Clearcutting in the National Forests: Background and Overview

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ABSTRACT

Clearcutting is a controversial method of harvesting and regenerating stands of trees in which all trees are cleared from a site and a new even-aged stand is grown. It is a proven, efficient method of harvesting trees and establishing new stands, but is criticized for degrading soil and water quality, wildlife habitat, and aesthetics. Clearcutting is still the primary timber management method used in the national forests, although its use has declined over the past decade. Legislation to ban clear-cutting on federal lands has been introduced in the past few Congresses. This report provides background and an overview on clearcutting use and effects; it will probably not be updated.

Clearcutting in the National Forests: Background and Overview

Summary

Clearcutting is a method of harvesting and regenerating trees in which all trees are cleared from a site and a new, even-aged stand of trees is grown. Clearcutting is the primary method of timber production and management in the national forests. However, this method of harvesting trees has been controversial since at least the 1960s. Many environmental and citizen groups object to clearcutting in the national forests, citing soil and water degradation, unsightly landscapes, and other damages. The wood products industry argues that clearcutting is an efficient and successful silvicultural system.

Between 1984 and 1997, clearcutting accounted for 59% of the area harvested for regeneration in the national forests. (This excludes salvage, thinning, and other harvesting not intended to establish new stands.) Other "even-aged" cutting systems (which result in areas that appear similar to clearcut areas) accounted for another 28% of the area harvested. Because of the continuing public outcry over clearcutting, the Chief of the Forest Service announced on June 4, 1992, that the Forest Service would reduce clearcutting by 70% from 1988 levels, and that this would reduce short-term harvest volumes by about 10%. Data show that half of the proposed reduction in acres clearcut had already been accomplished by 1991, but the total harvest volume declined proportionally (because of the economic recession, litigation to protect spotted owls, and a variety of other factors). Acres clearcut annually over the past 5 years (FY1993-FY1997) were 71% less than the FY1988 level, fulfilling the promised reduction. However, average annual harvests were 66% below the FY1988 level, much more than the projected 10% decline.

The choice of clearcutting or other silvicultural systems depends on a number of factors. Clearcutting is efficient, with lower costs for timber harvesting than other silvicultural systems, and has proven successful for regenerating stands of certain tree species. On the other hand, clearcutting and other even-aged systems often have greater impacts on soil, water, and aesthetics, and result in different plant and animal communities than do selection harvesting systems. Foresters argue that clearcutting is a legitimate forest silvicultural system under certain circumstances, and should be used when and where appropriate for particular species and specific site conditions, and on public lands when it also conforms with the public's values and goals for those lands.

Interest in clearcutting has increased in the past few Congresses. Several bills have been introduced in the 105th and preceding Congresses to ban clearcutting (or all even-aged management systems) in the national forests. If Congress were to enact specific management restrictions, such as a ban on clearcutting in federal forests, the professional flexibility and discretion of federal employees managing the lands entrusted to their stewardship would be reduced substantially. If, however, public tolerance continues to be eroded by the use of clearcutting or other even-aged silvicultural systems where they are unacceptable to the public and by recurring environmental damage from clearcutting, pressure for congressional intervention will likely increase. This report will not be updated.

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Clearcutting in the National Forests: Background and Overview

Clearcutting is a method of harvesting and regenerating timber in which all trees are cleared from a site and a new "even-aged" stand of trees (where the trees are nearly all the same age) is grown. Clearcutting, the primary method of cutting and growing trees in the national forests, has been controversial since at least the 1960s. Many environmental and citizen groups object to clearcutting in the national forests, citing soil and water degradation, unsightly landscapes, over-harvesting, loss of plant and animal diversity, and other damages and abuses. The timber industry generally endorses clearcutting because it is economically efficient and has been successful for regenerating forests of certain species. Forestry professionals argue that clearcutting is a legitimate *silvicultural* (vegetation management) system for certain species and particular site conditions, and is appropriate on federal lands when it conforms with the public's values and goals for those lands.

This report provides background on the clearcutting controversy, defines and describes clearcutting, and analyzes a U.S. Forest Service announcement to reduce clearcutting as the standard timber harvesting practice in the national forests. This report also discusses the considerations in and consequences of choosing to use clearcutting. This report focuses on clearcutting; other silvicultural methods are defined, but are not discussed in detail, even though the results of other even-aged silvicultural methods may appear quite similar to clearcutting.

General information about timber harvesting in this report is applicable to forest management practices on both public and private lands. Data on area clearcut and descriptions of federal policies on clearcutting, however, apply only to those lands managed by the Forest Service in the U.S. Department of Agriculture; the national forests administered by the Forest Service constitute the largest ownership of forest land in the United States, including about 90% of all federal timberlands. Data on acres clearcut on private and other government lands have not been compiled, and thus cannot be compared with the Forest Service data. In addition, the regulation of private forest management has traditionally been delegated to the states. Many states have forest practice acts that provide guidelines and requirements for private forest management, but none have banned clearcutting (although state ballot initiatives to prohibit clearcutting have been debated in at least two states). Information on state forest practice regulation is beyond the scope of this report.[1]

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[1]For more information, see: Russell K. Henly and Paul V. Ellefson. *State Forest Practice Regulation in the U.S.: Administration, Cost, and Accomplishment*. Sta. Bull. AD-SB3011. St. Paul, MN: Univ. of Minnesota Agricultural Experiment Station, 1986.

The Clearcutting Controversy

Clearcutting, particularly on federal lands, is controversial. Environmentalists and many other citizens often describe it as harmful and abusive. Many groups advocate a complete ban on clearcutting in federal forests, sometimes supporting the use of "selection" harvesting (see definitions below) as a substitute that they consider less abusive to the land and resources. (Other groups would ban *all* commercial timber harvesting in federal forests, but an analysis of this "zero-cut" option is beyond the scope of this report.) Professional foresters, represented by the Society of American Foresters, have stated that clearcutting:

> ... is an appropriate silvicultural method for regenerating [tree] species that are shade-intolerant and the optimum method to achieve other management objectives ... [although] it can have undesirable effects if not used properly.[2]

The wood products industry defends clearcutting as an efficient and successful system for harvesting and regenerating certain commercially-valuable tree species, and has expressed concerns that restricting or eliminating the use of clearcutting would unnecessarily restrict timber supplies and raise the costs of harvesting, and would consequently increase timber and wood product prices.

Definition

Silviculture is defined as:

> the process whereby forests are tended, harvested, and replaced, resulting in a forest of distinctive form. Systems are classified according to the method of carrying out the fellings that remove the mature crop with a view to regeneration and ... according to the type of forest thereby produced.[3]

Four primary silvicultural systems have traditionally been used to harvest timber and regenerate forests (*i.e.*, for regeneration harvesting) in the United States: clear-cutting, seed-tree, shelterwood, and selection harvesting. The first three — clear-cutting, seed-tree, and shelterwood systems — are called "even-aged" management systems, because the resulting stands of trees are essentially the same age and often (though not necessarily) about the same size. (Because the results are similar, other even-aged systems are often decried as another form of "clearcutting.") The fourth system — selection harvesting — is an "uneven-aged" system, because the resulting stands contain intermingled trees of many ages and a variety of sizes.

In **clearcutting**, all trees are cleared from a site and a new, even-aged stand of trees is grown naturally (from seeds from the surrounding trees) or artificially (from

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[2]Society of American Foresters. *Clearcutting*. from: http://www.safnet.org/news/clearcut.html (7/13/98, 1:40 PM)

[3]U.S. Dept. of Agriculture, Forest Service. *Silvicultural Systems for the Major Forest Types of the United States*. Agriculture Handbook No. 445. Washington, DC: U.S. Govt. Print. Off., Dec. 1983. p.185. (Hereafter referred to as USDA Forest Service, *Silvicultural Systems*.)

sown seeds or planted seedlings).[4] With the **seed-tree** system, the area is nearly cleared, but several seed-producing trees are left to regenerate the area naturally and the seed trees are removed after the seedling stand is established (about 5 years after the initial harvest). In the **shelterwood** system, trees are removed in two or more cuts; some trees are left for several years to provide seeds and to protect the seedlings before being removed. The **selection** system removes trees, either singly or in small groups, over time; regeneration of new trees is continuous. (These four silvicultural systems for regeneration harvesting are defined further in appendix A.)

Two additional silvicultural techniques are also commonly used. **Intermediate harvesting**, also called thinning, includes an array of harvests between establishing and regeneration harvesting the stand, often to improve the growth or value of the remaining trees. **Sanitation or salvage cutting** is used to remove trees that are dead, damaged, or threatened by insects or disease, typically to control the spread of the pest or pathogen and to use the wood before it deteriorates.[5] These latter types of harvests could clear all or most of a site, but would not be considered clearcutting or other even-aged regeneration harvesting because the principal purpose is other than establishing a new stand of trees.

Concerns about the shortcomings of clearcutting and other traditional silvicultural methods have led researchers to various alternative approaches. Initially, researchers developed "new forestry" — "a kinder, gentler forestry" than traditional silviculture. Research has continued to develop and assess alternative approaches:

> Silviculturists are challenged as never before by a multiplicity of management objectives and by recent scientific insights into forest ecosystems and landscapes.... Basic premises underlying traditional practices have been rendered obsolete.... The simplistic notion that four regeneration harvest practices, designed with the knowledge and objectives of the 19th century, can meet the objectives of the 21st century must be given up....
>
> In the 21st century, silvicultural prescriptions must be viewed as the working hypotheses that they are rather than as treatments with determinate and predictable ends. Adoption of the principles of adaptive management are essential. Hopefully, silviculturists will be leaders in creating the infinite array of silvicultural prescriptions that will be needed to achieve the complex multiple objectives, to abandon the straightjacket of the traditional regeneration harvest systems, and to embrace the view that silviculture is the art and science of manipulating forest stands, regardless of objectives.[6]

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[4]Timber harvesting where all trees are removed, but where establishing a new stand is not the principal purpose, such as clearing for agricultural use or to protect against wildfires, is not technically clearcutting, although the term is often used for such timber clearing.

[5]For additional information on salvage timber harvesting, see CRS Report 95-364 ENR, *Salvage Timber Sales and Forest Health*.

