APPENDIX B
THE ANALYSIS PROCESS

Introduction

Land and resource management planning requires that processes formerly used to make individual resource decisions be combined into integrated management decisions. It also requires that mathematical modeling techniques be used to identify the most economically efficient solution to meet the goals and objectives of any alternative. Appendix B presents a technical discussion of the analysis process and computer models used in the Revision planning effort. The Appendix focuses on the quantitative methods used to perform the analysis and documents how the analysis was done. The results from the modeling processes are estimates of what can be expected if alternatives are implemented and facilitate comparison of alternatives.

The Forests' major analysis goal is to provide enough information to help decision-makers and the publics determine which combination of goods, services, and land allocations will maximize Net Public Benefits (NPB). The regulations (36 CFR 219) developed under the National Forest Management Act (NFMA) provide the analytical framework within which these decisions are made.

The NFMA and its regulations also state that the requirements of the National Environmental Policy Act (NEPA) and its regulations (40 CFR 1500-1508) must be applied in this analytic process. The NEPA regulations require that the environmental effects of a proposed action and alternatives to that proposed action must be disclosed in an Environmental Impact Statement (EIS).

Information presented in this chapter supplements the broader and less technical descriptions included in the body of the EIS. This discussion includes basic assumptions, modeling components and inputs, rules, methods, and constraints. Additional information and documents used in the analysis process are contained in the planning process records. The planning record in its entirety is incorporated here by reference.

Framework of the Planning Process

The general planning process described in 36 CFR 219.12 was used to guide the revision of the OSFNFs Land and Resource Management Plan. This 10-Step process is described briefly below, followed by a more detailed discussion of the analytical processes used in Steps 3, 4, and 6.

STEP 1 - Identification of purpose and need: Issues, Concerns, and Opportunities. The Forests' Planning Team assessed changes in public issues, management concerns, and resource use and development opportunities since the 1986 Plan was initially developed and subsequently amended.

STEP 2 - Planning Criteria: Criteria are designed to guide the collection and use of inventory data and information; the analysis of the management situation; and the design, formulation, and evaluation of alternatives. This step establishes guidelines for accomplishing the next five steps. Planning criteria are based on:

- Laws, executive orders, regulations and agency policy as set forth in the Forest Service Manual
- Goals and objectives in the USDA Forest Service's Strategic Plan.
- Recommendations and assumptions developed from public issues, management concerns, and resource use and development opportunities.
- The plans and programs of other federal agencies, state and local governments, and Indian tribes.
- Ecological, technical, and other factors.
- The resource integration and management requirements in 36 CFR 219.13 through 219.27.
- Alternatives that are technically possible to implement.
- Alternatives that meet management requirements or standards.
- Various levels of multiple-use objectives and outputs achieved.

STEP 3 - Inventory Data and Information Collection: - The kind of data and information needed is determined in Step 2 based on the issues, concerns, and opportunities identified and the resulting assessment of the management situation and determination of what needs to change. Data collection is part of normal forest operations. Existing data is used whenever possible and supplemented with new data, when practicable. Data accuracy is continually evaluated. Much of this data and background documentation is on file in the planning records on file in the Supervisor's Office.

STEP 4 - Analysis of the Management Situation: - This step describes the existing situation on the Forests and determines if there is a need to change current management direction. It examines supply potentials and market assessments for goods and services, assesses demand for goods and services from National Forest lands, and determines suitability and feasibility for meeting needs. This information provides the basis for formulating an appropriate range of reasonable alternatives.

STEP 5 - Formulation of Alternatives: - A reasonable range of alternatives is formulated according to NEPA procedures. Alternatives are formulated to assist in identifying one that comes nearest to maximizing net public benefits (NPB). They provide for the resolution of significant issues and concerns identified in Step 1. Chapter 2 of the EIS describes the formulation of alternatives for the OSFNFs in more detail.

The alternatives reflect a range of resource management programs. Each identified major public issue and management concern is addressed in different ways in the alternatives. The programs and land allocations in each alternative represent the most cost-efficient way of attaining the goals and objectives for that alternative. Both priced and non-priced goods and services (outputs) are considered in formulating each alternative.

STEP 6 - Estimated Effects of Alternatives: - The physical, biological, economic, and social effects of implementing each alternative are described in Chapter 3 of the EIS in an effort to evaluate how well each alternative responds to issues, concerns and opportunities and what the potential impacts to resources might be.

STEP 7 - Evaluation of Alternatives: - Significant physical, biological, economic, and social effects of implementing alternatives are used to evaluate each alternative and compare them with one another. Typically, each alternative can be judged on how it addresses the significant issues, concerns, and opportunities (ICOs) identified in Chapter 1 of the EIS. Also, the alternatives are evaluated on how consistent they are with the recommended 1990 RPA program. Appendix B of the EIS presents the possible outputs and activities associated with each alternative.

STEP 8 - Preferred Alternative: - The Forest Supervisor reviews the Planning Teams evaluation of each alternative and the public issues and concerns. The Forest Supervisor then recommends a preferred alternative to the Regional Forester. The Regional Forester either selects the Forest Supervisor's recommendation, another alternative, or modifies the alternative recommended by the Forest Supervisor. This alternative is described as the Preferred Alternative in this EIS and is displayed as the Proposed Revised Forest Plan. Public comments are solicited and will be considered in the finalizing of the Revised Forest Plan and EIS.

STEP 9 - Plan Approval and Implementation: - After the Planning Team has reviewed public comments and incorporated any necessary changes into the Final EIS and the Revised Forest Plan; the Regional Forester reviews and approves the Revised Forest Plan and Final Environmental Impact Statement. A Record of Decision documents this step.

STEP 10 - Monitoring and Evaluation: - The Revised Forest Plan establishes a system of measuring, on a sample basis, actual activities and their effects, and compares these results with projections contained in the Revised Forest Plan. Monitoring and evaluation comprises an essential feedback mechanism to ensure the Revised

Forest Plan is dynamic and responsive to change. Appendix J of the Revised Forest Plan includes short term and long term monitoring.

Inventory Data and Information Collection (Step 3)

Several Interdisciplinary Team meetings were held to evaluate what data were needed to address the significant issues, concerns and opportunities identified in Chapter 1 of the EIS. Existing inventories were reviewed and updated and new information needs were identified and collected, if available. Most of the information was stored in databases, spreadsheets, and a geographic information system (GIS).

GIS Data Layers

A geographic information system (GIS) was used to develop the primary Forest Plan revision database. GIS links natural resource tabular information with spatial (map) information. This linkage enabled complex spatial analyses and rapid display for many different physical, biological, or administrative resources. The resulting database was used to preliminarily map the allocation of the management prescriptions, analyze suitable timber lands, build the forest planning model Spectrum analysis areas, and perform other analyses for the revision. To develop the database, the following layers were overlaid in GIS:

- The Continuous Inventory of Stand Condition (CISC) – the Southern Region's primary forest vegetation and stand inventory information that relates to forest cover type, age, site index, and land classification. The mapping of the management prescriptions for each alternative used recent CISC data. The Continuous Inventory of Stand Conditions, CISC, 1993, is the database component of the Silvicultural Examination and Prescription Process as documented in the Silvicultural Examination and Prescription Handbook, FSH 2409.26d, R8 Amendment 2409.26d-93-1. US Department of Agriculture, Forest Service.

- Land Status – This layer contains information on Forest surface ownership. The lands layer was updated several times throughout the process to incorporate new acquisitions. The latest update for mapping of management prescriptions and Spectrum analyses was the spring of 2003.

- Digital Elevation Models (DEMs) – The DEMs were used for creation of slope maps, shaded relief maps, and contour maps; for determination of what part of the landscape is visible from various locations; and for analysis of difficulty of traversing the terrain.

- Watersheds – This layer included Hydrologic Unit Code (HUC) mapping at both the fifth and sixth levels.

- Riparian – This layer is an approximation of the riparian habitat on the forest. It is impossible to map the true riparian corridor through the use of GIS due to the complexity of slope, vegetation, and other factors that help define the corridor. This coverage was generated by buffering perennial streams and lakes by 100 feet.

- Inventoried Roadless Areas - Appendix C of the EIS incorporates all the data used in the roadless area evaluations.

- Developed Recreation Sites – Includes established recreation area boundaries, trailheads, and shooting ranges.

- Scenery Management System (SMS) – This layer addressed the visual resources and included attributes related to scenic integrity, distance zone, scenic attractiveness, and concern level.

- Recreation Opportunity Spectrum (ROS) – This layer represented the recreation experience expected in a particular area and included attributes such as rural, roaded natural, semi-primitive motorized and semi-primitive non-motorized.

- Transportation (Travel Routes) – This layer included the public and Forest Service roads and trails within the Forest boundary.

