Appendix A

Glossary

Arterial roads: Authorized roads that provide service to large land areas that are usually developed and operated for long-term land and resource management purposes and constant service.

Classified road: A road within National Forest System lands planned or managed for motor vehicle access including state roads, county roads, private roads, permitted roads, and Forest Service roads.

Collector roads: Authorized roads, serving smaller land areas than arterial roads, that collect traffic from local roads and usually connect to forest arterial roads or State and county highways. They are operated for either constant or intermittent service depending on land use and resource management objectives.

Construction: Supervising, inspecting, building, and all expenses incidental to constructing or reconstructing of a forest development transportation facility, including location, surveying, and mapping.

Contiguous areas: For purposes of implementing the proposed action, these are areas of 1,000 acres or more with a common boundary of considerable length that provide important corridors for wildlife movement or extend a unique ecological value of the established inventoried area.

Decommissioning: Various levels of treatment to stabilize and rehabilitate unneeded roads, such as blocking the entrance, revegetating, water barring, removing fills and culverts, reestablishing drainage-ways, removing unstable road shoulders, or full obliteration by recontouring and restoring natural slopes.

Forest development road: A road wholly or partially within or adjacent to a National Forest System boundary that the Forest Service has authorized and maintains jurisdiction over and that is necessary for the protection, administration, and use of lands under the agency's jurisdiction.

Improvement: Construction activity that raises the traffic service level of a road or improves its safety or operating efficiency.

Invasive plant species:	Plants that have been introduced into an environment in which they did not evolve and thus usually have no natural enemies to limit their reproduction, which allows them to spread.
Local roads:	Roads that connect terminal activities *(e.g.*, trail head, log landing, camping site, *etc.*) to collector and arterial roads. They are constructed to meet the access requirements of a specific resource activity rather than travel efficiency. When not being used for the activity for which they were constructed, they may be used for other purposes. They are often gated to restrict motor vehicle use. The construction standards for these roads are determined by the requirements necessary for the specific activity.
Maintenance:	Ongoing minor restoration and upkeep of a road necessary to retain the road's approved traffic service level.
Noxious weeds:	Those plant species designated as noxious weeds by the Secretary of Agriculture or by a responsible State official. Noxious weeds generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insects or disease, and being native or new to or not common to the United States or parts thereof.
Private road:	A road under private ownership authorized by an easement to a private party, or a road that provides access pursuant to a reserved or private right.
Public road:	As defined in 23 U.S.C. 101(a), a road or street under the jurisdiction of and maintained by a public authority (*e.g.*, States, counties, or local governments) and open to public travel.
Realignment:	Construction activity that results in the new location of an existing road or portions thereof. Realignment may include decommissioning abandoned sections of roadways.
Reconstruction:	Construction activity that results in improvement, restoration, or realignment of a road.
Restoration:	Construction activity required to restore a road to its approved traffic service level.
Road:	A motor vehicle travelway over 50 inches wide, unless classified and managed as a trail. A road may be classified or unclassified.

Roadless areas:	Undeveloped areas typically exceeding 5,000 acres that meet the minimum criteria for wilderness consideration under the Wilderness Act and the planning regulations at 36 CFR 219.17 that were inventoried during the Forest Service's formal Roadless Area Review and Evaluation (RARE II) process, and that remain roadless through forest planning decisions. Designated roadless areas do not overlap with unroaded areas.
Temporary road:	A road associated with timber sale contracts, fire activities, or other short-term access needs that are unnecessary for future resource management and are not intended to be a part of the forest transportation plan.
Unclassified road:	A road not intended to be part of, and not managed as part of, the National Forest transportation system such as a temporary road, an unplanned road, an off-road vehicle track, and an abandoned travelway.
Unroaded areas:	Any area without a classified road that is at least 50 inches wide and was constructed or is maintained for vehicle use. The size of the area must be sufficient enough and in a manageable configuration to protect the inherent values associated with the unroaded condition. Unroaded areas do not overlap with designated roadless areas.