[6]"Section II. Silvicultural Systems and Management Concerns." *Creating a Forestry for the 21st Century: The Science of Ecosystem Management*. [Kathryn A. Kohm and Jerry F. Franklin, eds.] Washington, DC: Island Press, 1997. pp. 107-109.

Historical Perspective

The Multiple-Use Sustained-Yield Act of 1960 (P.L. 86-517) directs national forest management for "outdoor recreation, range, timber, watershed, and wildlife and fish purposes ... with consideration being given to the relative values of the various resources ...." The National Forest Management Act of 1976 (NFMA; P.L. 94-588) requires land and resource management plans that integrate scientific information to achieve these purposes while considering the economic and environmental effects of various management options and with public involvement. However, some critics argue that these mandates have not been followed, because the Forest Service has given priority to timber production over the other uses and values of the forests.[7]

Clearcutting has been controversial for at least 40 years, since it became the dominant method of harvesting and regenerating timber in the national forests.[8] Before 1970, national forest timber was mostly harvested and regenerated by the selection system. However, clearcutting and other even-aged systems are now the primary silvicultural methods used in the national forests.

The debate over the benefits and liabilities of clearcutting in the late 1960s was similar to the debate today. A Senate Committee Report, *Clearcutting on Federal Timberlands*, summarizes the early history of the debate and the Senate Committee on Interior and Insular Affairs views on the judicious use of clearcutting in the "Church Clearcutting Guidelines," named for Senator Frank Church of Idaho, Chair of the Subcommittee on Public Lands. Many of the provisions from the Church Clearcutting Guidelines were incorporated into §§ 6(g)(3)(D), (E), and (F) of NFMA. (These sections of NFMA are reproduced in appendix B.)

Enactment of NFMA did not end the clearcutting controversy. At various times since, the Forest Service has fine-tuned its clearcutting policy, but clearcutting is still widely used for timber harvesting on national forest lands, and many conservation and citizen groups continue to object to its use. Efforts to reserve old growth forests as habitat for the threatened northern spotted owl and other species have intensified the controversy, because clearcutting and other even-aged silvicultural techniques fragment wildlife habitat and because the area of old growth forest continues to decline.

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[7]See, for example: Randal O'Toole. *Reforming the Forest Service*. Washington, DC: Island Press, 1988.

[8]For more information on the history of clearcutting and other timber harvesting and regeneration methods in this country, see: A.P. Mustian. "The History and Philosophy of Silviculture and Management Systems in Use Today." *Uneven-Aged Silviculture and Management in the United States*. Washington, DC: USDA Forest Service, Feb. 1978. pp. 1-17.

In 1992, in response to these concerns and as a result of new information, the Chief of the Forest Service announced a new policy of "ecosystem management" for the National Forest System. The policy paper directing this new approach states:[9]

> This policy would reduce clearcutting where it has been used as a standard timber harvest practice on the National Forests. Clearcutting would be limited to areas where it is essential to meet forest plan objectives and involve one or more of the following circumstances:
>
> 1. To establish, enhance, or maintain habitat for threatened, endangered, or sensitive species.
> 2. To enhance wildlife habitat or water yield values, or to provide for recreation, scenic vistas, utility lines, road corridors, facility sites, reservoirs, or similar development.
> 3. To rehabilitate lands adversely impacted by events such as fires, windstorms, or insect or disease infestations.
> 4. To preclude or minimize the occurrence of potentially adverse impacts or insect or disease infestations, windthrow, logging damage, or other factors affecting forest health.
> 5. To provide for the establishment and growth of desired trees or other vegetative species that are shade intolerant.
> 6. To rehabilitate poorly stocked stands due to past management practices or natural events.
> 7. To meet research needs.
>
> This clearcutting policy combined with the new USDA-Forest Service ecosystem management can reduce clearcutting by as much as 70 percent from FY 1988 levels. The reduction on timber volume over the short-run is likely to be about 10 percent. There would be little reduction in timber volume over the long-term.

Conservation groups and others questioned whether this announcement would actually reduce clearcutting and increase the use of other silvicultural systems, because the "new" clearcutting guidelines were similar to those mandated in NFMA in 1976, which they assert were never really implemented. Industry argued that the policy would reduce the amount of timber from national forests by more than the estimated 10% and would increase the cost of timber harvesting.

National Forest Timber Harvests

Nationally, clearcutting has accounted for less than half (47%) of the national forest acres harvested in regeneration cutting over the past 5 years. (See table 1, below, and appendix C.) The acreage and relative importance of clearcutting have declined substantially. In 1988, more than 283,000 acres were clearcut, but fewer than 46,000 acres were clearcut in 1997 — only 16% of the 1988 acreage. Similarly, clearcutting was nearly 73% of total regeneration harvesting in 1987, but only 42% in 1997. Thus, by area, clearcutting has declined by more than the 70% promised in

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[9]U.S. Dept. of Agriculture, Forest Service, Washington Office. *Subject: Ecosystem Management of the National Forests and Grasslands*. Memorandum to Regional Foresters and Station Directors. Washington, DC: June 4, 1992.

the 1992 policy statement. However, the total timber volume harvested has declined by more than the projected 10% as a result of the policy change and other factors. In 1988, 12.6 billion board feet (BBF) of timber was cut from the national forests; the 1997 harvest was only 3.3 BBF, about a quarter (26%) of the 1988 harvest.

Table Acreage and Share of Timber Harvest in the National Forest System by Cutting Method

	1984-1988		1989-1992		1993-1997	
	acres	share	acres	share	acres	share
Clearcutting	253,739	66.0%	208,895	56.9%	80,768	46.6%
Even-Aged/Final	100,544	26.2%	117,742	32.1%	39,759	23.0%
Selection	29,913	7.8%	40,363	11.0%	52,648	30.4%
Regeneration Sum	**384,195**	**53.7%**	**367,000**	**44.6%**	**173,175**	**31.3%**
Even-Aged/Prep.	65,427	9.2%	105,831	12.9%	57,169	10.3%
Intermediate	165,304	23.1%	173,184	21.1%	143,872	26.0%
Sanitation	98,457	13.8%	171,089	20.8%	170,994	30.9%
Special	1,711	0.2%	5,426	0.7%	8,077	1.5%
Total	**715,093**		**822,529**		**553,286**	

Source: U.S. Dept. of Agriculture, Forest Service. *Annual Reforestation and Timber Stand Improvement Accomplishment Report: Table 20 — Regeneration and Intermediate Harvest Acres*. Unpublished annual report. Washington, DC: USDA Forest Service, Timber Management Staff.

The reported decline in acreage and importance of clearcutting could mask some of the public concern over clearcutting. Many people consider the other even-aged silvicultural methods to effectively result in clearcutting. The data in table 1 and appendix C show that the acreage and importance of other even-aged regeneration harvests have also declined.[10] Final even-aged regeneration harvests peaked in 1989, at 148,000 acres, 34% of regeneration harvest acreage. In 1997, such harvests were only 14,000 acres (9% of the 1988 acreage) and 13% of regeneration harvest acres. In addition, sanitation harvesting sometimes removes all or most of the trees from a site, and thus many would consider such harvests to be clearcuts. Sanitation harvest levels have fluctuated substantially, from fewer than 70,000 acres (about 10% of total harvest area) in 1987 to more than 240,000 acres (nearly 33% of total harvest area) in 1993. No trend can be discerned from the data, although the relative importance

[10]Regeneration harvests for seed-tree and shelterwood harvesting systems include only the final harvest of trees from the stand. The initial harvest — identified as even-aged/prep. in the table and the appendix — is not counted as a regeneration harvest, since it is not the final harvest of the site. Counting both the initial and final harvest acres would double-count the regeneration harvest acres, since (over several years) the same acres would be cut twice.

of sanitation harvesting has risen substantially over the past decade as the area of regeneration harvesting has declined.

These national data mask the substantial regional variation in using the various silvicultural systems. Although the relative importance of clearcutting and of regeneration harvesting generally have declined nationally, they have different levels of importance in the various regions, and clearcutting has not declined in all regions, as shown in the tables in appendix C. The information from those Forest Service data is summarized here:

- Region 1 — north Idaho and Montana: regeneration harvesting has declined less than nationally, and clearcutting has retained its relative importance (about 60% of regeneration harvesting).

- Region 2 — Colorado, South Dakota, and Wyoming: regeneration harvesting has increased (except for 1997) while intermediate harvesting has declined. Other even-aged harvesting is most important, although selection harvesting has increased in importance in the past 5 years.

- Region 3 — Arizona and New Mexico: regeneration harvesting has declined steeply. Clearcutting is uncommon (less than 3% of regeneration harvesting), while selection harvesting has become significant since 1990.

- Region 4 — south Idaho, Nevada, Utah, and Wyoming: regeneration harvesting has fluctuated widely, with lower relative importance in the past 5 years. Sanitation harvesting has increased substantially, from fewer than 5,000 acres annually (25% of total harvests) in the mid-1980s to nearly 40,000 acres annually (74% of total harvests) in the mid-1990s.

- Region 5 — California: regeneration harvesting has declined substantially, but the relative importance of clearcutting has declined less than nationally. Sanitation harvesting has always been significant, and has grown in importance.

- Region 6 — Oregon and Washington: regeneration harvesting and clearcutting have declined in importance, in parallel with national trends. Sanitation harvesting has become much more important in the past 5 years

- Region 8 — the South (Virginia through Oklahoma and Texas): regeneration harvesting has declined in parallel with national trends. In the mid 1980s, clearcutting accounted for more than 90% of regeneration harvesting, but has been only half of regeneration harvesting in the past 5 years.

- Region 9 — the Northeast and North Central (Maine to Maryland to Missouri to Minnesota): regeneration harvesting has declined less than nationally. Clearcutting has declined substantially, but still accounted for nearly 60% of regeneration harvesting over the past 5 years.

- Region 10 — Alaska: regeneration harvest acreage has declined, but less than nationally. Clearcutting accounts for more than 90% of all timber harvesting, although sanitation harvesting has become significant in the past 2 years.