- Special Areas – This layer includes Special Interest Areas (SIAs), Wilderness Areas, Research Natural Areas (RNAs), Wild and Scenic River Corridors, Scenic Byways, State Parks, and Ozark Highlands Trail Corridor.

- Old Growth – This layer included areas identified as meeting the old growth definition and was either field-verified or delineated as probable old growth areas from aerial photographs.

- Current Plan Management Areas (Alt. A) – This layer included Wilderness and Special Management Areas from the 1986 OSFNFs Plan.

- Soils - This is a polygon-based layer of soil map units within a particular soil survey area. A soil survey describes the characteristics of the soils in a given area, classifies the soils according to a standard system of classification, plots the boundaries of the soils on a map, and makes predictions about the behavior of soils. The different uses of the soils and how the response of management affects them are considered. The information collected in a soil survey helps in the development of land-use plans, and evaluates and predicts the effects of land use on the environment.

- Geology - This is a polygon-based layer of geologic map units. Polygons are delineated based on geologic characteristics and classifications. Geology class includes information that defines the classification in terms of: lithology (e.g., limestone), stratigraphic unit (e.g., Pilgrim), and age (e.g., Cambrian). Geologic map units are attributed by primary lithology, i.e., igneous extrusive, igneous intrusive, metamorphic, sedimentary, and unconsolidated. Each primary type has numerous secondary types such as granite, slate, sandstone, etc. In addition, geology is customarily attributed by a lithostratigraphic (or tectono-stratigraphic) unit, the name given to a defined body of strata (e.g., Pilgrim), and a geochronologic unit, the division of geologic time (e.g., Cambrian) assigned to all mapped strata. The geology map units are delineated and described by resource specialists in accordance with Forest Service Handbook 2090.11.

- Cultural Resources – This layer included areas with special historical or cultural emphases. A Heritage Resource is a feature, structure, building, object, site or aggregation of sites (district) that has one or more of the following: historic or natural significance, cultural, educational orartistic importance, significant architectural characteristics or an entity being managed for indefinite preservation.

- Streams and Watercourses – This layer included intermittent and perennial streams, lakes, rivers, and ponds.

- Terrestrial Ecological Communities - A modeled layer developed from 10 meter DEMs and the forest CISC vegetation layer to create a terrestrial ecological system layer. Terrestrial ecological systems are specifically defined as a group of plant community types (associations) that tend to co-occur within landscapes with similar ecological processes, substrates, and/or environmental gradients. The multiple ecological factors are evaluated and combined in different ways to explain the spatial co-occurrence of plant associations.

- Ecological Classification System (Land Type Associations and Land Types) - At the landscape scale, ecological units are defined by general topography, geomorphic process, surficial geology, associations of soil families, and potential natural communities, patterns, and local climates. Landtype association ecological units represent this scale in the hierarchy. These are groupings of landtypes or subdivisions of subsections based on similarities in geomorphic process, geologic rock types, soil complexes, stream types, lakes, wetlands, subseries or plant association vegetation communities. At the basic land unit scale, ecological units are designed and mapped in the field based on properties of local topography, rock types, soils, and potential natural vegetation. Landtypes, subdivisions of landtype associations or groupings of landtype phases based on similarities in soils, landform, rock type, geomorphic process, and plant associations. Land surface form that influences hydrologic function (for example, drainage density, dissection, and

relief) is often used to delineate different landtypes in mountainous terrain. Valley bottom characteristics (for example, confinement) are commonly used in establishing riparian landtype map units.

- Pastures – This layer shows the current lands that are delineated as active pasture lands.

Analysis of the Management Situation (Step 4)

In addition to the emerging issues, the need for change was identified through the Analysis of the Management Situation for the OSFNFs (AMS) in Fall of 2002. This analysis considered the results of monitoring and evaluation, other policy and direction since the previous Plan, the 5-Year Review, the current condition of the resources, and supply and demand factors to determine the need for change in management direction, as well as the ability of the planning area covered by the Forest Plan to supply goods and services. It provided a basis for formulating a broad range of reasonable alternatives. Because the AMS was done in 2002, quantitative estimates were updated with new information as available. The processes and results for the supply and demand analyses are briefly discussed below. The process records contain the full supply and demand analyses.

Determination of Demand Estimates

Recreation

This section provides additional details related to recreation supply and demand that was not covered in Chapter 3 of the FEIS. Recreation demands were based on several sources: 1) the findings of the Ozark-Ouachita Highlands Assessment, Outdoor Recreation Demand and Supply in the Region and Roadless Areas and Designated Wilderness; 2) Regional Demand and Supply Projections for Outdoor Recreation (1993 update to the 1989 RPA Assessment) by Donald B.K. English et al.; 3) Ouachita and Ozark NF Recreation realignment Report, August 2001; 4) Arkansas SCORP 1995; and 5) Outdoor Recreation in American Life, A National Assessment of Demand and Supply Trends, H. Ken Cordell, 1999.

National Forest recreation visits were estimated based upon data collected through the National Visitor Use Monitoring (NVUM) project. This project was implemented throughout the National Forest System in response to the need to better understand use of and satisfaction with recreation settings and to provide a standard means of quantifying recreation use across the system within a reasonable confidence level. The project was completed for the OSFNFs in 2001 and the report was completed in 2002. Basically, it utilized randomly selected stratified sites across the forest in four categories: Day Use Developed (DUD), Overnight Use Developed (OUD), General

Forest Area (GFA), and Wilderness (Wild). Both proxy and non-proxy site data was collected. Factors based upon national data were used as multipliers to estimate total visits by category. The spreadsheets used to calculate visits are available in the process records for this plan.

Assumptions by alternative about recreation programs use were based on the overall theme and emphasis of each alternative as stated in its description. These assumptions, in turn, influenced changes in supply and capacity for developed recreation, dispersed recreation, general forest/trails, and wilderness across the alternatives. Projected effects by alternative on each recreation category were made.

The OSFNFs NVUM data was further refined to RPA activity groups for use in the Present Net Value (PNV) and Jobs/Income calculations for the FEIS. The percent breakdown by RPA activity group was done using NVUM survey results from the OSFNFs NVUM data, and local experience. Table B-1 shows a summary of the conversion of visits by the NVUM categories to the RPA activity groups for the forest under Alternative A (Current Direction). Visits were converted to trips and shown by RPA activity for each alternative in Table B-2.

Table B-1: RPA Activity Group Summary from NVUM data for Alternative A (Current)

RPA Categories	DUDS		OUDS		GFA		WILD		TOTAL
	Percent	M Visits	Percent	M Visits	Percent	M Visits	Percent	M Visits	M Visits
Camping, Picnicking, Swimming	29	319	100	130	6	96	0	0	545
Mechanical Travel & Viewing Scenery	18	154	0	0	39	637	0	0	791
Hiking, Horseback Riding, Water Travel	2	24	0	0	24	389	0	0	413
Resorts	0	2	0	0	0	0	0	0	2
Fish & Wildlife	29	322	0	0	24	391	0	0	713
Wilderness	0	0	0	0	0	0	100	16	16
Other	22	234	0	0	7	121	0	0	355
Total	100	1,055	100	130	100	1,634	100	16	2,835

Table B-2: Recreation Trips by RPA Activity Group Summary by Alternative

Resource	Alternatives				
	A	B	C	D	E
Recreation					
Local Residents Day Use	447,625	470,006	470,006	447,625	465,530
Non-Local Residents Day Use	150,118	157,624	157,624	150,118	156,123
Local Residents Overnight off the NF	73,904	77,599	75,382	75,382	75,382
Non-Local Residents Overnight off the NF	162,985	171,134	166,245	166,245	166,245
Local Residents Overnight on the NF	46,190	48,500	47,114	47,114	47,576
Non-Local Residents Overnight on NF	110,856	116,399	113,073	113,073	114,182
Wildlife & Fish Hunting					
Local Residents Hunting	64,407	67,341	67,222	65,504	66,888
Non-Local Residents Hunting	54,684	56,738	57,395	55,324	56,645
Wildlife & Fish Viewing					
Local Residents	43,908	44,656	45,778	44,282	45,030
Non-Local Residents	37,403	37,842	38,501	37,623	38,062
Fishing					
Local Residents	176,820	183,077	179,323	178,071	180,574
Non-Local Residents	81,026	84,155	82,278	81,652	82,903

Range

Projections for range were derived from past history of the range program on the Forests, the 1989 Recommended RPA Program (USDA 1990) and the Forest Service Program for Forest and Rangeland Resources (USDA 1995).

Livestock grazing has a long history in this area. Much of the rougher upland areas were settled between the 1880s and 1930s. These settlers made wide use of open range for cattle and hogs (OOHA 1999). Grazing permits have been issued on the Forests since the early 1920s; however, most of the livestock grazed in trespass. It is estimated that as late as 1965 there were more than 8,000 head of cattle and 6,000 hogs illegally grazing on the Forests in addition to the 1,500 head that were grazing legally (Bass 1981).