Appendix B

List of Acronyms

CFR	Code of Federal Regulations
EA	environmental assessment
EIS	environmental impact statement
Fed. Reg.	*Federal Register*
NEPA	National Environmental Policy Act
NFS	National Forest System
RARE II	Roadless Area Review and Evaluation (second phase)
TES	threatened, endangered, and sensitive (species)
U.S.C.	United States Code
USDA	United States Department of Agriculture

Appendix C

Demographic Data

United States Population Potentially Affected by the Proposed Road Management Strategy
(based on the 1990 U.S. Census)

By Total U.S. Population	248,709,873	(100%)
Urban population	187,051,543	(75%)
Rural population	61,658,330	(25%)
Rural farm population	3,871,583	(2%)
Rural nonfarm population	57,786,747	(23%)

By Average Age - 35.3

By Sex

Male	121,172,379	(49%)
Female	127,537,494	(51%)

By Race

White	199,827,064	(80%)
Black	29,930,524	(12%)
American Indian, Eskimo or Aleut	2,015,143	(1%)
Asian or Pacific Islander	7,226,986	(3%)
Other Race	9,710,156	(4%)
Hispanic Origin (any race)	21,900,089	(9%)

By Disability

Total persons with disabilities	13,158,203	(7%)
Mobility limitation only	4,250,180	(2%)
Self-care limitation only	5,093,652	(3%)
Mobility and self-care limitation	3,814,371	(2%)

By Ancestry

Single ancestry	148,836,940	(60%)
Multiple ancestry	73,771,307	(30%)
Unclassified or not reported	26,101,626	(10%)

By Citizenship

Native born	228,942,557	(92%)
Foreign born	19,767,316	(8%)
Naturalized citizen	7,996,998	(3%)

Foreign born by year of entry to United States

1980-1990	8,663,627	(3%)
1970-1979	4,869,415	(2%)
1960-1969	2,792,565	(1%)
Before 1960	3,441,709	(1%)

By ability to speak English

Speak only English	198,600,798	(86%)
Speak English "very well"	17,862,477	(8%)
Speak English "well"	7,310,301	(3%)
Speak no English or "not well"	6,672,201	(3%)

By Non-English Home Language

Spanish	17,345,064	(8%)
Asian or Pacific Islander	4,471,621	(2%)
Other	10,028,294	(4%)

Appendix D

Map

U.S. Map of National Forests and Grasslands

APPENDIX E

Cost-Benefit Analysis: Long-term National Forest System road management strategy

Introduction

The Forest Service is proposing to revise its policy concerning the management of the National Forest Transportation System to address changes in how the system is developed, used, maintained, and funded. This action is necessary to ensure that the transportation system meets current and future management objectives and public uses of the National Forest System (NFS) lands, provides for safe public use, allows for economical and efficient management, and causes minimum adverse environmental impacts. The changes in policy would be reflected in Forest Service regulations (36 CFR Parts 212 and 261) and in the Forest Service Manual, Titles 1900 (Planning) and 7700 (Transportation System).

The existing road system on NFS lands was largely constructed over the last 50 years to develop areas for timber harvesting and to develop other resources such as minerals. In the last two decades alternative uses of the NFS have increased. Specifically, resource uses have shifted substantially toward recreational activities and away from timber harvesting and similar resource development.

The Forest Service needs to modify its existing road development policy to one that allows the agency to balance scientific information, public needs, safety and environmental protection, and funding levels when determining the size, purpose, and extent of the future Forest Transportation System and any specific road reconstruction or construction activities. Further, in response to strong public sentiment, the Forest Service needs to manage its lands to take into account roadless areas values such as scenic quality, solitude, and primitive recreation opportunities as well as values associated with resource use such as timber harvesting. The agency also needs to develop a complete inventory of its existing road system to identify unneeded roads that could be decommissioned.

The costs and benefits associated with the proposed strategy are described qualitatively in most cases. The proposed strategy provides guidance for transportation planning, but does not dictate land management decisions. Therefore, for the most part only the expected direction of change can be described. The only exception was the potential effects on timber harvest, in which case the maximum potential effects were estimated.

