood Forest (White Pine Forest Types)	Group Selection	Species composition will shift to more moderate shade tolerant species.
	Single Tree Selection	Species composition will shift to exclusively shade tolerant species.
Conifer-Northern Hardwood Forest (Eastern Hemlock Forest Types)	Group Selection	Species composition will shift to more moderate shade tolerant species, hemlock would be outcompeted.
Mixed Mesophytic Forest	Group Selection	Species composition will shift to more shade tolerant species, yellow poplar would be lost.
River Floodplain and Eastern Riverfront Forest	Group Selection	Species composition will shift to more shade tolerant species.
Dry-Mesic Oak Forest	Group Selection	Species composition will shift to more shade tolerant species, oak species would be reduced.
Dry and Xeric Oak Forest; Woodland and Savanna	Group Selection	Species composition will shift to more shade tolerant species, oak species would be reduced.
Dry and Dry-Mesic Oak-Pine Forest	Group Selection	Species composition will shift to more shade tolerant species, oak and yellow pine pine species would be reduced.
Montane Spruce-fir Forest	Group Selection	Species composition will shift to moderate shade tolerant species, spruce and fir may be outcompeted.