Forest-wide, a downward trend in the number of range permittees and livestock has occurred since 1978 when there were 231 permittees with approximately 6,400 cattle grazing NF lands. That number dropped quickly and in 1982 there were 164 permittees on NF lands with approximately 4,100 cattle. Currently, there are fewer than 35 permittees with 1,300 head of cattle, or a reduction of 79 percent in the number of permit holders and 68 percent in the number of cattle permitted to graze

(OSFNFs FEIS, LRMP 1986). While the demand for improved pastures has remained relatively high, woodland range use has diminished to a large degree (OOHA 1999).

Timber

The timber market area for the OSFNFs was comprised of 52 counties within 3 states. The demand for all wood products from the OSFNFs has remained high and will continue to increase into the future for all but pine small roundwood. For the past 17 years, operating under the guidance of the 1986 LRMP, the OSFNFs has averaged 43.65 million board feet sold per year. Pine sawtimber remains the largest volume of offered product and generates the highest dollar value in receipts to the US Treasury. Hardwood sawtimber is increasing in volume and in dollar bid rates and has at times exceeded pine values. High value oak timber is expected to increase in value as the supply of undamaged timber from the mountain forests is found to be increasingly rare. Current demand for hardwood chipwood is expected to continue to rise. The demand for pine small roundwood will be limited due to the regional glut of small wood being grown in non-industrial private and timber industry pine plantations.

The Social/Economic Report for the Ozark-Ouachita Highlands Assessment, 1999 also addressed questions related to timber supply and demand on a more regional and national level. That assessment concluded, which current trends indicate, that over the next three decades the Ozark Highlands region will continue to increase in importance in both southern and national timber markets.

Minerals

Congress passed a law in 1987 that updated and enlarged the Forest Service role in administering surface operations for oil and gas development on National Forest System lands (Federal Onshore Oil and Gas Leasing Reform Act of 1987). The reasonably foreseeable development projected for the Revised Forest Plan was developed based on the law and the implementing regulations, including the 36 CFR 228E regulations for Forest Service review and approval of surface use plans of operations and is discussed in detail in Chapter 3 of the EIS. The reasonably foreseeable development included an estimate of the number of wells, miles of access road and pipeline construction, and acres of clearing for well pads, access roads, and pipelines. The development of new gas wells, access roads and associated facilities would occur over 15 years, which is the time span for the Revised Forest Plan.

Wilderness

Appendix C of the FEIS contains the roadless area evaluations. One of the three major factors in these evaluations is the identification of need, a consideration of the amount of wilderness already in the area regionally and nationally.

The Ozark-St. Francis National Forests used a GIS model to complete the initial inventory based on key criteria for identifying roadless areas identified in the Regional Foresters Letter dated May 19, 1995, "Inventories for Forest Plan Revision."

The road density model focused on 7.11b, 5 of the criterion as the initial screening to determine if any land was available to be included in the roadless inventory. The density model searched for core areas with no more the .5 miles of improved road for 1000 acres. This test was applied across the Ozark-St. Francis National Forests, regardless if an area was inside or outside of RARE II lands

Wildlife and Fisheries

The Recreation demand projections addressed hunting, fishing and wildlife viewing. Chapter 3 of the EIS discussed trends in certain wildlife demand species, such as deer, turkey, bear, grouse, and others.

Timber Analysis

Benchmark Analysis

Benchmark analysis is specified in the NFMA regulation in 36 CFR 219.12(e) as part of the Analysis of the Management Situation. Benchmarks approximate maximum economic and biological resource production opportunities and are useful in evaluating the compatibilities and conflicts between individual resource objectives and in defining the range within integrated alternatives can be developed. Selection of those benchmarks to develop is dependent upon the revision topics. Benchmarks are primarily modeled in SPECTRUM by changing the objective function and by adjusting constraints. Because the SPECTRUM model was developed to primarily model vegetation management through the use of timber sales, three timber related benchmarks were developed in addition to one that reflected out current level of management.

The NFMA regulations in 36 CFR 219.27 list management requirements that must be considered in benchmark analysis. The following basic management requirements were included in all of the benchmark SPECTRUM models:

- Non-declining flow and long-term sustained yield.
- All tentatively suitable timber lands are included in the analysis.

CUR – Current Level Benchmark

This benchmark provides for management using the current plan as amended, adjusted to incorporate changes necessary to meet current management direction. The benchmark estimated the capability of the planning areas to provide for a wide range of goods, services, and other uses for the present land allocations. This benchmark was the same as Alternative A.

TIM – Maximum Timber Benchmark

This benchmark was used to identify the timber production potential of the Forests, subject to these specifications:

- The objective function maximizes timber volume in the first five decades, with a rollover to maximize present net value.
- All tentatively suitable acres were included, without any management prescription allocation, so every tentatively suitable acre was eligible for harvest.

PNV – Maximum Present Net Value Benchmark

This benchmark was established to estimate the schedule of outputs and costs that would maximize the present net value of timber production without any constraints, subject to these specifications:

- The objective function maximizes present net value over the entire planning horizon.
- All tentatively suitable acres were included, without any management prescription allocations.

MIN – Minimal Level of Management Benchmark

This benchmark represents "the minimum level of management which would be needed to maintain and protect the unit as part of the National Forest System together with associated cost and benefits" (36 CFR219.12[e][1][I]). This benchmark shows no commercial timber production or harvest; therefore the ASQ is zero. In this benchmark, no early successional habitat condition was created by way of man.

One of the effects of minimum level management is that the OSFNFs would not be able to meet the habitat needs of those species associated with disturbance dependant habitats. Active management will be necessary to restore and maintain desired conditions relative to a number of major forest communities and rare communities.

Benchmark Evaluation

Table B-3 displays some of the distinctive outputs and effects for each benchmark analysis.

Table B-3: Benchmark Results

	Current Mgt. (Alt. A)	Maximum Timber	Maximum PNV	Minimum Level Mgt.
Allowable Sale Quantity (ASQ) MMCF Decade 1	162	338	240	0
Long-term Sustained Yield MMCF p/year	16.2	34.9	24.0	0
Suitable Acres	760,469	939,317	939,317	0
Clearcut Acres – 50 Year Annual Average	<50	554	1,399	0
Regeneration – 50 Year Annual Average	5,329	12,080	7,135	0
Total Harvested Acres – 50 Year Annual Average	14,600	27,791	18,944	0
Present Net Value (M$)– 50 Year Annual Average	$2,600	$2,942	$4,540	0
Successional Habitat	**Decade 1**			
% Early (0-10 yrs)	9%	20%	6%	0%
% Sapling (11-20 yrs)	7%	6%	7%	7%
% Pole (21-40 yrs)	5%	5%	5%	<1%
% Mid (41-70 yrs)	9%	11%	10%	2%
% Late (71-100 yrs)	20%	21%	19%	31%
% Old (100+ yrs)	50%	37%	53%	60%

Timber Suitability

During forest land and resource management planning, the Forest Service is required to identify lands unsuited for timber production (16 USC 1604(k); 36 CFR 219.14). This identification process involves three stages of analysis. Stage I analysis identifies lands tentatively suitable for timber production. Stage II analysis is designed to explore the financial aspect of varying intensities of timber management on lands identified as tentatively suitable for timber production from Stage I. Stage III analysis identifies lands as unsuited for timber production under the alternatives selected in the revised Forest Land and Resource Management Plan. The National Forest Management Act (NFMA) of 1976 identifies 'suitability' as "the appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices."

Stage I: Physical Suitability

The first stage of the timber suitability analysis addresses the administrative and physical suitability of the land administered by the OSFNFs. The primary outcome of the Stage I analysis are the acres remaining after analysis is complete. These acres are considered 'tentatively suitable.' Stage I lands unsuitable for timber production include:

- Non-Forest lands
- Lands that have been administratively or congressionally withdrawn from timber production by an act of Congress, the Secretary of Agriculture, or the Chief of the Forest Service
- Forest lands incapable of producing industrial wood
- Lands where technology is not available to ensure timber production from the land without irreversible soil and water resource damage
- Lands where there is not reasonable assurance that they can be adequately restocked
- Lands where there is inadequate information

The Forests' GIS layers, with the vegetation layer being used as the base, were used for this analysis. A detailed description of this process can be found in the process record. Table B-4 and Table B-5 below display the criteria used and resulting acres deduced from the total forest acreage. It should be noted that the acre figures shown throughout the suitability analysis are not total acres for each deduction criteria but rather total acres after previous deductions.