A qualitative assessment found more factors with expected net positive benefits than expected negative benefits (Table E1). Although a quantitative assessment of net benefits was not possible, the qualitative comparison implies that the benefits of the proposed strategy outweigh the costs. The proposed strategy would clearly result in net benefits through improving water and air quality, wildlife and fish habitat, protection of wilderness areas and passive use values, and reducing the spread of noxious weeds and invasive plants. More mixed effects are expected for recreation and heritage resources, with likely reductions in some types of roaded access and some improvements or maintenance of legal more wilderness-type environments. Access for public safety, law enforcement, and

access would not be affected. Access to minerals and timber would be reduced by the proposed strategy, particularly in the transition phase.

Background[1]

The NFS contains about 192 million acres. Approximately 35 million acres (18%) of that area is congressionally designated wilderness areas. An additional 50 million acres (26%) are roadless areas inventoried in the Roadless Area Review and Evaluation (RARE II) conducted in the mid-1970s or identified in existing land and resource management plans. Although designated "roadless," some of these areas do contain classified and/or unclassified roads. Only 8 million acres of the 50 million acres are designated as suitable for timber harvest.

The remaining 124 million acres (65%) are roaded (developed) areas and other unroaded areas. Unroaded areas are defined as 1,000 acres or more that are contiguous to: (1) remaining unroaded portions of RARE II inventoried roadless areas, (2) roadless areas inventoried in land and resource management plans, (3) congressionally designated wilderness or Federally-administered components of the National Wild and Scenic River System classified as Wild, or (4) unroaded areas of 5,000 acres or more on other Federal lands. These areas of 1,000 acres or more have a common boundary of considerable length, a width of at least one-quarter mile, and provide important corridors for wildlife movement or extend a unique ecological value of the established inventoried area

The current NFS transportation system consists of approximately 450,000 miles of classified roads, of which 373,000 miles are roads managed by the Forest Service. Public and private roads are not affected by this proposed strategy. About 22% of classified Forest Service roads are main access roads that serve all users (arterial and collector roads), 55% are local roads typically passable by high-clearance vehicles, and 23% provide intermittent access for administration, protection, and non-highway vehicle use, but are restricted from highway-vehicle access by gates or other methods. The Forest Service estimates that at least 60,000 miles of unclassified roads occur on NFS, although the number could be substantially higher. Unclassified roads include temporary roads and roads that were never planned, built, or maintained to safety, service, and environmental standards.

Currently, about 1% of forest roads are used for logging purposes. About 15,000 logging trucks and vehicles associated with timber harvest use FS roads each day, about the same level of use as 1950. The current usage reflects the decline in timber harvest from about 12 billion board feet in 1987 to 3.3 billion board feet in 1998. Road use has also declined

[1] Statistics on road miles and road use are based on USDA Forest Service. The National Forest Road System and Its Use. Draft Report (9/9/98) Engineering Staff.

from non-roaded harvesting techniques, such as helicopter logging. About 9,000 FS vehicles travel FS roads each day for management purposes.

In contrast to road use for timber harvest, recreation road use has increased dramatically since 1950 and is expected to continue to increase. An estimated 1.7 million vehicles associated with recreation activities travel FS roads daily during the summer.

Recent trends in road construction, reconstruction, and decommissioning are shown in table E2. New road construction has been steadily declining, while trends in reconstruction and decommissioning have varied over the same time period.

Framework for the Economic Analysis

The proposed strategy provides policy guidance for the purpose of land and resource management planning on the National Forests and Grasslands. It does not dictate resource outcomes at the local level. Although it is not possible to quantify the impacts at the National Forest and Grassland level, it is possible to describe a potential range of effects by comparing two alternatives that capture the potential maximum range of effects.

Comparison of alternatives
The no action alternative is a continuation of management actions described in current land and resource management plans. A complete description of the no action alternative can be found in the Environmental Assessment. Table E3 lists the total miles of road development planned under the no action alternative. The number of miles of planned development that would occur in inventoried roadless or other unroaded areas is also shown in Table E3.