Considerations in Choosing Clearcutting

Forest management is both science and art. Although there are principles and guidelines that can be followed in managing a forest, whether for timber production or wilderness recreation, each site is a unique composition of many factors that must be considered and which respond in many different ways to silvicultural systems. As described by one well-known forest silviculturalist:

> Logical programs for the long-term management of particular stands or kinds of stands are not devised by making judicious selections from classifications and schematic descriptions of silvicultural systems. This book, for example, and in spite of certain superficial resemblances, is not a cookbook from which such choices can be made and applied. A good silvicultural system is not chosen but formulated as a solution to a specific set of circumstances.[11]

> The human demands placed on forests are so variable that it is fortunate that forest vegetation usually is flexible and resilient. Because of this, silviculture can be quite variable. Natural factors set limits on what is possible, but after these natural limitations are taken into account, the next considerations are the management objectives that society and ownership, public and private, have set for a given tract of forest land.[12]

Natural Factors

Certain natural factors limit the feasible management possibilities for a tract of land without impairing its long-term productivity. These factors include: existing stand conditions; the nature of the desired future forest; impacts on soil and water; and implications for non-timber values.

Existing Stand Conditions. The current stand of trees — the distribution of sizes and species, the health and quality of the trees, and the species composition — limit the feasible management options. For example, trees of poor health or low quality would provide a substandard seed source for establishing a new stand, and thus clearcutting might be the preferred silvicultural system since it is more efficient for artificial regeneration (tree planting). Similarly, a stand of mixed species might be an undesirable seed source, if the landowner objectives are to maximize timber production. Thus, current stand conditions may limit the silvicultural options that are feasible, since the current stand may be unable to provide the necessary protection or seed supply.

Desired Future Conditions. Equally as important is the desired condition of the future timber stand. Silvicultural techniques greatly affect the composition and diversity of plant and animal species on a site and on neighboring sites. Clearcutting and other even-aged harvesting methods are often described as attempts to mimic

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[11]David M. Smith. *The Practice of Silviculture*, 7th ed. New York, NY: John Wiley & Sons, 1962. pp. 358-359. (Hereafter referred to as Smith, *The Practice of Silviculture*.)

[12]David M. Smith. "The Forests of the United States." *Regional Silviculture of the United States*, 2nd ed. [John W. Barrett, ed.] New York, NY: John Wiley & Sons, 1980. p. 22.

natural disturbances, particularly natural patterns of damage by fires or by native insects and diseases. Because fire sometimes threatens human life and property, rapid fire suppression has been a priority for many decades. However, this has decreased the natural role fire has historically played in opening up stands of trees, particularly for species that do not tolerate shade and/or that depend on fire for propagation.

Some of the most in-depth research on the ecological succession of forests has been done by the Hubbard Brook Ecosystem Study in the hardwood forests of the White Mountains of New Hampshire. The objectives of that study include linking basic research with forest management and studying the forest ecosystem through various stages of development, such as before and after clearcutting. As with any forestry research, results are site-specific. However, generalities based on research results can often be extrapolated to other cases and sites. Regarding the acceptability of the environmental consequences of clearcutting in a forest ecosystem, scientists from Hubbard Brook have stated:[13]

> Our studies suggest that many similarities exist between redevelopment occur-ring in clearcut ecosystems and in openings in the forest created by naturally occurring tree fall. This suggests to us that clearcutting has the potential to work with nature rather than against it and that clearcutting may be considered as an ecologically acceptable procedure in White Mountain northern hardwood forests. However, it also is apparent that misuse of stem-only clearcutting can lead to necessary short- and long-term degradation of the forest ecosystem. Therefore, it should be coupled with carefully designed safeguards.

Some of these guidelines identified from the Hubbard Brook Ecosystem Study include:[14]

- clearcutting should be limited to sites with strong recuperative ability;
- roads should consume an absolute minimum amount of area;
- proper ecological weight should be given to species that have little importance as a source of wood products but play an important role by conserving nutrients, minimizing erosion, and being a source of food for wildlife;
- cuts should be relatively small (several hectares) to insure the availability of seed sources and to minimize losses *via* dissolved substances and eroded material.

In addition to affecting future plant diversity, every silvicultural decision also has consequences for wildlife.

> Timber management is wildlife management. The degree to which it is good wildlife management depends on how well the wildlife biologist can explain the

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[13]F. Herbert Bormann and Gene E. Likens. *Pattern and Process in a Forested Eco-system*. New York, NY: Springer-Verlag, 1979. p. 225.

[14]*Ibid.*, p. 226. These are just a few of the guidelines identified by the study. Also, according to these scientists, the Forest Service has already implemented most of their guidelines.

> relationship of wildlife to habitat and how well the forester can manipulate habitat to achieve wildlife goals.[15]

The principal difference between uneven-aged and even-aged silvicultural systems, in terms of plant and animal diversity, is the long-lasting effect of the regeneration harvest. These differences have been described by Thomas and Radtke:[16]

> Uneven-aged management ... tends, over time, to reduce the horizontal diversity of plants and animals in the forest. The resulting stands often have high structural (vertical) diversity because of the intermingling of the different ages and sizes of trees. But there is a gradual reduction of shade-intolerant trees and understory plants.... Such forests lack the variety of distinct successional stages that ensure diversity and a myriad of habitat niches.
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> Uneven-aged management, however, can be a useful wildlife management technique. It benefits wildlife and plant species adapted to more mature forest conditions, and it can be used to preserve the integrity of delicate and disproportionately important wildlife habitats, such as riparian zones.
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> A forest under even-aged management usually has low vertical diversity because of the comparative simplicity of the stand structure.... Even-aged systems ... produce distinct successional stages and high degree of horizontal diversity because there are numerous stands of various age scattered through the forest ... [that] provide a variety of habitats ... [including conditions] not available in the more mature forest.
>
> No single system of forest management can be a panacea for wildlife management. The decision about which system to use must be based on specific management goals. The forest structure must be considered, along with size and shape of the stand, its juxtaposition to other stands, the road systems, and special habitat needs. Flexibility in the use of silvicultural systems can be a key to meeting a range of wildlife goals.

Impacts on Soil and Water. Timber harvesting can have substantial impacts on soil and water.[17] The quantity of water flowing from a forest is proportional to the extent of vegetative cover, especially tree cover; as more trees are removed from a site, water yields increase. In addition, the seasonal distribution of streamflow is often

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[15]Jack Ward Thomas and Robert E. Radtke. "Effects of Timber Management Practices on Forest Wildlife Management." *The Scientific Basis for Silvicultural and Management Decisions in the National Forest System*. [Russell M. Burns, technical compiler.] USDA Forest Service Gen. Tech. Rept. WO-55. Washington, DC: U.S. Govt. Print. Off., 1989. p. 108.

[16]*Ibid.*, pp. 112-114.

[17]Unless otherwise specified, the information in this section is drawn from: Wayne T. Swank, Leonard F. DeBano, and Devon Nelson. "Effects of Timber Management Practices on Soil and Water." *The Scientific Basis for Silvicultural and Management Decisions in the National Forest System*. [Russell M. Burns, technical compiler.] USDA Forest Service Gen. Tech. Rept. WO-55. Washington, DC: U.S. Govt. Print. Off., 1989. pp. 80-82. (Here-after referred to as Swank, *et al*., "Effects of Timber Practices on Soil and Water.")

altered for a few years following timber harvesting. Increased yields are often seen as a benefit, if water quality is not degraded. However, since spring snow melt typically occurs earlier in clearcut areas, the increased flow can also add to potential spring flooding and can decrease summer streamflows.

Water quality characteristics most affected by timber harvesting are sediment loads, dissolved nutrients, and water temperature. Undisturbed forests generally result in low levels of dissolved or suspended matter (except during floods); sediment loads and dissolved nutrients generally increase with the level of disturbance to the forest. Timber harvesting adjacent to stream channels typically increases sediment flows into streams and raises stream temperatures, because it removes the streamside vegetation that buffers the stream. Buffer strips (typically 50-100 feet on either side of stream) are often suggested to mitigate these effects.

Clearcutting and other cutting practices, however, are not the primary cause of erosion or water quality deterioration resulting from timber harvesting operations. Rather, the associated skidding (hauling logs to a loading site) and road construction are typically the major sources of soil and water degradation:[18]

> Felling trees alone seldom causes erosion although some soil compaction and surface gouging may occur during this operation. In contrast, road building, skidding and stacking logs, and some site preparation activities can produce major soil surface disturbance that greatly increases the erosion on a site.

In fact, clearcutting may result in *less* road construction, and thus less water quality degradation, than other silvicultural methods. Clearcutting typically requires fewer roads than other silvicultural systems, because cable logging systems can be used to transport the timber from the stump to the loading site. "With systems using cable skidding, however, partial cutting [*i.e.*, silvicultural systems other than clear-cutting] is rarely practical, as residual trees are apt to be damaged or destroyed" during harvesting.[19] Clearcutting usually leads to less road maintenance, because activities occur in one operation; other even-aged systems typically require access to the site two or three times, while the selection system essentially requires permanent access to all timber stands. Of course, no timber harvesting or road construction would yield the highest water quality.

Prescribed fires are often used on sites that have been clearcut, to remove the combustible fuels from the area and to prepare the site for reforestation. The effects of fire on soil and water depends primarily on the intensity of the fire. "Generally, a low-intensity fire increases the availability of nutrients to plants ...[and] generally does not increase soil erosion. Intense, hot fires may completely burn the forest floor, expose mineral soil, and accelerate soil erosion in steep terrain."[20] However, prescribed fires conducted under proper weather and fuel conditions can avoid most of the problems arising from intense fires.

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[18]*Ibid.*, p. 80.

[19]A.E. Wackerman, W.D. Hagenstein, and A.S. Michell. *Harvesting Timber Crops*, 2nd ed. New York, NY: McGraw-Hill Book Co., 1966. p. 41.

[20]Swank, *et al.*, "Effects of Timber Practices on Soil and Water," p. 82.