Table B-4 – Stage 1 - Deduction Criteria

Categories of Stage I Analysis	Deduction Criteria
Non-Forest Lands	Water Openings: Pastures & Wildlife Openings Transportation: Level 1-5 Roads Rock Outcroppings Industrial: Utility Lines, etc. Buildings and Admin Sites
Administratively Withdrawn	Wilderness (1.A.) Research Natural Areas (1.F.) Experimental Forests (1.E.) Wild and Scenic River Corridors (1.C.) Cultural Areas
Physically Incapable	Low Site Index (≤40 SI pine; ≤50 SI hardwood)
Technologically Restricted	Mountainburg Soil Type
Not Adequately Restocked	None
Inadequate Response Information	Remaining Land with Incomplete Information

Table B-5: Acres Deducted for Stage I Analysis

Classification	Acres
Total OSFNF Land	1,161,012
Non-Forest Land	-43,218
Administratively Withdrawn	-91,817
Physically Incapable	-66,526
Technologically Restricted	-19,046
Not Adequately Restocked	0
Inadequate Response Information	-283
Tentatively Suitable	940,122

Stage II: Financial Analysis

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

The Stage II analysis was done using the Forests SPECTRUM model. A full description of this modeling exercise is explained elsewhere in this Appendix. That description is not replicated here. The financial analysis identifies the present net value (PNV) for different SPECTRUM analysis areas (analysis units). For the purpose of this analysis, PNV is a measure of the discounted timber benefits less the discounted timber management costs, using a 4 percent discount rate. The actual PNV analysis consisted of a SPECTRUM run which examined all of the silvicultural prescriptions for all of the tentatively suitable SPECTRUM analysis areas (analysis units). There are many factors that determine the economic efficiency of the timber sale that cannot possibly be modeled using a landscape level planning model such as SPECTRUM. However, based on this financial analysis, the following primary conclusions were made:

- In general, silviculture prescriptions that do not require reforestation costs (planting) have a higher PNV.
- The Clearcutting and High Quality silviculture prescriptions, applied to low site red oak/white oak/hickory stand, have the lowest PNV.

Stage III: Identification of Suitable Acres

From the tentatively suited acres (Stage I) are subtracted lands for which planned periodic timber harvest would preclude the achievement of other non-timber management objectives. During alternative formulation, the following lands (Table B-6) were determined to be ‘not appropriate for timber production. Due to land allocation varying among alternatives, Stage III suitable acres will also vary.

Table B-6 – Stage III Suitability by Alternative

Deduction Criteria Stage III	Alternatives				
	A	B	C	D	E
Tentatively Suited Acres from Stage I Analysis	940,122	940,122	940,122	940,122	940,122
Management Areas					
0.A. Custodial Management	0	-337,491	0	0	0
1.B. Wilderness Additions	0	0	-268	0	-268
1.D. Rivers Recommended for Wild & Scenic Rivers	0	-4,487	-4,487	0	-4,487
1.G. Special Interest Areas	-14,302	-14,302	-14,302	-14,302	-14,302
1.G. Additional Special Interest Areas	0	0	-1,635	0	-1,635
2.A. Ozark-Highlands Tail Corridor	-5,039	-5,039	-5,039	-5,039	-5,039
2.B. State Parks	-2,251	-2,251	-2,251	-2,251	-2,251
2.C. Developed Recreation Areas	-2,004	-2,004	-2,004	-2,004	-2,004
Any 1.H. with an above sub-code (Scenic Byways)	0	-3,866	0	0	0
Other					
Cable Ground: % slope ≥ 35%*	-102,108	-102,108	-102,108	-102,108	-102,108
Remaining Land - 'unsuitable' CISC codes	-53,838	-29,389	-53,555	-53,838	-47,448
Total Suitable Acres	760,580	439,185	754,473	760,580	760,580

***35 percent slope was chosen as the break between tractor and cable ground because it is accepted as the industry standard for the area. Planned periodic harvests are not intended for these areas, which have a non-timber emphasis, and therefore are determined to be unsuitable.**

Table B-7 compares, by alternative, the suitable, unsuitable, and percent of suitable acres.

Table B-7: Suitable vs. Unsuitable comparison

Alternative	Unsuitable Acres	Suitable Acres	% of OSFNFs Suitable
A	400,436	760,580	66%
B	721,831	439,185	38%
C	406,543	754,473	65%
D	400,436	760,580	66%
E	406,543	760,580	66%

Analytical Tools Used

IMPLAN

The economic effects to local counties, primarily in terms of employment and income, were estimated using an economic input-output model with Impact Analysis for Planning (IMPLAN). IMPLAN is a commercial software package for personal computers that uses the latest national input-output tables from the Bureau of Economic Analysis. The data consists of national-level technology matrices and estimates of industrial sector activity for final demands, final payments, industry outputs and employment for each county in the U.S. along with state and national trends. The software was originally developed by the Forest Service and is now maintained by the Minnesota IMPLAN Group, Inc (MIG). Data used for the impact analysis was from secondary data for those counties considered to be in the Forests' impact area. The assumption used in this modeling process was that the impact area comprised the counties within the Forests' designated county boundaries. The data source used in developing the OSFNFs model for impact purposes was the most recent data available from MIG (2002).

Input-output analysis gives estimates of employment and income for an increase in final demand on certain sectors of the economy. For Forest Service timber, we have looked at sawmill and roundwood industries where our timber goes as the first processing step in manufacturing. Impacts include all those industries initially impacted as well as those industries linked with supplying inputs to production, as well as workers in those industries who then spend wages in their households (known as direct, indirect, and induced effects, respectively). A Forest Service developed spreadsheet, known as "FEAST" (Forest Economic Analysis Spreadsheet Tool) was used to apply the IMPLAN results to each alternative which was expressed in units of output. FEAST transformed the dollar impact for a given industry from IMPLAN to the various resource outputs by alternative into a specific employment and dollar output.

Pre-Suppose

Pre-Suppose is a program used to query and sort Forest Inventory and Analysis (FIA) data for use in the growth and yield model. It was developed to assist forest analysts in producing strata for management planning. The program allows the user to evaluate, select or discard plots that fit desired criteria and create support files to directly be linked in to the Suppose interface for the Forest Vegetation Simulator.

Suppose

Suppose is a computer program that was used to simulate the changes in forest vegetation over a long time span at the 'landscape' level spatial scope. Suppose accomplished the simulation by creating an input file used by the Forest Vegetation Simulator (FVS) and starting the FVS program that reads and processes the input file. The program contains the desired geographic variant and extensions to the base FVS system. FVS, and not Suppose, actually accomplishes the desired simulation.

Forest Vegetation Simulation Model (FVS)

The primary tool for estimating growth and yield used in the SPECTRUM model is the Forest Vegetation Simulator (FVS) model. FVS is an individual-tree, distance-independent, growth and yield model. It has its structural roots in the Stand Prognosis Model developed by Albert Stage from the Intermountain Research Station. Staffs at the USFS Forest Management Service Center in Fort Collins, Colorado have calibrated numerous variants of the model to specific geographic regions throughout the United States. Each variant uses different species-specific growth and yield equations and assumptions. The southern variant was used for developing yield tables for the OSFNFs SPECTRUM model.

FVS allows the user to calculate estimates of forest stand structure and species composition over time and quantify this information to: 1) describe current and future forest stand conditions; 2) simplify complex concepts of forest vegetation into user defined indices, attributes, etc.; and 3) allow the manager to ask better questions about growth and yield of forested stands and complete analyses to answer those questions. For the purposes of the OSFNFs plan revision, Forest Inventory and Analysis (FIA) data for the Southern Region was converted into a format that FVS could use. This data is collected by the Forest Inventory and Analysis Unit of the Southern Research Station for each State on a continuous cycle in order to provide unbiased, accurate, current, and relevant forest resource information that meets the diverse needs of land stewardship.

In 2003, the Forests completed an inventory on the Oak/Hickory forest type stands which covers approximately 2/3rds of the total Forests' acreage. Prior to management plan revision efforts it was thought that the current inventory data in CISC and that collected by FIA for these areas would be inaccurate due to recent epidemic levels for red oak borer mortality. Data from the 2003 inventory was colleted in NRIS FSVeg, processed, and converted in FVS data for yield table development. Prior to stratification, the 2003 inventory data was 're-aged' in order to more accurately represent condition class (stand age). The details of that process can be found in the process record but are not replicated here. Other forest types not represented in the 2003 inventory were accounted for by using recent FIA data. Stratification of both data sets was performed based on forest type, condition class (age), site index, and mortality ratings ('03 data only). The dataset from which the FIA data could potentially be selected was limited to plots taken on the OSFNFs or in Arkansas survey units 1, 4, and 5. Forest type was used to group data into one of six

working groups; Oak, Oak/Pine, Pine/Hwrd, Pine, Cedar, and Bottomland Hwrds. These working groups correspond to analysis unit identifiers in the SPECTRUM model. Four categories of condition class were used to further stratify the data within these working groups; 13 (0-19 yrs), 11 (20-49 yrs), 12 (50-69 yrs), 10 (70+ yrs). Two levels of site indices further stratified the working groups; (for all forests types except Oak/Pine) site indices 0-69 and 70+, (for Oak/Pine) 0-59 and 60+ were used. Finally, the 2003 inventory data plots all had a calculated mortality rating based on the percent of dead oak within each plot. After this ranking was completed a GIS circular neighborhood modeling analysis was done to estimate mortality ranking for all hardwood stands in the northern portion of the Ozark NF. A detailed description of this analysis can be found in the process record. This mortality rating was the final stratification identifier for the working groups. The mortality rating was divided by those plots which had; 1) a high ranking and, 2) all other rankings.