The proposed Road Management Strategy differs from the current policy in several ways. The proposed strategy switches the emphasis from road development to providing the minimum transportation system needed to meet management objectives. Any proposal to construct, reconstruct, maintain, or decommission roads will be required to better account for effects on ecosystem values. Priority will be given to decommissioning unneeded roads and maintaining the most heavily used roads. Finally, until a comprehensive road inventory and road analysis has been conducted and integrated into revisions of land and resource management plans, any construction or reconstruction proposals for inventoried roadless and other unroaded areas must demonstrate a compelling need and will require an environmental impact statement approved by the Regional Forester.

The proposed action alternative was designed to provide an estimate of maximum potential effects in comparison to the no action alternative. The proposed action alternative assumes that no road construction or reconstruction will occur in inventoried roadless or other unroaded areas, except to guarantee public safety and to ensure access

provided by statute, or provided pursuant to reserved and outstanding rights. Total road development activity under the proposed action alternative is shown in Table E3.

Generally, it was assumed that road development activity on roaded areas of the NFS will be similar under the no action alternative and the proposed strategy alternative. The main difference is the greater emphasis on reconstruction and decommissioning. If funds are available, more miles of reconstruction and decommissioning will occur in roaded areas than under the no action alternative. The proposed strategy is also likely to result in roads that have fewer negative environmental impacts, and are more responsive to current user and management needs.

Economic effects

Two economic effects are considered when comparing the no action alternative to the proposed strategy alternative: economic efficiency and economic impacts. Economic efficiency is accomplished using benefit-cost analysis procedures and will be referred to as such hereafter. The benefit-cost analysis focuses on the potential change in the flow of goods and services valued by society. Ideally, the effects on economic values would be captured in a benefit-cost framework. However, the proposed policy does not dictate site level effects, and so it was not possible to estimate effects numerically. The exception was the potential for reduced timber harvest. The expected effects on other resources are qualitatively described.

The no action alternative as described above and in the Environmental Assessment will serve as the baseline for comparison of effects with other alternatives (in this case the proposed action). This is consistent with guidelines in the Office of Management and Budget (OMB) Best Practices document (1996). All quantified and monetized costs and benefits are reported on an annual basis. There are no quantified or monetized temporal streams of benefits and/or costs reported because of the indeterminable transition period between the proposed rule and when Forest Land Management Plans are revised.

Costs and benefits expressed quantitatively are incremental. Monetized values are "nominal" unless otherwise indicated. Estimates of inflation are not included in any future benefits or costs. A real discount rate of 4% was used where costs and benefits were compared for a particular base year (FSM 1909.17, ch 10 s15.42, 7/88).

In addition to balancing the benefits and costs to the public, the Forest Service considers the impacts of its policies on economic activity, measured by the effects on jobs and payments to States. Activities on NFS lands generate jobs in local communities and revenue to States. Jobs are created by commodity extraction, recreation use, and special uses. Payments to States are from receipts generated through a variety of programs. As with the cost benefit analysis, effects could only be quantified for potential reductions in timber harvest.

Timeframe for the analysis
The effects described in this analysis will occur over the transition phase, which ends when all land and resource management plans have completed the revision process. Plans must be revised at least once every 15 years, but the revision cycle varies across management units. Therefore, the revision process will be continuous over the 15-year period.

The maximum potential economic effects are estimated on an annual basis. Revised land and resource management plans will incorporate the new road policy, which includes consideration of the full range of benefits and costs associated with management options for inventoried roadless and other unroaded areas. As plans are revised, the effects of the proposed policy are replaced by the direction in the revised plan. Therefore, the maximum effects are only likely to occur in the first few years of the transition phase, when few plans have completed the revision process.

Economic Effects

Agency Road Management Costs
The road management costs of the proposed action are not expected to vary significantly from the road management costs of the no action alternative, particularly in the short term. Management of arterial and collector roads is expected to be similar under both alternatives. These roads, which account for 22% of FS road miles, carry over 80% of the traffic on the NFS. These roads need to be brought up to safety and environmental standards, and are not targeted for decommissioning. Although accounting for less than a quarter of total road miles, the cost of construction, reconstruction, and maintenance is higher on these roads than on local roads.

The proposed strategy shifts the emphasis of road management on NFS, but not necessarily the total costs of road management or total miles of activity. New road construction is expected to decline, while reconstruction and decommissioning is expected to increase. New road construction is generally more expensive than reconstruction and decommissioning, although the range of costs for all of these activities varies widely. Overall, the net effect on costs is difficult to assess because of the wide variability in costs.