Implications for Non-Timber Values. The primary non-timber use of forests is for recreation, but surprisingly little research has documented the effects of the various silvicultural systems on recreation patterns and levels. Research studies have identified public preferences for various forest conditions; the least preferred conditions include:[21]

> Artificial intrusions, especially: clearcuts, slash, stumps, [and] other signs of timber harvesting disturbances.
> Plantations and "monocultures".
> Standing diseased, dead, or dying trees in large numbers.
> Dense "eye-level" vegetation or undergrowth; *i.e.*, a thicket with dense sapling stands or dense forest understories over large areas.

In contrast, the most preferred conditions were natural-appearing landscapes, with a diversity of vegetation, large-diameter trees, sparse undergrowth, and natural-appearing openings.

Research has more typically focused on aesthetics, and the effects of silvicultural activities on aesthetics. Visual management is often based on visual quality objectives, ranging from no change to impacts not visible or subordinate to the characteristic landscape to impacts that dominate but are modified to appear natural from various distances. Uneven-aged timber management practices generally have less noticeable effects on aesthetics than even-aged silvicultural systems, because the impacts are typically smaller in scale and more random in pattern, thus leaving the natural forest characteristics apparently intact. In contrast, even-aged silvicultural systems have greater impact on visual quality, with clearcutting generally having greater impacts than other even-aged cutting systems. Nonetheless, when even-aged management is "carefully applied, it should be possible to meet [high visual quality objectives] ... along less sensitive parts of view sheds."[22]

However, "There is no way to deny a fresh clearcut is *ugly*.... like a new haircut, the clearcut is embarrassingly evident. For this reason, it has become a symbol of man's injury, real and fancied, to the natural world."[23] Forests are increasingly valued for spiritual reasons. American society is becoming increasingly urbanized and increasingly removed from the historical utilitarian values of forests and forest products, and forests are increasingly romanticized, as increasingly rare vestiges of our wilderness heritage, regardless of past human intrusions into (and impacts on) those forests. Such values directly conflict with timber harvesting generally, and particularly with silvicultural systems that result in more significant visual impacts, such as clearcutting.

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[21]See: Wayne G. Tlusty and Warren R. Bacon. "Effects of Timber Management Practices on Recreation and Esthetics (Visual Resource)." *The Scientific Basis for Silvicultural and Management Decisions in the National Forest System*. [Russell M. Burns, technical compiler.] USDA Forest Service Gen. Tech. Rept. WO-55. Washington, DC: U.S. Govt. Print. Off., 1989. pp. 134-140.

[22]*Ibid.*, p. 140.

[23]Eleanor C.J. Horowitz. *Clearcutting: A View From the Top*. Washington, DC: Acropolis Books, Ltd., 1974. p. 30.

Landowner Objectives

Financial Considerations. Clearcutting is often considered desirable by land owners, professional foresters, and the timber industry, because it is more efficient than other methods, both in harvesting timber and in regenerating stands. Efficiency is important, because "Harvesting timber crops is usually the most expensive operation conducted in the forest."[24] Efficiency is typically measured as expenditure per unit of output (*e.g.*, per million board feet of timber cut). This often excludes the non-financial cost of environmental damages (discussed above), however, and thus incompletely accounts for economic impacts. Nonetheless, cost efficiency — the financial element — is one consideration in selecting a silvicultural system.

Clearcutting is more efficient than other silvicultural systems for harvesting trees, because it yields a greater volume of wood from one site and in one operation, and thus the average unit cost is lower than under other silvicultural systems. Selection systems are particularly expensive, because the variety of tree species and sizes in uneven-aged stands requires a greater variety of treatments:[25]

> One disadvantage that limits the use of the selection system is the complexity of all operations conducted in the intermingled mixtures of different age.... The difficulty and expense of harvesting operations is usually greater than in even-aged stands.

As noted above, clearcutting can have additional advantages in areas with steep terrain, because it typically requires fewer roads, and road construction and maintenance are expensive (as well as environmentally damaging) operations.

Clearcutting can also be more efficient for regenerating timber stands. Cleared sites reduce the cost of site preparation, because there is no need to avoid damaging residual trees. Furthermore, artificial regeneration (planting seedlings) is sometimes preferable to natural regeneration:[26]

> The significant advantages [of planting] are: (a) close control over the arrangement, composition, and genetic qualities of new stands; (b) shortening of period of establishment; (c) avoidance of dangers to which seed and new seedlings are exposed in the field; and, (d) freedom from restrictions on harvesting techniques.
>
> Planting, *if properly* done, creates stands that can be treated more efficiently and yield greater volumes and values than naturally regenerated stands. [emphasis in original]

One provision of the National Forest Management Act (NFMA) makes rapid reforestation particularly important for the national forests. Section 6(g)(3)(E) requires regulations that "insure that timber will be harvested from National Forest System lands only where ... (ii) there is assurance that such lands can be adequately

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[24]Smith, *The Practice of Silviculture*, p. 382.

[25]Smith, *The Practice of Silviculture*, p. 500.

[26]Smith, *The Practice of Silviculture*, p. 307.

restocked within five years after harvest." Despite other provisions that may restrict the use of clearcutting (see appendix B), this reforestation requirement may increase the emphasis on and incidence of clearcutting, because clearcutting increases the assurance of adequate reforestation within 5 years.

Other Landowner Objectives. Harvesting techniques selected for public and private forests are linked to all the landowners' goals for the lands being managed, and those lands may have a variety of objectives. The objectives may depend in part upon whether the land is publicly owned or is in private ownership — owned by an individual (such as a farmer), or by a corporation. A wood products company may have timber production as the primary objective for its forestlands, and thus financial considerations may be paramount. A farmer may plant trees as a windbreak or to protect soil from erosion, and then decide to harvest the trees to put the land back into crop production or to generate cash. Sometimes, an individual owning a small tract of forestland may decide to manage the land primarily for camping and/or hunting and may choose to harvest certain trees that would enhance a particularly beautiful view or increase habitat for a certain game species. Increasingly, private lands are being leased for hunting, leading to potential landowner profits from timber harvesting that benefits game species.

Many public forestlands include some timber harvesting. A multitude of laws govern which federal forestlands are available for timber harvesting. For example, some land has been designated by Congress as wilderness, where timber harvesting is prohibited. Section 6(k) of NFMA requires the agency to designate lands that are not "suited for timber production, considering physical, economic, and other pertinent factors." And, as noted earlier, national forest lands and resources are managed for a variety of purposes under the Multiple-Use Sustained-Yield Act of 1960.

Harvesting level and other silvicultural decisions for the national forests are determined in land and resource management plans developed for each forest, a planning process mandated by NFMA. Because the national forests are essentially owned by the public, NFMA requires the Forest Service to involve the public in the planning process, to enable the Forest Service to understand the values and goals the public envisions for those forests. These objectives differ for various tracts of land, with some areas managed for more than one resource and objective at the same time. Objectives can include producing and/or protecting: water, timber, minerals, and forage; wildlife, fisheries, and other animal habitat; biological diversity; recreation and aesthetics; wilderness; research; and other resources and values.

Public opinion about how federal lands should be managed change over time and have become a greater influence in selecting silvicultural systems in recent years.

> Public attitudes especially with regard to clearcutting have become a factor ... that can no longer be ignored by the land manager.... The selection of a silvicultural system is guided by what people think they want as well as by what is biologically possible, technically feasible, and economically realistic.[27]

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[27]Nelson S. Loftus and Richard O. Fitzgerald. "An Overview of the Ecological Basis for (continued...)

One forestry textbook describes silviculture as "all the manipulating operations that go into the development and maintenance of a *socially* determined form of forest stand" (emphasis added).[28] This emphasizes that, particularly for publicly-owned forests, the person carrying out the activities on the ground is not necessarily the decisionmaker regarding what type of operation should be applied. Management goals and limitations for the land and its resources are determined by the landowner — the public in the case of federal lands — and the acceptable silvicultural system and other management operations are then chosen and applied within those limitations to achieve those objectives.

Selecting Clearcutting as a Silvicultural System

Many of the concerns over clearcutting result because the damages caused by abuses of clearcutting are more apparent than are the damages caused by misuse of other regeneration harvesting systems. A study on the use of clearcutting in Maine describes these concerns thoroughly. Although written about clearcutting in Maine, many of the sentiments discussed in this report also explain views about clearcutting throughout the United States:

> [It] is a reaction against abusive, overused clear-cutting and intensive, industrial monoculture of trees. It is based on the belief that most nontimber values of forests are best fostered by eliminating clearcutting from consideration.[29]

> Abuses of clearcutting are highly visible, while abuses of other cutting methods are not. Logging a selection cut on wet soil with poor skidtrail layout can result in as much erosion as clearcutting. Mishandled selection cutting over several rotations can undermine stand productivity and eliminate desirable species. Managing without clearcutting and cutting the same total volume means that more acres must be logged to obtain a given harvest volume, and more roads constructed. Selection cuttings, when poorly managed, often lead to root and stem damage that can sap future productivity.[30]

> Shoddy, exploitive clearcutting is clearly one of the more destructive forest management practices .... It is not forestry and it is certainly not land

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[27](...continued)
Silvicultural Systems." *The Scientific Basis for Silvicultural and Management Decisions in the National Forest System*. [Russell M. Burns, technical compiler.] USDA Forest Service Gen. Tech. Rept. WO-55. Washington, DC: U.S. Govt. Print. Off., 1989. p. 4.

[28]Grant W. Sharpe, Clare W. Hendee, and Wenonah E. Sharpe. *Introduction to Forestry*, 5th ed. New York, NY: McGraw-Hill Book Co., 1986. p. 186.

[29]The Irland Group. *Clearcutting as a Management Practice in Maine Forests: Re-port to the Maine Department of Conservation, Forests for the Future Program*. Augusta, ME: 1988. Part 2, p. 39.

[30]*Ibid.*, Part 1, pp. 30-31.

> stewardship.... Clearcutting in these cases is simply cheap logging and not a planned silvicultural practice.[31]

Clearcutting is a financially efficient silvicultural method for harvesting timber and regenerating stands. As described above, the environmental effects of clearcutting are generally no worse than under other silvicultural systems, *if properly planned and administered*. Silvicultural treatments — under clearcutting or other systems — can only be judged by how well they are applied on the ground. However, such monitoring has not been performed at a level to determine the quality of timber harvesting efforts.