The FVS model structure contains modules for growing trees, predicting mortality, simulating growth reductions due to stocking, calculating tree volumes, and producing reports. The Fire and Fuels Extension to the Forest Vegetation Simulator was used in this modeling exercise in an attempt to model and accurately account for the effects of fire as a management tool.

Silvicultural Prescriptions

The array of potential vegetative treatments applied to an analysis unit is represented in the SPECTRUM model by sets of actions known as management actions. Generally, a management action in SPECTRUM refers to a set of treatments or practices designed to develop or protect some combination of resources on a particular land type. Eighteen Silviculture treatments were simulated in FVS in order to meet various vegetation manipulations and land management objectives. These prescriptions and there associated treatments are displayed in Table B-8.

Table B-8: Silvicultural Prescriptions Simulated in FVS

Silvicultural Rx	TSI Treatment	Thinnings	Harvest Rotations	5 Year Fire Interval
100 Grow Only	n/a	n/a	n/a	No
101 Grow Only w/Fire	n/a	n/a	n/a	Yes
102 Shelterwood	@ 20 yrs to 300 TPA	@ 70 yrs to 70 BA	@ 90-110 yrs	Yes
103 Group Selection	n/a	n/a	harvest 1/6 of stand every 20 yrs	No
104 Old Growth	@ 20 yrs to 300 TPA	@ 60 yrs to 60 BA @ 80 yrs to 70 BA @ 100 yrs to 70 BA	@ 130-200 yrs	Yes
105 Oak Savanna	@ 10 yrs to 300 TPA	@ 40 & 70 yrs to 20 BA	@ 180-200 yrs	Yes
106 Oak Woodland	@ 10 yrs to 300 TPA	@ 50 & 60 yrs to 40 BA	@ 140-160 yrs	Yes
107 Single Tree	n/a	n/a	harvest every 10 yrs to 60 BA	No
108 Shelterwood w/Reserves	@ 10 yrs to 300 TPA	@ 60 & 90 yrs to 60 & 80 BA	@ 120-140 yrs	Yes
109 Seed Tree	@ 20 yrs to 300 TPA	@ 50 & 60 yrs to 80 BA	@ 80-110 yrs	Yes
110 Oak Decline	@ 20 yrs to 300 TPA	@ 60 & 80 yrs to 70 & 80 BA	@ 90-110 yrs	Yes
111 High Quality	@ 15 yrs to 300 TPA	@ 60 & 80 yrs to 70 BA	@ 90-110 yrs	No
112 Indiana Bat	@ 10 yrs to 300 TPA	@ 60 yrs to 30 BA	@ 140-160 yrs	Yes
113 Crowley's Ridge	@ 20 yrs to 300 TPA	@ 60 yrs to 70 BA	@ 80-120 yrs	Yes
114 Bottomland Hardwoods	@ 20 yrs to 300 TPA	@ 60 yrs to 70 BA	@ 80-120 yrs	Yes
115 Mixed Forest	@ 20 yrs to 300 TPA	@ 60 yrs to 60 BA	@ 90-110 yrs	Yes
116 Pine Bluestem	@ 20 yrs to 300 TPA	@ 30, 50, & 70 yrs to 50 BA	@ 120-150 yrs	Yes
117 Clearcut	@ 10 yrs to 300 TPA	@ 60 yrs to 70 BA	@ 70-90 yrs	Yes

Development of the Forests' SPECTRUM Model

Land management planning is the major mechanism for making large-scale and long-term forest land allocations and resource management decisions. Planning consists largely of exploring a national forest's productive potential and experimenting with various allocation choices. A forest model is the primary planning tool because it permits studying the consequences of choices without actually committing valuable resources to experimentation or having to wait many years to observe an outcome. It can also evaluate whether desired future conditions are feasible when taking all resource management goals and objectives into consideration. However, decisions about land allocation, choosing and pursuing trade-offs, and accepting one result instead of another are made by people, not the model. The model is merely a device for organizing elements of the decision problem, discovering possible choices and identifying potential conflicts. The SPECTRUM model is an evolved version of FORPLAN, a linear programming model that solves for an overall objective, such as maximizing present net worth of benefits and costs. It is an excellent tool for determining the most cost-efficient way to reach objectives and for analyzing the impacts to vegetative conditions over time from various management activities.

In the past, this model has been used to make land allocation decisions; however, for this Forest Plan, those land allocations were essentially determined through the mapping of the management prescriptions (such as 3.A. Pine Woodland Management) that varied for each alternative. Therefore, within SPECTRUM, the land allocation/management prescriptions assigned to every acre were already made in the model through the use of analysis areas. Because silviculture treatments are one of the primary means of ecosystem management, and are easily modeled, the SPECTRUM model was constructed principally to examine how silviculture treatments within ecosystem management could be used to achieve the goals, and objectives for each alternative and for the individual management prescriptions. The OSFNFs model was therefore constructed to be a timber allocation model, i.e. it was used to model management constraints and to determine the most efficient way of meeting management objectives through the use of silvicultural prescriptions. Only benefits and costs pertaining to timber management were included in the model. The effects from other types of treatments on vegetation and other resources, as well as other resource benefits and costs, were addressed outside of the model, based on the timber-related outputs from the SPECTRUM model.

SPECTRUM Model Overview

The model was designed and solved in the following steps:

- Model creation – Designing the SPECTRUM model was the most intensive of the four steps. In this setup the modeler input resource data, specified resource interactions, set goals and objectives, outlined management actions, defined activities and outputs, set the planning horizon, stratified the landscape into similar response areas, and input economic data.

- Matrix Generation – Generating the matrix was the process of converting the input from step one to a matrix of rows and columns that the optimization software can solve.

- Optimization of the Solution – The commercial software C-Whiz was used to solve the matrix. The linear programming solver found the best mix of management actions to meet the management objectives.

- Interpretation of the Solution – The final step in the modeling process was to use the reports and outputs created in SPECTRUM to interpret the results of the optimization and perform sensitivity analysis.

The six basic components of the SPECTRUM model include the following and are discussed individually in this section:

- The planning horizon
- Land stratification
- Silvicultural prescriptions
- Activities and outputs and their associated costs and benefits
- Constraints
- Objectives Functions

Planning Horizon

Each SPECTRUM model has a specific time frame known as a 'planning horizon' that may be as short or long as desired and is broken into time periods of 10 years each. The OSFNFs model used a planning horizon of 200 years, with 20 time periods, or decades. Activities and outputs are primarily represented/reported in SPECTRUM on a decadal basis, occurring at the mid-point of the decade.

Land Stratification

Analysis areas are defined as units of land, not necessarily contiguous, which can be considered to be homogeneous with respect to responses to treatments in term of yields, costs, and values received for resource outputs. Management objectives or constraints are also expected to be relatively the same throughout an analysis area. In SPECTRUM, each analysis area is allowed up to six stratification categories to identify its unique responses to treatments, yields, costs, values, and constraints. The OSFNFs used five 'layers' to stratify the land. They are as follows:

- Layer 1 = Vegetation
- Layer 2 = Management Areas
- Layer 3 = Age Class
- Layer 4 = Scenic Management System
- Layer 5 = Suitability

The unique combinations of these five layers are known as 'analysis units.' The OSFNFs used a combination of Geographic Information system (GIS) data layers to construct its analysis units. A detailed description of the GIS layer development process can be found in the process record.

Layer 1 – Vegetation

Layer one is a combination of six forest type groups, two site indices, and two mortality rankings. The six forest type groups are aggregates of 'like' CISC forest types. All of the forest types represented in the OSFNFs CISC data had to be accounted for in one of the six groups. The aggregation is displayed in Table B-9.