The cost of new road construction has been estimated to range from $50,000 (for high-clearance vehicles) to $210,000 per mile (for arterial or collector roads). Under the no action alternative, the Forest Service would incur costs for constructing 469 miles of new roads, at a cost between $23 million and $98 million. The cost of constructing the remaining 157 miles would be incurred by private landowners, ski area operators, or mining interests. Under the proposed action, the Forest Service would pay for construction of 327 of the 484 miles, for a total cost ranging from $16 million to $69 million. Therefore, new road construction costs are expected to be lower under the proposed action.

The cost of reconstruction also varies widely, ranging from $8,000 (for high-clearance roads) to $50,000 (for arterial or collector roads) per mile. Under the no action alternative, the Forest Service would incur costs for reconstructing 3,853 of the total 4,140 miles of road, at a cost ranging from $31 to $193 million. Reconstruction miles under the proposed action are less than under the no action because data were only available to estimate the miles of road reconstruction that would not occur in inventoried roadless or other unroaded areas. In fact, the proposed action is intended to place more emphasis on reconstruction. Therefore, costs for reconstruction should be higher under the proposed policy. The FS already has a significant backlog of deferred maintenance and improvement needs identified. The potentially lower new construction costs would be balanced against reconstruction needs within available funding constraints.

A related cost issue is the effect of the procedural requirements under the proposed action for building roads in inventoried roadless or other unroaded areas. If a road is proposed into a roadless area, an EIS will be required. However, current practice is to conduct an EIS for any proposed timber sale or other action that enters a roadless area, so the procedural costs are not affected. The main change under the proposed action is to elevate the decision authority to the Regional Forester. To the extent that roads do get built in roadless areas, the cost per mile tends to be higher than for roaded areas. The no action alternative includes new road construction into roadless areas, which implies those construction costs will be higher than those under the proposed action.

A final agency cost consideration is the effect of requiring a complete inventory of roads on the National Forest System, which will be compiled in a transportation atlas. The requirement for a complete inventory has always existed, and is being emphasized to address real property accounting requirements. No additional budget requests are associated with the transportation atlas.

The miles of road development estimated for the no action and proposed action alternatives are based on existing land and resource management plans. These plans do not necessarily reflect budget constraints on road development. As a result, the estimated miles in Table E3 are significantly higher than miles of construction and reconstruction accomplished in recent years (as shown in Table E2).

Forest Service budget allocations for road management have not been sufficient to meet planned goals in recent years. The Forest Service budgets for road management activities in fiscal years 1998 and 1999 and an estimate for FY 2000 are shown in Table E4. The Forest Service has estimated that current funding provides only 20% of funds necessary to fully maintain Forest Service roads to intended safety, service, and environmental standards. The backlog of deferred road maintenance and capital improvement needs on Forest Service roads has been estimated at $8.4 billion. Based on a Forest Service report

to Congress[2], the Forest Service estimated annual maintenance needs to be $568 million. Addressing only immediate threats to health and safety, resource protection, access, and basic operation would require $197 million per year, about double current funding levels.

In the short-term, under current budget constraints, the Forest Service will be allocating scarce funds across competing priorities in road management. The main difference between the no action alternative and the proposed action alternative is the guidance for establishing priorities. There is no basis for any major change in agency budget requests for road management. In the long-term, the FS expects to realize some management efficiencies from the proposed strategy. Completing the road inventory will improve the information available for identifying priorities for road priorities. The revision of land and resource management plans will also provide new information about road management needs. The emphasis on the minimum required transportation system to serve management objectives will result in fewer total road miles than originally planned. Therefore, the agency will be able to improve the use of the limited funds to maximize the benefits associated with road activities. (The preceding road management costs and other data was provided by Skip Coghlan, Deputy Director of Engineering ret., USDA, Forest Service--worksheet in EA project work file).

Access and public safety
No roads needed for access to pre-existing rights or for public safety would be decommissioned under the no action alternative or the proposed action alternative. Plans for construction and reconstruction are also assumed to be the same for both alternatives. Therefore, the net effect on public benefits would be zero.