> Planned, supervised clearcutting has an important role to play in modern forestry. When due regard is given to the [specific] conditions ... clearcutting contributes to forest management objectives without significant environmental damage. To meet this test, however, cutting must be carefully planned and coordinated with other resource values.
>
> But to say that clearcutting, properly applied, has a role is to beg a major question. That question, for land stewardship as well as for public policy, is: "how many clearcutting operations actually are properly done?" The answer, unfortunately, is not known in any statistical sense, for clearcutting or for its alternatives.[32]

Much of the public outcry against clearcutting, and demand for reducing its use in the national forests, has its basis in section 6(g)(3)(F)(i) of NFMA, which directs the use of clearcutting only where "it is determined to be the optimum method ... to meet the objectives and requirements of the relevant land management plan." When written, these guidelines were thought to have been specific enough to prevent the overuse and abuse of clearcutting, while still allowing the agency the flexibility to choose when and where to clearcut. Despite such direction, the use of clearcutting in the national forests has apparently not declined as much as many believe it should.

Given the agency's history, many do not believe the Forest Service can or should be trusted to comply with public desires and congressional guidelines for the proper use of clearcutting and seek to ban clearcutting from use on the national forests. In citing apparent continued abuses — and implying that clearcutting is not the optimum method for achieving objectives and has not always been properly planned and implemented — they argue that the Forest Service should not be allowed to use this useful but potentially abusive silvicultural tool.

However, a ban on clearcutting would not necessarily stop abusive and harmful land management practices. As stated above, many of the problems associated with clearcutting result from its implementation on the ground; clearcutting may have been an appropriate silvicultural choice for the species, the setting, and the site to achieve the stated goals, but the sale and road layout and design were inconsistent with the goals or were applied without enough environmental safeguards. Similarly, clearcutting may be publicly acceptable in one area, but not another. Such potential

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[31] *Ibid.*, Part 1, pp. 35-36.

[32] *Ibid.*, Part 1, p. 36.

conflicts can happen not only with clearcutting, but with any silvicultural method. Selection harvesting was used widely in the early development of American forest resources, and led to much high-grading of the forests (harvesting the desired high-quality timber while leaving the less desirable species and unmerchantable trees as the source for natural regeneration). As a result, the character of many forestlands, especially federal forests in the east, now differs substantially from pre-settlement conditions. Also, more roads are typically required for selection harvesting systems than for clearcutting, and since road building is often the major cause of soil erosion and stream siltation associated with timber harvests, substituting selection harvesting for clearcutting potentially could cause more environmental degradation.

The issue is how to assure that the choice of a silvicultural system and the implementation of the management practices will achieve the stated goals for federal land and resource management. Congress' enacting specific management restrictions, such as a ban on clearcutting on national forests, would remove much of the flexibility and discretion of agency employees in managing the lands entrusted to their stewardship. However, if public trust continues to be eroded by persistent use of clearcutting when and where the public objects, and by continued environmental damage from clearcutting, pressure for congressional intervention will likely continue and increase.

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Appendix A: Definitions of Silvicultural Systems

The following definitions describe the four primary silvicultural systems used to harvest timber and regenerate forests in the United States: clearcutting, seed-tree, shelterwood, and selection harvesting. The first three — clearcutting, seed-tree, and shelterwood systems — are even-aged management systems which result in stands of trees that are essentially the same age and often, but not necessarily, the same size. The fourth system — selection harvesting — is an uneven-aged management system, resulting in stands with intermingled trees of many ages and a variety of sizes. These definitions are taken from the USDA Forest Service publication, *Silvicultural Systems for the Major Forest Types of the United States*, Agriculture Handbook No. 445 (Dec. 1983).[33]

The Clearcutting System

"Clearcutting is the harvesting in one cut of all trees on an area for the purpose of creating a new, even-aged stand.... Regeneration is obtained through natural seeding, through sprouting of trees that were in or under the cut stand, or through planting or direct seeding. This system requires careful location of boundaries to fit the landscape and appropriate cleanup of debris to improve the appearance of the harvested area. The absence of reserved trees on the clearcut area facilitates site preparation and other area-wide cultural treatments."

The Seed-Tree System

"The seed-tree system involves harvesting nearly all the timber on the selected area in one cut. A few of the better trees of the desired species are left well distributed over the area to reseed naturally. When feasible, the seed trees are harvested after regeneration is established. This system applies mainly to conifers."

The Shelterwood System

"In the shelterwood system, the mature stand is removed in a series of cuts [over a relatively few years]. Regeneration of the new stand occurs under the cover of a partial canopy or shelterwood. A final harvest cut removes the shelterwood and permits the new stand to develop in the open as an even-aged stand. This system provides a continuing cover of either large or small trees. It is especially adapted to species or sites where shelter is needed for the new reproduction, or where the shelterwood gives the desired re-generation an advantage over undesired competing vegetation."

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[33]For more information, see a general text on silviculture, such as Smith, *The Practice of Silviculture*.

The Selection System

"The selection system involves the removal of mature and immature trees either singly or in groups at intervals. Regeneration is established almost continuously. The objective is maintenance of an uneven-aged stand, with trees of different ages or sizes intermingled singly or in groups. When properly applied, the system is esthetically pleasing, but is difficult to apply successfully in most forest types. The two types of selection are individual tree selection and group selection.

"**Individual (single) tree selection** involves the removal of individual trees rather than groups of trees. In mixed stands it leads to an increase in the proportion of shade-tolerant species in the forest.

"**Group selection** can be used to maintain a higher proportion of less shade tolerant species in a mixture than individual tree selection. For this purpose larger groups are more effective than smaller ones. In Eastern timber types, groups a fraction of an acre in size are generally suitable. In some Western timber types, where the stands are open or the trees are very tall, the groups may be as large as an acre or two. When groups are of maximum size, they resemble small clearcut patches. The group selection is distinguished from clearcutting in that the intent of group selection is ultimately to create a balance of age or size classes in intimate mixture or in a mosaic of small contiguous groups throughout the forest."

Appendix B:
National Forest Management Act of 1976

Act of October 22, 1976; Public Law 94-588, 90 Stat. 2949. 16 U.S.C. 1604, *et al.*

Section 6. National Forest System Resource Planning.— ...
(g) ... The regulations shall include, but not be limited to— ...
(3) specifying guidelines which— ...

(D) permit increases in harvest levels based on intensified management practices, ... if (i) such practices justify increasing the harvests in accordance with the Multiple-Use Sustained-Yield Act of 1960, and (ii) such harvest levels are decreased at the end of the planning period if such practices cannot be successfully implemented or if funds are not received to permit such practices to continue substantially as planned;

(E) insure that timber will be harvested from National Forest System lands only where—

(i) soil, slope, or other watershed conditions will not be irreversibly damaged;

(ii) there is assurance that such lands can be adequately restocked within five years after harvest;

(iii) protection is provided for streams, streambanks, shorelines, lakes, wetlands, and other bodies of water from detrimental changes in water temperature, blockages of water courses, and deposits of sediment, where harvests are likely to seriously and adversely affect water conditions or fish habitat; and

(iv) the harvesting system to be used is not selected primarily because it will give the greatest dollar return or the greatest unit output of timber; and

(F) insure that clearcutting, seed tree cutting, shelterwood cutting, and other cuts designed to regenerate an even-aged stand of timber will be used as a cutting method on National Forest System lands only where—

(i) for clearcutting, it is determined to be the optimum method, and for other such cuts it is determined to be appropriate, to meet the objectives and requirements of the relevant land management plan;

(ii) the interdisciplinary review as determined by the Secretary has been completed and the potential environmental, biological, esthetic, engineering, and economic impacts on each advertised sale area have been assessed, as well as the consistency of the sale with the multiple use of the general area;

(iii) cut blocks, patches, or strips are shaped and blended to the extent practicable with the natural terrain;

(iv) there are established according to geographic area, forest types, or other suitable classifications the maximum size limits for areas to be cut in one harvest operation, including provision to exceed the established limits after appropriate public notice and review by the responsible Forest Service officer one level above the Forest Service officer who normally would approve the harvest proposal; *Provided*, That such limits shall not apply to the size of areas harvested as a result of natural catastrophic conditions such as fire, insect and disease attack, or windstorm; and

(v) such cuts are carried out in a manner consistent with the protection of soil, watershed, fish, wildlife, recreation, and esthetic resources, and the regeneration of the timber resource.

Appendix C:
Acres Harvested in the National Forest System by Cutting Method, and Their Relative Importance

The following tables present Forest Service data on timber harvesting by silvicultural treatment for the nine Forest Service regions since FY1984.. The tables are numbered to correspond to the number of each region (*e.g.*, table 1 presents Region 1 data); there is no table 7, because Forest Service Region 7 was merged into Region 9 in 1966. In addition, the aggregate National Forest System data are presented in table 11.

Part a of each table presents the acres cut under each cutting system, with the regeneration harvesting data above the bold-face line (and with shelterwood and seed-tree harvesting combined under "Even-age/final"); the data between the bold-face lines are, first, the sum of regeneration harvesting, and then the other (non-regeneration) harvesting methods, including the initial cut under shelterwood and seed-tree harvesting ("Even-age/prep") as well as thinning (*i.e.*, "Intermediate") and salvage (*i.e.*, "Sanitation").

Part b of each table presents the share (percentage) of the acres harvested by each cutting system. The data above the bold-face line are the share of regeneration harvest acres (and thus the sum is 100%), while the data below the bold-face line (including total regeneration harvesting) are the share of total acres harvested. Thus, for example, clearcut acres in FY1984 in Region 1 (first column of table 1b) were 40.4% of regeneration harvest acres, while regeneration harvest acres were 48.4% of total harvest acres; clearcut acres, as a percent of total harvest acres, were 19.6% (= 40.4% times 48.4% = 8,225 clearcut acres divided by 42,060 total harvest acres). Also, because acres cut are presented in thousands of acres, the totals and shares presented may differ slightly from the apparent data because of rounding errors.