Table B-9: Forest Type Aggregation for Layer 1

CISC Code	Description	SPECTRUM Code
53	White Oak, Red Oak, Hickory	53
82	Black Walnut	
88	Black Locust	
69	Beech-Magnolia	
71	Black Ash, American Elm, Red Maple	
51	Post Oak - Black Oak	
54	White Oak	
55	Northern Red Oak	
56	Yellow Poplar, White Oak, Red Oak	
57	Scrub Oak	
52	Chestnut Oak	
47	White Oak, Black Oak, Yellow Pine	47
44	Southern Red Oak - Yellow Pine	
46	Bottomland Hardwood - Yellow Pine	
48	Northern Red Oak, Hickory, Yellow Pine	
12	Shortleaf Pine - Oak	12
13	Loblolly Pine - Hardwood	
25	Yellow Pine	32
31	Loblolly Pine	
32	Shortleaf Pine	
11	Eastern Red Cedar – Hardwood	35
43	Oak - Eastern Red Cedar	
35	Eastern Red Cedar	
81	Sugar Maple, Beech, Yellow Birch	64
75	Sycamore, Pecan, American Elm	
72	River Birch - Sycamore	
68	Sweetbay, Swamp Tupelo, Red Maple	
65	Overcup Oak - Water Hickory	
64	Laurel oak - Willow Oak	
62	Sweet Gum, Nuttall Oak, Willow	
58	Sweet Gum, Yellow Poplar	
73	Cottonwood	
78	Sycamore – Sweet Gum	
98	Undrained Flatwoods	
99	Brush Species	
42	Upland Hardwoods - White Pine	
50	Yellow Poplar	

The other two layer 1 identifiers are site index and mortality ranking. Site index data comes from the Forests' CISC database. Mortality ranking refers to the level of Red Oak Borer damage within a stand, which has been modeled for the hardwood stands on the Forests using GIS. More details about the mortality ranking modeling can be

found in the process record. Tables B-10 and B-11 display the coding used for site indices and mortality raking for layer 1.

Table B-10: Site Indices for Layer 1

CISC	Description	SPECTRUM Code
All forest types except FT47		
0-69	Site indices between 0-69	MD
70+	Site indices greater than 70	HI
Forest Type 47		
0-59	Site indices between 0-59	MD
60+	Site indices greater than 60	HI

Table B-11: Mortality Ranking for Hardwoods

Ranking	Description	SPECTRUM CODE
1	Very High Mortality (greater than 50% Oak Mortality)	H
2-5	High to Very Low Mortality (from 0-50% Oak Mortality)	L

Mortality rankings were only given to analysis areas that were in a 53 (red oak, white oak, hickory) or 47 (white oak, black oak, yellow pine) forest type and had a condition class of 10 (mature sawtimber), 11 (immature poletimber), or 12 (immature sawtimber).

The three criteria for layer 1; 1) forest type, 2) site index, and 3) mortality ranking were combined to form the following (Table B-12) layer 1 SPECTRUM strata.

Table B-12: Layer 1 SPECTRUM Codes and Descriptions

Forest Type Group	Site Index	Mortality Ranking	SPECTRUM Code
53	H*	H	53HH
53	H*	L	53HL
53	M*	H	53MH
53	M*	L	53ML
53	HI	n/a	53HI
53	MD	n/a	53MD
47	H*	H	47HH
47	H*	L	47HL
47	M*	H	47MH
47	M*	L	47ML
47	HI	n/a	47HI
47	MD	n/a	47MD
12	HI	n/a	12HI
12	MD	n/a	12MD
32	HI	n/a	32HI
32	MD	n/a	32MD
35	HI	n/a	35HI
35	MD	n/a	35MD
64	HI	n/a	64HI
64	MD	n/a	64MD

*Because of having a mortality rating these strata only have a one digit site index code

Table B-13: Layer 2 – Management Areas

Management Area	SPECTRUM Code
Custodial Management	0A
Wilderness	1A
Designated Wild and Scenic River	2A
Wilderness Additions	1B
Rivers Recommended as Wild & Scenic	2B
Experimental Forest	3A
Research Natural Areas	3B
Special Interest Areas	3C
Proposed Special Interest Areas	3E
Areas Managed to Restore/Maintain Old Growth	5A
Scenic Byway-Upper Buffalo Backcountry	6A6E
Scenic Byway – Indiana Bat Mgt.	6A7A
Scenic Byway – Pine Woodland Mgt.	6A8A
Scenic Byway – Oak Woodland Mgt.	6A8B
Scenic Byway – Oak Decline Restoration Mgt	6A8E
Scenic Byway – Mixed Forest Mgt	6A8F
Scenic Byway – High Quality Mgt	6A9A
Scenic Byway – Crowley's Ridge Mgt	6A9C
Scenic Byway – Bottomland Hardwood Mgt	6A9D
Ozark Highlands Trail Corridor	6B
State Parks	6C
Developed Recreation Areas	6D
Upper Buffalo Headwaters Backcountry	6E
Indian Creek Dispersed Recreation Area	6G
Proposed Scenic Byway – Indian Creek Dispersed Rec.	6H6G
Proposed Scenic Byway – Indiana Bat Mgt.	6H7A
Proposed Scenic Byway – Pine Woodland Mgt.	6H8A
Proposed Scenic Byway – Oak Woodland Mgt.	6H8B
Proposed Scenic Byway – Oak Decline Restoration Mgt	6H8E
Proposed Scenic Byway – Mixed Forest Mgt	6H8F
Proposed Scenic Byway – High Quality Mgt	6H9A
Indiana Bat Management Area	7A
High Quality Wildlife Habitat Emphasis Area	7B
Pine Woodland Management	8A
Oak Woodland Management	8B
Oak Decline Restoration Area	8E
Mixed Forest Management Area	8F
High Quality Forest Products	9A
Crowley's Ridge	9C
Bottomland Hardwoods	9D
Riparian Corridors	10A

Layer 3 – Age Class

This layer uses the newly calculated ages for the hardwood stands, due to Red Oak Borer, and CISC condition class for all other strata.

Table B-14: Layer 3 - Age Class

Condition Class	Age (Years)	SPECTRUM Code
13	0-19	SSP
11	20-49	POL
12	50-69	IMS
10	70+	MAT

Layer 4 – Scenic Management System (SMS)

All national forest landscapes have values as scenery, some more than others. Scenic classes are used as a measure of the value of scenery in a national forest. These classes, expressed numerically as one through seven, are a product of the Forests' scenery inventory that combines viewing distance zones, concern levels, and scenic attractiveness.

Table B-15: Layer 4- Scenic Management Systems

SMS	SPECTRUM Code
1	1
2-6	0

Layer 5 – Suitability

This GIS layer is a result of the Stage III suitability analysis. It will vary by alternative because management area allocation changes by alternative. For more information, see the Forests' suitability analysis in this Appendix.

Table B-16: Layer 5 Suitability

Description	SPECTRUM Code
Suitable for Timber Production	S
Unsuitable for Timber Production – Forested	UN
Unsuitable for Timber Production – Non-Forested	UNF

Silvicultural Prescriptions in SPECTRUM

A choice of silviculture prescriptions were allocated to specific management areas within the SPECTRUM model. These Silviculture prescriptions are discussed in more detail earlier in this section of the FEIS appendix. Table B-17 displays silvicultural prescription allocations by management area.

Table B-17: Silvicultural Prescription Allocation by Management Area

Management Areas	Grow Only	Grow Only w/ Fire	Shelterwood	Group Selection	Old Growth	Oak Savanna	Oak Woodland	Single Tree	Shelterwood w/ Reserves	Seed Tree	Oak Decline	High Quality	Indiana Bat	Crowley's Ridge	Bottomland Hardwoods	Mixed Forest	Pine Woodland	Clearcut
0.A.	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
1.A.	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
1.B.	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
2.A.	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
2.B.	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
3.A.	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
3.B.	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
3.C.	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
3.E	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
5.A.	A	A	N	N	A	A	A	N	A	N	N	N	N	N	N	N	N	N
6.A.6.E.	A	A	N	A	N	A	A	A	A	A	N	N	N	N	N	N	N	N
6.A.7.A.	A	A	N	A	N	A	A	A	A	A	N	N	A	N	N	N	N	N
6.A.8.A.	A	A	N	A	N	A	A	A	A	A	N	N	N	N	N	N	A	N
6.A.8.B.	A	A	N	A	N	A	A	A	A	A	N	N	N	N	N	N	N	N
6.A.8.E.	A	A	N	A	N	A	A	A	A	A	A	N	N	N	N	N	N	N
6.A.8.F.	A	A	N	A	N	A	A	A	A	A	N	N	N	N	N	A	N	N
6.A.9.A.	A	A	N	A	N	A	A	A	A	A	N	A	N	N	N	N	N	N
6.A.9.C.	A	A	N	A	N	A	A	A	A	A	N	N	N	A	N	N	N	N
6.A.9.D.	A	A	N	A	N	A	A	A	A	A	N	N	N	N	A	N	N	N
6.B.	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
6.C.	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
6.D.	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
6.E.	A	A	A	A	N	A	A	A	A	A	N	N	N	N	N	A	N	N
6.F.	A	A	N	N	N	N	N	N	A	N	N	N	N	N	N	N	N	N
6.G.	A	A	A	A	N	A	A	A	A	A	N	N	N	N	N	A	N	N
6.H.6.G.	A	A	N	A	N	A	A	A	A	A	N	N	N	N	N	N	N	N
6.H.7.A.	A	A	N	A	N	A	A	A	A	A	N	N	A	N	N	N	N	N
6.H.8.A.	A	A	N	A	N	A	A	A	A	A	N	N	N	N	N	N	A	N
6.H.8.B.	A	A	N	A	N	A	A	A	A	A	N	N	N	N	N	N	N	N
6.H.8.E.	A	A	N	A	N	A	A	A	A	A	A	N	N	N	N	N	N	N
6.H.8.F.	A	A	N	A	N	A	A	A	A	A	N	N	N	N	N	A	N	N
6.H.9.A.	A	A	N	A	N	A	A	A	A	A	N	A	N	N	N	N	N	N
7.A.	A	A	N	N	N	A	A	N	A	N	N	N	A	N	N	N	A	N
7.B.	A	A	A	N	N	A	A	N	A	A	N	N	N	N	N	A	A	N
8.A.	A	A	N	N	N	A	A	N	A	N	N	N	N	N	N	A	A	N
8.B.	A	A	N	N	N	A	A	N	A	N	N	N	N	N	N	A	A	N
8.E.	A	A	A	A	N	A	A	N	A	N	A	N	N	N	N	A	N	A
8.F.	A	A	A	A	N	A	A	A	A	A	N	N	N	N	N	A	N	N
9.A.	A	A	N	A	N	A	A	N	A	A	N	A	N	N	N	N	N	A
9.C.	A	A	A	A	N	N	N	N	A	N	N	A	N	A	N	N	N	N
9.D.	A	A	A	A	N	N	N	N	A	N	N	N	N	N	A	N	N	N
10.A	A	A	N	N	N	N	N	N	A	N	N	N	N	N	N	N	N	N