Fire, Insects, and Disease
Roads are needed for access to fight fires, and provide treatments for insects and disease, but access also provides increased opportunity for human-caused fire and spread of insects. There are numerous treatment methods that do not require roaded access, such as prescribed burns. Treatment needs for fire, insects, and disease on NFS lands are far greater than can be accomplished in any year. As a result, treatments requiring roaded access to inventoried roadless and other unroaded areas could be replaced by treatments on other areas of equal priority.

No roads will be decommissioned that are required for forest management objectives in either the no action alternative or the proposed strategy alternative. There is likely to be more road miles decommissioned under the proposed action, which should reduce the future risk of human-caused fire and the spread of insects and disease. Since alternative treatment opportunities exist, and the agency's ability to fight fires and provide treatment

[2] USDA Forest Service. Supporting Documentation on Maintenance and Improvement Needs. Submitted in the Fiscal Year 2000 Budget Justification.

for insects and disease will be the same under both scenarios, the only likely effect is a net benefit from reduced access.

Forest Management (Timber)
Timber sales are often used to achieve vegetation management objectives. Timber sales may be the least cost method to manage vegetation for improving wildlife habitat, reducing fuels, recovering values from natural disasters, combating insect and disease infestations, and improving tree growth. Timber sales include timber commodity purpose sales made primarily to supply timber for wood demand, as well as for personal use made primarily to supply firewood, Christmas trees, and other forest products to individuals for their own consumption. Roads are generally required for timber harvest, although some timber can be harvested using helicopters or cable-yarding systems from existing roads.

The primary effect of the proposed action alternative is a reduction in timber sales in inventoried roadless and other unroaded areas (Table E5), particularly in the transition phase when a compelling need must be demonstrated for new road construction or reconstruction. To estimate the maximum potential effect, the proposed action alternative assumes that no road construction for timber harvesting purposes is allowed in these areas. Table E5 displays the no action alternative planned annual volume of timber harvest on all NFS lands by Forest Service Region, the estimated volume harvested under the proposed action alternative, and the maximum potential harvest loss by not harvesting in inventoried roadless and other unroaded areas.

The maximum reduced harvest likely overestimates the potential impact for several reasons. First, it includes volumes from planned sales that partially occur on roaded areas. It was assumed for the analysis that the entire sale would be abandoned, rather than reduce only that portion of the sale occurring on inventoried roadless or other unroaded areas. Also, a number of forests may be able to plan sales in roaded areas to offset the reductions from roadless areas. Such a substitution effect was not considered in the analysis.

Options are available for replacing some of the reduced NFS harvest volume from other ownerships in the United States. The availability of substitute harvest opportunities varies by region. Substitute opportunities are most available in the eastern United States (Regions 8 and 9) where it was assumed that 90% of the NFS harvest could be replaced on other ownerships. Opportunities are more limited in the West, where NFS lands occupy a higher proportion of the forest land base. Region 2 was assumed to have opportunities to replace 40% of the volume; Regions 1 and 4 were assumed to be able to replace 20% and Regions 3, 5, 6, and 10 were assumed to have no substitute opportunities.

Benefit-Cost Effects. Benefit-cost analysis compares the benefits and costs associated with a proposed action. The benefit-cost effects of the NFS timber sales program should compare the benefits of timber harvest to the cost. The benefits include the market value

of the timber and any associated positive resource impacts. For example, timber harvest may result in a temporary increase in forage production or an improvement in elk winter range. To the extent these effects can be quantified, they should be added to the timber values. Similarly, the total costs should include all associated harvest costs and any negative environmental effects. For example, timber harvest may cause sedimentation that negatively impacts water-based recreation activities. The non-timber economic effects are an important component of the efficiency analysis since an increasing proportion of timber sales on the NFS are undertaken to achieve forest management objectives other than commercial harvest to provide raw materials to the U.S. economy.