Table 1a. Total Acres Cut (in thousands of acres) by Cutting System in Region 1 (northern Idaho and Montana)

Region 1 Total	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	8.2	10.1	14.1	18.8	16.6	27.6	25.8	20.3	22.0	15.2	12.6	6.5	5.9	5.6
Even-age/final	9.1	6.9	7.7	5.9	6.8	11.3	7.8	8.2	9.3	6.6	6.5	4.0	3.0	3.1
Selection	3.1	2.7	2.1	1.9	1.0	0.8	0.8	0.7	1.4	1.6	1.5	2.2	1.4	0.8
Regeneration	**20.4**	**19.7**	**23.9**	**26.6**	**24.3**	**39.7**	**34.5**	**29.2**	**32.6**	**23.4**	**20.6**	**12.7**	**10.3**	**9.5**
Even-age/prep	13.6	14.3	12.8	17.3	13.7	14.3	17.1	12.0	9.3	9.9	7.9	6.4	6.3	6.9
Intermediate	3.1	2.6	1.7	3.5	0.9	3.1	2.9	2.7	1.9	2.7	1.0	1.5	4.1	5.2
Sanitation	5.0	4.8	5.9	6.1	8.9	7.7	5.2	5.5	7.6	7.7	11.0	8.0	11.8	14.7
Special	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.7	0.2	0.3	0.7	0.8	0.8	0.7
Total	**42.1**	**41.5**	**44.4**	**53.6**	**48.0**	**65.1**	**60.0**	**50.1**	**54.8**	**44.0**	**41.2**	**29.4**	**33.3**	**37.0**

Table 1b. Relative Importance of Cutting Methods in Region 1

Region 1	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	40.4%	51.3%	59.0%	70.7%	68.1%	69.5%	75.0%	69.3%	67.3%	65.0%	61.0%	51.1%	56.9%	58.2%
Even-age/final	44.6%	35.2%	32.1%	22.1%	27.8%	28.5%	22.6%	28.3%	28.5%	28.1%	31.7%	31.6%	29.0%	32.9%
Selection	15.0%	13.5%	8.9%	7.2%	4.1%	2.0%	2.4%	2.4%	4.2%	6.9%	7.2%	17.3%	14.0%	8.9%
Regeneration	48.4%	47.6%	53.9%	49.6%	50.7%	61.0%	57.5%	58.2%	59.5%	53.2%	50.1%	43.2%	30.9%	25.8%
Even-age/prep	32.2%	34.6%	29.0%	32.3%	28.6%	22.0%	28.5%	23.9%	22.7%	22.4%	19.2%	21.7%	18.9%	18.5%
Intermediate	7.5%	6.2%	3.8%	6.6%	1.9%	4.7%	4.9%	5.5%	3.5%	6.1%	2.5%	5.0%	12.4%	14.0%
Sanitation	11.9%	11.7%	13.4%	11.4%	18.5%	11.8%	8.6%	11.0%	13.9%	17.5%	26.6%	27.2%	35.5%	39.7%
Special	0.0%	0.0%	0.0%	0.0%	0.3%	0.5%	0.5%	1.4%	0.4%	0.8%	1.6%	2.9%	2.3%	2.0%

Table 2a. Total Acres Cut (in thousands of acres) by Cutting System in Region 2 (Colorado, South Dakota, and Wyoming)

Region 2 Total	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	1.9	2.7	2.9	3.8	4.9	5.8	7.9	6.5	7.1	4.1	3.9	1.9	2.3	1.2
Even-age/final	2.6	2.1	3.0	2.1	4.2	6.3	10.7	12.4	17.1	10.2	9.9	8.1	4.6	1.7
Selection	0.6	0.1	0.5	0.3	0.7	1.1	0.9	0.8	0.9	3.2	4.2	3.2	6.0	2.5
Regeneration	**5.1**	**5.0**	**6.4**	**6.2**	**9.9**	**13.2**	**19.5**	**19.7**	**25.1**	**17.6**	**18.0**	**13.1**	**12.9**	**5.4**
Even-age/prep	3.7	9.4	8.6	8.4	19.3	21.1	23.5	21.1	18.2	17.3	11.5	9.6	8.1	8.7
Intermediate	8.9	11.5	15.4	25.8	16.3	17.0	12.2	10.3	13.9	4.7	6.8	3.8	4.4	4.3
Sanitation	9.2	4.7	4.4	2.4	3.8	5.6	3.9	4.7	8.4	4.6	6.9	2.8	3.5	2.3
Special	0.2	<0.1	<0.1	0.6	<0.1	0.4	1.0	1.1	3.7	3.3	2.6	1.2	1.4	0.5
Total	**27.1**	**30.5**	**34.8**	**43.3**	**49.3**	**57.3**	**60.1**	**56.8**	**69.3**	**47.4**	**45.9**	**30.4**	**30.2**	**21.1**

Table 2b. Relative Importance of Cutting Methods in Region 2

Region 2	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	37.0%	54.1%	44.9%	62.3%	50.0%	43.9%	40.7%	33.1%	28.1%	23.6%	21.9%	14.4%	17.6%	21.8%
Even-age/final	51.0%	43.2%	47.4%	33.5%	43.0%	47.9%	54.9%	62.8%	68.3%	58.0%	54.9%	61.5%	35.6%	30.8%
Selection	12.0%	2.8%	7.7%	4.2%	7.0%	8.2%	4.4%	4.1%	3.6%	18.4%	23.2%	24.1%	46.8%	47.4%
Regeneration	18.8%	16.3%	18.5%	14.2%	20.0%	23.0%	32.4%	34.6%	36.2%	37.0%	39.3%	43.0%	42.7%	25.4%
Even-age/prep	13.7%	30.9%	24.6%	19.3%	39.2%	36.8%	39.1%	37.1%	26.2%	36.4%	25.0%	31.5%	26.7%	41.0%
Intermediate	32.7%	37.5%	44.2%	59.7%	32.9%	29.7%	20.3%	18.2%	20.0%	10.0%	14.9%	12.6%	14.5%	20.5%
Sanitation	34.1%	15.3%	12.6%	5.5%	7.8%	9.8%	6.6%	8.2%	12.1%	9.6%	15.1%	9.0%	11.7%	10.7%
Special	0.7%	<0.1 %	0.1%	1.3%	0.1%	0.7%	1.6%	1.9%	5.4%	7.0%	5.7%	3.9%	4.5%	2.3%

Table 3a. Total Acres Cut (in thousands of acres) by Cutting System in Region 3 (Arizona and New Mexico)

Region 3 Total	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	0.3	0.2	<0.1	0.0	<0.1	0.4	0.2	0.4	0.1	0.2	0.4	<0.1	0.0	0.0
Even-age/final	14.0	13.4	12.9	4.3	4.4	21.1	12.5	16.0	4.4	6.2	1.6	1.8	1.0	0.0
Selection	1.0	0.1	0.0	0.0	<0.1	0.1	0.9	0.4	0.9	2.0	1.6	1.1	0.1	0.3
Regeneration	**15.3**	**13.6**	**13.0**	**4.3**	**4.5**	**21.6**	**13.6**	**16.8**	**5.4**	**8.3**	**3.6**	**2.9**	**1.1**	**0.3**
Even-age/prep	5.5	4.8	2.2	2.5	0.8	8.7	11.3	13.6	5.5	5.0	1.6	1.5	0.4	0.4
Intermediate	7.9	11.1	4.5	2.4	5.1	26.3	26.4	35.1	31.2	20.1	11.8	12.4	2.2	6.6
Sanitation	5.9	4.7	0.8	<0.1	2.1	3.3	1.3	4.2	2.5	5.0	3.8	1.5	0.4	5.4
Special	0.2	<0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	1.4	0.4	0.5	0.1	<0.1
Total	**34.8**	**34.2**	**20.4**	**9.2**	**12.4**	**59.8**	**52.6**	**69.9**	**44.7**	**39.9**	**21.2**	**18.8**	**4.2**	**12.7**

Table 3b. Relative Importance of Cutting Methods in Region 3

Region 3	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	2.0%	1.4%	0.1%	0.0%	1.1%	1.8%	1.7%	2.5%	2.4%	1.9%	10.3%	0.5%	0.0%	0.0%
Even-age/final	91.6%	98.1%	99.9%	100%	98.6%	98.0%	91.9%	95.3%	81.4%	74.3%	45.6%	63.0%	91.7%	0.0%
Selection	6.4%	0.5%	0.0%	0.0%	0.3%	0.3%	6.4%	2.2%	16.2%	23.8%	44.0%	36.5%	8.3%	100%
Regeneration	43.8%	39.8%	63.4%	46.6%	35.9%	36.0%	25.9%	24.1%	12.1%	20.8%	17.0%	15.6%	26.4%	2.0%
Even-age/prep	15.9%	13.9%	10.9%	27.0%	6.2%	14.5%	21.5%	19.4%	12.4%	12.6%	7.3%	7.9%	8.8%	3.5%
Intermediate	22.6%	32.5%	21.8%	26.0%	40.7%	44.0%	50.2%	50.3%	69.8%	50.5%	55.8%	65.7%	52.6%	52.2%
Sanitation	17.0%	13.7%	3.9%	0.4%	17.2%	5.4%	2.4%	6.1%	5.5%	12.5%	18.1%	8.2%	8.8%	42.3%
Special	0.7%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.3%	3.6%	1.8%	2.6%	3.4%	<0.1 %

Table 4a. Total Acres Cut (in thousands of acres) by Cutting System in Region 4 (southern Idaho, Nevada, Utah, and Wyoming)