A = Acceptable N = Not Acceptable

Activity Costs and Output Benefits

Management of a national forest yields a variety of public goods and services, many of which can be assigned cost and benefit values, such as timber and minerals. Environmental settings and maintaining or protecting long-term biological productivity of forested lands are examples of public goods created through forest management that cannot be assigned monetary values. Table B-18 and B-19 show activity and output variables used in the OSFNFs SPECTRUM model, and their assigned activity

unit costs and priced output benefits. Since SPECTRUM was designed to model timber management, other resources activity costs and output values were estimated outside of the model.

Table B-18: Activities and Associated Cost as Modeled in SPECTRUM (Base Year 2004)

SPECTRUM Activity	Unit of Measure	Cost per Unit
Sales Preparation	MCF (thousand cubic feet)	$250
Site Preparation	Acre	$455
Reforestation - Pine	Acre	$54.90
Reforestation - Hardwood	Acre	$82.70
Timber Stand Improvement	Acre	$150
Pre-Commercial Thinning	Acre	$179
Road Construction	Mile	$18,000
Road Re-Construction	Mile	$23,000
Temporary Road Construction	Mile	$2,500
Road Maintenance	Mile	$1,600

Table B-19: Outputs and Associated Benefits as Modeled in SPECTRUM (Base Year 2004)

SPECTRUM Output	Unit of Measure	Cost per Unit
Red Oak Sawtimber	MCF	$787
White Oak Sawtimber	MCF	$1100
Mixed Oak Sawtimber	MCF	$878
Mixed Hardwood Sawtimber	MCF	$785
Pine Sawtimber	MCF	$864
Roundwood	MCF	$53

Sales preparation costs were computed from District records contained in the QuickSilver economic program. Site preparation costs were pulled from a forest database for typical silvicultural treatments (KVP). Pine and Hardwood reforestation costs refer to the differences of planting pine seedlings versus planting hardwood seedlings. Timber stand improvement costs refer to TSI of young stands and were derived from forest contract prices. Pre-commercial thins refer to wildlife thinnings of non-commercial material to achieve ecological conditions. Road costs are estimates, provided by the Forests' engineering department, based on recent project work Selling prices for timber products were derived from average selling prices of recently awarded sales as of March 2004.

Cost differentiations between logging systems and silviculture applications were not estimated given the numerous factors on the Forests' determining how an area should be harvested. Trying to add this complexity into the modeling application would have exponentially increased the complexity of the SPECTRUM model.

The location of new road construction, reconstruction, maintenance, and temporary roads needed to access future timber harvests were not calculated in the SPECTRUM

model for several reasons. SPECTUM is not a spatial model; therefore it is difficult to address accessibility. However, recent timber sale data was analyzed with respect to the amounts and type of road construction that was needed for each sale. Coefficients for the cost and mileages of system and temporary roads were estimated for each thousand cubic feet (MCF) of wood harvested and then applied to each alternative's estimated timber outputs. The cost of roads was therefore included in the present net value analysis. Table B-20 displays the four road categories used in SPECTRUM and their associated coefficients.

Table B-20: Road Coefficients for Future Timber Access Needs

Type of Road	% of Mile p/MCF
New Construction	.00025
Reconstruction	.001
Temporary Road	.003
Road Maintenance	.03

Constraints

The land allocation mapping of management prescriptions for each alternative essentially applied that alternatives overall goals, objectives, and resource constraints to the land base. Therefore the SPECTRUM models constructed for each alternative were basically identical, with the exception of a new set of analysis units for each alternative. The same set of silviculture prescriptions, costs, benefits, and yields were applied to each alternative. Several constraints were developed for the SPECTRUM model in response to standards and objectives and the management requirements in the NFMA regulations (36 CFR 219.27). Constraints were also developed in response to management goals and to improve the model's simulation of actual management of the Forests.

The Following SPECTRUM constraints were applied to all alternatives.

- Long Term Sustained Yield (LTSY) constraint was used to ensure that the harvest of timber in the last decade is not greater than the long-term timber production capacity of the Forests. Long-term sustained yield capacity was computed using the acreage scheduled to each regeneration prescription applied in the model.

- The Perpetual Timber Harvest constraint was used to ensure that the remaining timber inventory would allow achievement of non-declining harvest levels beyond the modeling horizon. To achieve this condition the constraint required that the Forests contain as much timber inventory volume at the end of the last decade as the Forests would have, on the average, under the management intensities selected in the analysis. Without this constraint the SPECTRUM model would have no reason to leave any inventory at the end of the planning period to sustain timber harvest levels into perpetuity.

- The Non-Declining Yield constraint was used to ensure that the harvest of timber in a decade was greater than or equal to the harvest of timber in the previous decade. This constraint indirectly limited the model to a lower present net value and reduced flow of timber in the early decades but also provided community economic and social stability through the controlled flow of timber.

- Each alternative was modeled with the same objective function: to solve for the maximization of present net value. The mapping of management prescriptions for each alternative reflected the over all goals, objectives, and constraints of that alternative so a different objective function was not needed to reflect the overall emphasis of a particular alternative.

- Allocation to the clearcut silviculture prescription (# 117) was limited to less than one percent of the suitable land base in management areas 8.E. and 9.A. except in Alternative B where it was limited to fifty percent. This was done in an attempt to model the reality of a limited use of clearcutting on the OSFNFs.

- Total harvest acres for even-aged harvest, uneven-aged harvest, overstory removal, and thinnings were limited to less than or equal to 150,000 acres per decade, for the first five decades. The distribution among these three categories varied by alternative based on the alternatives overall objective.

- Intermittent Stream: the allocation of acres within each management area, determined to be intermittent streams through GIS modeling, were limited to only the Grow Only with Fire (#101) and Shelterwood with Reserves (#108) silviculture prescriptions.

- See Table B-17 of this FEIS for management area allocation constraints.

The following are additional constraints by alternative:

Alternative A

- Acres harvested under an uneven-aged silviculture prescription were limited to less than 10,000 in the first five decades.

Alternative B

- Acres harvested under an uneven-aged silviculture prescription were limited to less than 20,000 in the first five decades.

Alternative C

- The use of the Group Selection silviculture prescription (#103) was limited to less than five percent of the acreage in analysis units from which it could choose allocation.

- The allocation of the Single Tree Selection silviculture prescription (#107) was limited to less than ten percent in management areas: 8F, 6E, and 6G; and less than thirty percent in management areas 6A and 6H.

- The allocation of Oak Savanna (#105) and Oak Woodland (#106) silviculture prescription, within management area 8B, was constrained to greater than seventy percent.

- The allocation of the Pine Woodland silviculture prescription (#116), within management area 8A, was constrained to greater than seventy percent.

- The minimum amount of Oak Woodland condition must be greater than 25,000 acres in the first decade.

- The allocation of Oak Savanna (#105), Oak Woodland (#106), and Pine Woodland (#116) were constrained to greater than forty percent within the management areas 'allowed' to chose from those prescriptions.

- In management area 7A (Indiana bat) the allocation of the Indiana Bat (#112), Oak Woodland (#106), Oak Savanna (#105), and Pine Woodland (#116) were constrained to greater than fifty percent of the management area.