The total planned volume in the no action alternative and the estimated maximum affected volume under the proposed action alternative are not tied to any particular timber sale. Therefore, the estimate of the economic benefits and costs has to reflect some average regional range of values. The data used for the benefits and costs of harvest were taken from the Forest Service's Timber Sales Program Information Reporting System (TSPIRS) Economic Account--Table 2. The methodology used to determine timber harvest costs and benefits are included in each annual TSPIRS report for each National Forest. These documents explain where real and nominal values are used. The result is presented in the form of present net value (PNV).

The TSPIRS Economic Account (Table 2) displays the long-term benefits and costs expected to result from a given year's timber-harvesting activities. The analysis uses a traditional with-without approach by analyzing the incremental benefits and costs associated with timber harvest in a given fiscal year. The time frame for the analysis is determined by the longevity of effects, either on the timber resource or other resources. All effects are summarized into a present net value for the base year, using a 4% real rate of interest. An example (Flathead NF) is included in the EA project file.

Other resource effects may be either positive (e.g., increased recreation opportunities or increased forage available for grazing) or negative (e.g., increased sedimentation). If these effects can be expressed in physical outputs, such as animal unit months of forage or number of recreation visits, those effects can be monetized and included in the analysis. Most of the benefits and costs reported in the Economic Account are related to the timber harvesting activity, since many of the associated resource effects are difficult to quantify. In FY 1997, 79% of the present net value was associated with timber harvest, with the remaining 21% attributed to other resource effects. In FY 1996, 88% of the present net value was associated with timber harvest.

Forest-level TSPIRS data were used as the basis for regional estimates of benefits and costs. Benefits are basically the estimated selling values of timber. Costs are basically the costs to the agency that make the sale possible. These costs include the cost of sale preparation, administration, silvicultural exams, transportation planning, and reforestation.

The values taken from TSPIRS are expressed in real dollars with the base year being the year of the report. Data from Fiscal Years 1996 and 1997 were combined to calculate a regional 2-year average for total benefits and total costs of timber harvest. Harvest data for those same years were used to convert the regional benefit and cost estimates to regional benefit and cost per million board feet estimates. The estimated annual net benefits under the no action and the proposed strategy alternatives are show in Table E6, as well as the difference in annual net benefits. The proposed strategy would reduce timber harvest net benefits by $13.8 million annually, a reduction of approximately 3.5% of current net benefits. Other-than-timber (wildlife, water, etc.) benefits were not monetized and consequently not included in the net benefits above. This is because those values were not available.

The estimated value, of timber harvest forgone, because of the proposed action, is subject to a great degree of uncertainty. The values used from TSPIRS result from timber harvests in areas of average conditions. Most of these areas were not roadless. Timber values in roadless areas can be significantly lower or sales might not sell at all because of high logging costs per unit harvested. This can be due to steep slopes requiring advanced logging systems (ex. Skyline, helicopter), long haul distances to market, and low timber volume per acre. For some of the same reasons average agency costs of offering timber sales can be much higher in roadless areas. For this reason, the TSPIRS values for timber selling values should be viewed as a maximum and the costs as a minimum with the resulting difference viewed as a maximum reduction in annual benefits from the proposed action. At the other extreme the actual reduction in net benefits could be negligible.

This reduction assumes that no harvest substitution occurs on non-NFS lands. Although the costs and benefits of harvesting on other lands may vary significantly, the substitution factors do provide some information about where negative effects would be lessened. In Regions 8 and 9, increased harvest on other lands could almost completely offset the reduction on NFS lands. This effect is significant, since the greatest reduction in NFS harvest benefits occurs in Region 8. Conversely, there is no potential for offsetting effects in Regions 5, 6, and 10 through increased domestic harvest.

Total United States wood consumption would be unaffected by the reduction in harvest. Harvest from NFS lands was only 4% of total U.S. production in 1997. The maximum potential harvest reduction is less than 0.2% of total U.S. production. Therefore, the total supply effect is marginal, and no price impacts are expected as a result. Consumers are not expected to suffer any net welfare loss, since the combination of harvest on other ownerships and imports will make up for the NFS reduction.

Employment Effects. Employment effects can be described as direct, indirect, and induced. Direct effects include jobs associated with the harvest of the timber and processing of the raw material. Indirect effects include jobs associated with industries that supply inputs to the harvesting and processing sector. Induced effects include jobs