Region 4 Total	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	2.5	1.2	2.6	2.8	1.9	1.5	9.3	11.3	9.5	4.9	4.7	2.7	2.7	1.6
Even-age/final	6.2	0.8	1.0	1.3	4.5	3.2	2.6	2.0	3.0	3.1	1.1	0.8	5.5	1.5
Selection	9.2	0.9	3.3	6.3	1.0	1.6	2.9	2.0	4.7	3.8	0.6	0.7	2.1	1.3
Regeneration	**17.9**	**2.8**	**6.9**	**10.4**	**7.4**	**6.3**	**14.8**	**15.2**	**17.2**	**11.8**	**6.5**	**4.2**	**10.4**	**4.4**
Even-age/prep	2.9	5.3	4.3	3.6	2.6	2.6	4.5	7.1	5.0	4.8	3.2	1.5	4.0	1.5
Intermediate	1.4	0.4	1.0	2.2	2.5	3.8	6.7	4.2	6.6	2.9	2.1	3.5	5.2	4.1
Sanitation	4.3	7.1	6.1	5.7	1.3	0.9	6.8	13.0	6.4	89.2	52.2	25.3	17.8	14.0
Special	0.1	0.4	0.2	0.0	0.0	0.1	<0.1	0.3	0.2	>0.1	0.1	0.4	0.5	0.1
Total	**26.6**	**16.0**	**18.5**	**21.9**	**13.9**	**13.8**	**32.9**	**39.9**	**35.5**	**108.7**	**64.1**	**34.9**	**37.9**	**24.1**

Table 4b. Relative Importance of Cutting Methods in Region 4

Region 4	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	14.1%	40.7%	38.0%	26.9%	26.0%	24.0%	62.5%	73.9%	55.1%	41.5%	73.3%	64.7%	26.0%	36.2%
Even-age/final	34.7%	27.1%	14.9%	12.2%	61.0%	51.4%	17.7%	13.3%	17.3%	26.0%	17.4%	18.6%	53.5%	33.4%
Selection	51.2%	32.2%	47.2%	60.9%	13.0%	24.6%	19.8%	12.8%	27.5%	32.5%	9.3%	16.7%	20.5%	30.4%
Regeneration	67.3%	17.7%	37.3%	47.3%	53.7%	46.0%	45.1%	38.2%	48.5%	10.9%	10.1%	11.9%	27.3%	18.2%
Even-age/prep	10.9%	33.2%	23.5%	16.5%	18.9%	18.9%	13.8%	17.9%	14.2%	4.4%	5.0%	4.4%	10.6%	6.0%
Intermediate	5.1%	2.3%	5.2%	10.0%	17.9%	27.6%	20.5%	10.5%	18.6%	2.7%	3.3%	10.1%	13.8%	17.1%
Sanitation	16.2%	44.5%	32.8%	26.2%	9.5%	6.5%	20.5%	32.6%	18.1%	82.0%	81.5%	72.4%	47.0%	58.1%
Special	0.5%	2.3%	1.2%	0.0%	0.0%	1.0%	0.1%	0.8%	0.6%	<0.1 %	0.1%	1.2%	1.2%	0.6%

Table 5a. Total Acres Cut (in thousands of acres) by Cutting System in Region 5 (California)

Region 5 Total	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	14.4	22.0	12.9	18.5	35.8	11.1	12.4	12.0	9.8	10.6	7.5	3.0	2.4	1.2
Even-age/final	21.5	34.0	4.8	5.8	20.2	19.7	10.8	10.7	6.4	6.8	9.7	7.4	0.8	0.4
Selection	9.8	11.1	2.2	2.7	6.7	3.7	3.9	3.5	5.2	4.7	3.9	7.4	1.3	0.7
Regeneration	**45.8**	**67.1**	**19.9**	**27.0**	**62.8**	**34.5**	**27.1**	**26.2**	**21.5**	**22.2**	**21.2**	**17.8**	**4.5**	**2.3**
Even-age/prep	5.9	5.5	3.4	3.5	4.0	5.2	3.3	1.6	1.3	0.6	1.2	1.1	1.0	0.5
Intermediate	4.3	6.8	5.5	6.0	5.8	1.6	2.9	3.7	4.7	6.1	5.4	8.9	11.2	17.2
Sanitation	64.2	49.5	20.7	16.8	50.9	68.3	105.4	79.9	118.7	77.1	70.5	43.3	25.0	35.8
Special	0.3	0.4	0.5	0.7	0.1	0.3	0.2	<0.1	<0.1	0.2	0.7	0.9	0.1	0.2
Total	**120.6**	**129.4**	**49.9**	**54.1**	**123.6**	**109.9**	**138.9**	**111.5**	**146.2**	**106.2**	**99.0**	**71.9**	**41.8**	**56.0**

Table 5b. Relative Importance of Cutting Methods in Region 5

Region 5	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	31.5%	32.7%	64.6%	68.7%	57.1%	32.3%	45.9%	45.8%	45.7%	47.9%	35.6%	16.7%	54.2%	50.7%
Even-age/final	47.0%	50.7%	24.2%	21.3%	32.2%	57.0%	39.8%	41.0%	30.0%	30.8%	45.8%	41.6%	17.6%	18.8%
Selection	21.5%	16.6%	11.3%	10.0%	10.7%	10.7%	14.3%	13.3%	24.3%	21.3%	18.6%	41.7%	28.2%	30.5%
Regeneration	38.0%	51.9%	39.9%	49.9%	50.8%	31.4%	19.5%	23.5%	14.7%	20.9%	21.4%	24.7%	10.7%	4.1%
Even-age/prep	4.9%	4.3%	6.8%	6.5%	3.3%	4.7%	2.4%	1.4%	0.9%	0.6%	1.2%	1.6%	2.3%	0.8%
Intermediate	3.6%	5.2%	11.0%	11.1%	4.7%	1.5%	2.1%	3.3%	3.2%	5.8%	5.5%	12.4%	26.8%	30.7%
Sanitation	53.3%	38.3%	41.4%	31.1%	41.2%	62.2%	75.9%	71.7%	81.2%	72.6%	71.2%	60.1%	59.9%	63.9%
Special	0.2%	0.3%	0.9%	1.4%	0.1%	0.3%	0.2%	<0.1 %	<0.1 %	0.2%	0.7%	1.2%	0.3%	0.4%

Table 6a. Total Acres Cut (in thousands of acres) by Cutting System in Region 6 (Oregon and Washington)

Region 6 Total	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	42.5	41.3	42.1	51.4	68.5	81.5	59.5	49.7	29.3	22.1	10.9	9.5	4.5	4.7
Even-age/final	47.8	61.3	33.9	42.1	58.7	80.1	68.0	59.6	43.7	25.7	25.3	11.0	3.5	2.1
Selection	6.3	5.7	11.8	4.6	13.3	11.1	11.6	22.5	15.8	13.2	11.4	10.8	11.2	8.9
Regeneration	**96.6**	**108.3**	**87.9**	**98.0**	**140.5**	**172.6**	**139.1**	**131.9**	**88.9**	**61.0**	**47.6**	**31.3**	**19.2**	**15.7**
Even-age/prep	17.9	17.7	14.3	27.1	23.3	51.0	48.4	33.8	26.0	20.2	24.5	13.2	6.6	9.4
Intermediate	9.1	9.7	6.9	6.5	10.0	16.6	21.8	14.5	17.2	9.5	12.0	12.0	13.1	22.4
Sanitation	40.7	31.7	8.3	11.8	6.8	31.4	33.6	61.5	16.4	47.6	26.1	33.0	60.1	68.9
Special	0.1	0.5	0.2	0.9	1.1	1.0	0.3	2.0	1.4	0.1	1.8	1.0	0.2	0.6
Total	**164.4**	**167.9**	**117.5**	**144.4**	**181.6**	**272.6**	**243.2**	**243.8**	**149.9**	**138.4**	**112.0**	**90.6**	**99.2**	**117.0**

Table 6b. Relative Importance of Cutting Methods in Region 6

Region 6	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	44.0%	38.1%	47.9%	52.4%	48.8%	47.2%	42.8%	37.7%	33.0%	36.1%	23.0%	30.4%	23.3%	29.8%
Even-age/final	49.4%	56.7%	38.6%	42.9%	41.8%	46.4%	48.9%	45.2%	49.2%	42.2%	53.0%	35.0%	18.3%	13.5%
Selection	6.5%	5.2%	13.5%	4.7%	9.5%	6.4%	8.3%	17.1%	17.8%	21.7%	24.0%	34.6%	58.4%	56.7%
Regeneration	58.8%	64.5%	74.8%	67.9%	77.5%	63.3%	57.2%	54.1%	59.3%	44.1%	42.5%	34.6%	19.4%	13.4%
Even-age/prep	10.9%	10.5%	12.1%	18.8%	12.8%	18.7%	19.9%	13.9%	17.4%	14.6%	21.9%	14.6%	6.6%	8.0%
Intermediate	5.5%	5.8%	5.9%	4.5%	5.5%	6.1%	9.0%	6.0%	11.5%	6.9%	10.7%	13.2%	13.2%	19.2%
Sanitation	24.7%	18.9%	7.1%	8.2%	3.7%	11.5%	13.8%	25.2%	11.0%	34.4%	23.3%	36.5%	60.6%	59.9%
Special	<0.1 %	0.3%	0.1%	0.6%	0.6%	0.4%	0.1%	0.8%	0.9%	<0.1 %	1.6%	1.1%	0.2%	0.5%

Table 8a. Total Acres Cut (in thousands of acres) by Cutting System in Region 8 (Oklahoma & Texas through Virginia)

Region 8 Total	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	106.9	108.7	97.8	97.0	90.3	66.2	55.1	34.1	34.4	30.3	18.7	13.4	9.3	9.0
Even-age/final	13.6	10.8	8.5	6.2	3.6	2.5	3.9	2.6	1.7	2.1	2.0	2.0	1.4	2.1
Selection	0.0	0.0	0.0	0.0	0.6	1.3	4.5	6.6	8.8	11.3	15.5	12.7	13.1	16.8
Regeneration	**120.5**	**119.6**	**106.2**	**103.3**	**94.5**	**70.0**	**63.4**	**43.3**	**44.9**	**43.6**	**36.2**	**28.2**	**23.8**	**27.7**
Even-age/prep	5.8	5.6	5.6	6.0	6.7	3.9	6.8	9.6	11.8	15.4	13.9	9.9	9.4	9.1
Intermediate	104.2	93.4	75.7	81.6	74.4	50.6	70.4	51.1	60.4	58.5	62.2	53.2	61.9	51.8
Sanitation	28.3	5.1	17.4	18.0	1.8	5.1	45.9	3.4	8.3	7.0	4.8	8.2	28.2	9.3
Special	0.4	0.0	0.0	0.3	0.7	<0.1	0.0	<0.1	7.7	3.0	6.7	3.2	3.4	2.0
Total	**259.1**	**223.7**	**205.0**	**209.2**	**178.1**	**129.6**	**186.6**	**107.5**	**133.0**	**127.5**	**123.8**	**102.7**	**126.6**	**100.0**

Table 8b. Relative Importance of Cutting Methods in Region 8

Region 8	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	88.7%	90.9%	92.0%	94.0%	95.6%	94.6%	86.9%	78.9%	76.7%	69.5%	51.7%	47.6%	39.3%	32.6%
Even-age/final	11.3%	9.1%	8.0%	6.0%	3.8%	3.6%	6.1%	5.9%	3.7%	4.7%	5.4%	7.2%	5.7%	7.5%
Selection	0.0%	0.0%	0.0%	0.0%	0.6%	1.8%	7.0%	15.2%	19.6%	25.8%	42.9%	45.2%	55.1%	59.9%
Regeneration	46.5%	53.5%	51.8%	49.4%	53.1%	54.0%	34.0%	40.3%	33.7%	34.2%	29.2%	27.5%	18.8%	27.7%
Even-age/prep	2.2%	2.5%	2.7%	2.9%	3.8%	3.0%	3.7%	8.9%	8.8%	12.0%	11.2%	9.7%	7.4%	9.1%
Intermediate	40.2%	41.8%	36.9%	39.0%	41.8%	39.0%	37.7%	47.6%	45.4%	45.9%	50.2%	51.8%	48.9%	51.9%
Sanitation	10.9%	2.3%	8.5%	8.6%	1.0%	3.9%	24.6%	3.2%	6.2%	5.5%	3.9%	8.0%	22.2%	9.3%
Special	0.1%	0.0%	0.0%	0.2%	0.4%	0.0%	0.0%	<0.1 %	5.8%	2.4%	5.5%	3.1%	2.7%	2.0%

Table 9a. Total Acres Cut (in thousands of acres) by Cutting System in Region 9 (Maine to Maryland to Missouri to Minnesota)

Region 9 Total	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	59.4	54.8	54.7	56.1	55.2	49.6	44.9	41.6	38.8	34.8	32.9	24.5	25.6	20.9
Even-age/final	4.1	3.6	2.4	3.4	3.0	3.8	3.8	3.3	2.1	2.8	3.4	3.2	2.9	2.9
Selection	7.8	7.0	8.1	9.0	6.7	9.7	9.6	11.3	11.9	13.5	16.1	15.8	17.4	17.2
Regeneration	**71.3**	**65.4**	**65.3**	**68.5**	**64.9**	**63.1**	**58.3**	**56.2**	**52.8**	**51.1**	**52.4**	**43.5**	**45.8**	**41.0**
Even-age/prep	3.6	3.7	3.4	3.9	4.4	5.0	5.3	5.4	6.7	6.8	7.1	6.6	6.5	6.4
Intermediate	36.9	38.3	36.5	44.4	42.1	43.4	45.1	38.6	45.8	48.5	43.0	38.8	38.0	36.2
Sanitation	4.4	5.9	7.2	7.3	0.0	4.0	5.6	5.2	3.9	3.0	3.8	4.3	5.0	3.6
Special	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	<0.1	<0.1	<0.1	0.1	0.1
Total	**116.3**	**113.3**	**112.3**	**124.1**	**111.7**	**115.5**	**114.2**	**105.4**	**109.3**	**109.5**	**106.3**	**93.2**	**95.5**	**87.4**

Table 9b. Relative Importance of Cutting Methods in Region 9

Region 9	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	83.3%	83.7%	83.8%	81.9%	85.1%	78.6%	77.0%	74.0%	73.4%	68.1%	62.8%	56.3%	55.8%	51.0%
Even-age/final	5.7%	5.6%	3.7%	5.0%	4.6%	6.1%	6.5%	6.0%	4.1%	5.4%	6.6%	7.4%	6.3%	7.2%
Selection	10.9%	10.7%	12.5%	13.1%	10.3%	15.3%	16.5%	20.1%	22.5%	26.5%	30.7%	36.3%	37.9%	41.8%
Regeneration	61.4%	57.7%	58.1%	55.2%	58.1%	54.6%	51.0%	53.3%	48.3%	46.6%	49.3%	46.7%	48.0%	47.0%
Even-age/prep	3.1%	3.3%	3.0%	3.2%	3.9%	4.3%	4.6%	5.2%	6.1%	6.3%	6.6%	7.1%	6.8%	7.3%
Intermediate	31.8%	33.8%	32.5%	35.7%	38.0%	37.6%	39.5%	36.6%	41.9%	44.3%	40.5%	41.6%	39.8%	41.4%
Sanitation	3.8%	5.2%	6.4%	5.9%	0.0%	3.5%	4.9%	4.9%	3.6%	2.8%	3.6%	4.6%	5.3%	4.1%
Special	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	<0.1 %	<0.1 %	<0.1 %	<0.1 %	0.1%	0.2%

Table 10a. Total Acres Cut (in thousands of acres) by Cutting System in Region 10 (Alaska)

Region 10 Total	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	6.8	8.6	8.6	8.9	9.8	13.5	14.0	10.7	11.7	10.5	9.1	6.4	3.9	1.7
Even-age/final	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.4	0.2
Selection	0.8	0.3	0.2	0.2	<0.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.0	0.0	0.1
Regeneration	**7.6**	**8.9**	**8.8**	**9.0**	**9.8**	**13.5**	**14.0**	**10.7**	**11.7**	**10.5**	**9.1**	**6.9**	**4.3**	**2.0**
Even-age/prep	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.0	<0.0	0.1	0.1	0.0
Intermediate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sanitation	<0.0	<0.0	1.2	0.9	<0.0	0.2	0.2	0.2	0.2	0.2	0.6	0.2	0.6	0.5
Special	0.0	<0.0	<0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**7.6**	**8.9**	**10.1**	**10.5**	**9.8**	**13.6**	**14.2**	**10.9**	**11.9**	**10.8**	**9.7**	**7.2**	**5.0**	**2.5**

Table 10b. Relative Importance of Cutting Methods in Region 10

NFS Total	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	89.3%	96.9%	97.6%	98.1%	99.9%	100%	100%	100%	100%	100%	100%	92.9%	91.4%	86.6%
Even-age/final	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.9%	8.6%	8.3%
Selection	10.7%	3.1%	2.4%	1.9%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	5.1%
Regeneration	99.9%	99.9%	87.6%	85.8%	99.8%	98.9%	98.3%	98.3%	98.1%	97.7%	93.5%	95.6%	86.3%	78.4%
Even-age/prep	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	<0.1 %	<0.1 %	2.0%	1.0%	0.0%
Intermediate	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sanitation	0.1%	<0.1 %	12.2%	8.9%	0.2%	1.1%	1.7%	1.7%	1.9%	2.3%	6.3%	2.3%	12.7%	21.6%
Special	0.0%	0.1%	0.2%	5.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 11a. Total Acres Cut in the National Forest System by Cutting System (in thousands of acres)

NFS Total	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	243.0	249.5	235.7	257.4	283.1	257.2	229.2	186.6	162.7	132.7	100.8	67.9	56.6	45.9
Even-age/final	118.9	133.1	74.3	71.0	105.5	148.1	120.1	115.0	87.8	63.4	59.6	38.8	23.0	14.0
Selection	38.6	27.9	28.3	24.9	29.9	29.2	35.0	47.7	49.5	53.4	54.8	53.9	52.7	48.4
Regeneration	**400.5**	**410.5**	**338.3**	**353.3**	**418.5**	**434.4**	**384.3**	**349.2**	**300.0**	**249.5**	**215.2**	**160.6**	**132.3**	**108.3**
Even-age/prep	59.0	66.4	54.6	72.4	74.8	111.9	120.3	104.2	87.0	80.0	70.8	50.1	42.2	42.8
Intermediate	175.8	173.7	147.2	172.4	157.4	162.4	188.4	160.3	181.6	153.1	144.4	134.0	140.1	147.8
Sanitation	162.0	113.6	71.9	69.1	75.7	126.4	207.8	177.7	172.5	241.5	179.9	126.5	152.6	154.5
Special	1.2	1.3	0.9	3.1	2.0	2.1	1.9	4.3	13.5	8.4	13.0	8.0	6.5	4.4
Total	**798.5**	**765.4**	**612.9**	**670.3**	**728.4**	**837.1**	**902.6**	**795.7**	**754.6**	**732.5**	**623.3**	**479.2**	**473.7**	**457.8**

Table 11b. Relative Importance of Cutting Methods in the National Forest System

NFS	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97
Clearcutting	60.7%	60.8%	69.7%	72.9%	67.6%	59.2%	59.6%	53.4%	54.2%	53.2%	46.8%	42.3%	42.8%	42.4%
Even-age/final	29.7%	32.4%	22.0%	20.1%	25.2%	34.1%	31.3%	32.9%	29.3%	25.4%	27.7%	24.1%	17.4%	12.9%
Selection	9.6%	6.8%	8.4%	7.0%	7.2%	6.7%	9.1%	13.7%	16.5%	21.4%	25.5%	33.6%	39.8%	44.7%
Regeneration	50.2%	53.6%	55.2%	52.7%	57.4%	51.9%	42.6%	43.9%	39.8%	34.1%	34.5%	33.5%	27.9%	23.6%
Even-age/prep	7.4%	8.7%	8.9%	10.8%	10.3%	13.4%	13.3%	13.1%	11.5%	10.9%	11.4%	10.4%	8.9%	9.4%
Intermediate	22.0%	22.7%	24.0%	25.7%	21.6%	19.4%	20.9%	20.2%	24.1%	20.9%	23.2%	28.0%	29.6%	32.3%
Sanitation	20.3%	14.8%	11.7%	10.3%	10.4%	15.1%	23.0%	22.3%	22.9%	33.0%	28.9%	26.4%	32.2%	33.8%
Special	0.2%	0.2%	0.1%	0.5%	0.3%	0.2%	0.2%	0.5%	1.8%	1.1%	2.1%	1.7%	1.4%	1.0%