- The following harvest constraints were included for the first five decades:
  Even-Aged – greater than 35,000 acres
  Uneven-Aged – less than 10,000 acres
  Thinning – greater than 55,000 acres

Alternative D

- The following harvest constraints were included for the first five decades:
  Even-Aged – greater than 100,000 acres
  Uneven-Aged – less than 10,000 acres

Alternative E

- The allocation of the Oak Savanna silviculture prescription (#105), within management areas 'allowed' to choose from that prescription (except 8B), was constrained to greater than one percent.

- The allocation of the Oak Woodland silviculture prescription (#106), within management areas 'allowed' to choose from that prescription (except 8B), was constrained to greater than fourteen percent.

- The allocation of the High Quality silviculture prescription (#111), within management area 9A, was constrained to greater than fifty percent.

- The allocation of Oak Savanna (#105) and Oak Woodland (#106) silviculture prescription, within management area 8B, was constrained to greater than sixty percent.

- The allocation of the Pine Woodland silviculture prescription (#116), within management area 8A, was constrained to greater than forty percent.

- The minimum amount of Oak Woodland condition must be greater than 20,000 acres in the first decade.

- The use of the Group Selection silviculture prescription (#103) was limited to less than five percent of the acreage in analysis units from which it could choose allocation.

- The allocation of the Single Tree Selection silviculture prescription (#107) was limited to less than ten percent in management areas: 8F, 6E, and 6G; and less than thirty percent in management areas 6A and 6H.

- Acres harvested in management area 7.A. (Indiana Bat) under the Indiana Bat (#112), Oak Savanna (#105), or Oak Woodland (#106) silvicultural prescription were constrained to greater than 350.

- Acres harvested in management area 8.B under the Oak Savanna (#105) or Oak Woodland (#106) silvicultural prescriptions were constrained to greater than 350.

- Acres allocation in the 64 forest type group in management area 9.D. with the shelterwood (#102) silvicultural prescription were constrained to greater than twenty percent of the management area 9.D. acreage

Objective Function

The objective function allows specification of an overall objective to be met in a given run of the model while all constraints otherwise specified are met. Since the alternative dependent mapping of the management prescription and the application of the constraints essentially established the overall objective for each alternative, the SPECTRUM models for all of the OSFNFs alternatives were designed to solve for the most economical manner in which to accomplish those inherent objective. Therefore, all of the alternatives had an objective function to solve for maximum present net value for all activities and outputs.

Sediment Yield

A sediment yield/cumulative effects model was developed to estimate sediment yields and analyze the cumulative effects of proposed management actions on water quality. The process provided a means to systematically evaluate water quality conditions for 5th level watersheds covered in whole or in part by the Forest Plan. The process also provided results that aided in aquatic viability analysis at the community scale

In earlier planning efforts, forests were directed to calculate sediment and water yield increases over time. This served as a surrogate of existing condition and provided a quantification of potential effects of alternatives. However, watershed condition was described in general physical terms, not in terms of aquatic health or vulnerability to management actions. With the current level of planning, available data layers, and GIS information there is an opportunity to specifically evaluate watershed conditions and estimate the effects of management activities based on a number of watershed parameters. Sediment yield will still be used for this analysis, but the results are related to overall watershed condition or aquatic health rather than just erosion potential.

Sediment is an appropriate measure to determine the effects of management activities on water quality and its associated beneficial uses on forested lands (Coats and Miller 1981). Sediment increases can adversely affect fish productivity and diversity (Alexander and Hansen 1986), degrade drinking water, and affect recreational values. There may be other cumulative impacts such as increases in water yield as a result of harvesting methods. However, water yield models do not characterize the impacts of all management activities such as road construction and

A valid cumulative effects analysis must be bound in space and time. For the purposes of this analysis, 5th level watersheds are appropriate spatial bounds for cumulative effects. The implementation period for a forest plan is 5-15 years, however, the appropriate time period captured for the sediment model is for 5 decades (50 years). This allows for a discussion of past, present, and future activities for public and private lands by watershed for a time period of 50 years. A detailed description of data sources and the model process can be found in a process paper on file at the OSFNFs' Supervisor's Office (Clingenpeel and Leftwich 2004).

The sediment model calculates the baseline, current, and predicted sediment values resulting from the activities described in this plan, anticipated road construction and maintenance, and land uses/activities on private land, for each alternative, in all 51 watersheds intersected by the Forests' administrative boundary. To determine the potential cumulative effects to beneficial uses, these sediment values are expressed as a percent increase over the baseline and compared to thresholds determined by the tolerance of aquatic inhabitants (fish). The baseline assumes an undisturbed forestland use with no roads.

Watershed Condition Rank (WCR) is a measure that characterizes the watersheds with respect to current and future sediment load increases. In order to establish WCRs, the relationship between fish assemblages and cumulative sediment yields were identified as a functional indicator of aquatic health. From sites across Arkansas, fish collections were grouped into specific assemblages and the watershed above each fish sample point was evaluated to determine the cumulative sediment values. These fish assemblages and sediment values were used to describe a relationship between increasing sediment (as modeled by the process) and aquatic health of the various groupings for each of the major ecoregions covered by the OSFNFs. This relationship, in most cases, portrayed by a wedge-shaped pattern, indicated that as sediment rises, the ability for a water body to support the fish populations decreased.

Risk levels were determined based on these wedge-shape relationships and each ecoregion expressed different threshold tolerances. The sediment increase values were divided into quartiles to establish categories of risk and determine the sediment thresholds. The upper quartile (least disturbed, least sediment) was considered a low risk. The next quartile was considered a moderate risk and the two bottom quartiles were considered the highest risk of an adverse biotic response. They resulted in the identification of two threshold values for each watershed, listed as a percent increase over baseline values, and associated with a WCR risk level. Table B-21 shows the watershed condition rank thresholds for sediment identified for cumulative effects. An explanation of each risk level follows the table.

Table B-21: Watershed Condition Rank Thresholds For Sediment Identified For Cumulative Effects Found On The 4 Eco-Regions Of The OSFNFs.

Risk Level	Eco-region			
	Arkansas BM	Boston Mountain	Delta	Ozark Highlands
Low	0 to 311	0 to 456	0 to 4800	0 to 2817
Moderate	311 to 623	456 to 913	4800 to 9601	2817 to 5635
High	> 623	> 913	> 9601	> 5635

***Values given represent the percent increase above a baseline erosion value.**

Watershed condition is expressed in three categories of risk: high, medium, and low. This does not necessarily translate into an excellent or poor watershed but categorizes the watersheds based on the sediment prediction/fish assemblage relationship.

Where a watershed risk level is *low*, the probability (or potential) is **low** for adverse effects to aquatic species. If the results of forest alternatives remain within this range there should be no adverse effect on water quality with respect to beneficial uses (fish communities).

Where a watershed risk level is ***moderate,*** the potential to adversely affect beneficial uses is **moderate**. Project level planning should seek to identify the

source of the problem, and conduct monitoring prior to project implementation to establish actual health of the biota.

Where a watershed risk level is ***high***, the potential to adversely affect beneficial uses is **high**. Project level planning should seek to identify the source of the problem, conduct monitoring prior to project implementation to establish actual health of the biota, and design the project activities to have no net increase in sediment yields.

Many assumptions are made throughout the sediment model and the WCR. Every effort has been made to describe those assumptions and minimize misrepresentation. With that in mind, the application of the sediment model and associated WCR should not be taken as absolutes but as a method that can describe the effects from the range of alternatives and suggest where a greater risk with respect to water quality and aquatic biota exists.

Major assumptions associated with the model include:

- Sediment yield is an appropriate surrogate for determining cumulative impacts to water quality.
- Fifth level watersheds are the appropriate scale of analysis for cumulative effects to water resource.
- Appropriate erosion coefficients from Dissmeyer and Stump (1978) approximate erosion rates from land use activities on OSFNF lands.
- More technical assumptions associated with the model can be found in the Process Paper (Clingenpeel, 2002) with a citation found in the list of references.
- The model will provide the following information:
- Estimate of the current sediment yield within 5th level watersheds covered in total or partially by the Forest Plan.
- Estimate of sediment yield attributable to Forest Service activities by alternative and planning period.
- Estimate of cumulative sediment yields for entire 5th level watersheds (all ownerships) by alternative and planning period.

Social and Economic Analysis

The purpose of this portion of Appendix B is to provide interested readers with additional details regarding the social and economic analyses. This section does not provide sufficient information to replicate the analysis. For that level of detail, the companion specialist reports contained in the administrative record should be consulted.

The Models

Economic effects to local counties were estimated using Impact Analysis for Planning (IMPLAN) Professional 2.0, an economic input/output model. IMPLAN is a software and database system that uses the latest economic data, such as national input/output tables from the Bureau of Economic Analysis. The software and data were originally developed by the Forest Service and is now maintained by the Minnesota IMPLAN Group, Inc (MIG). Data used for the impact analysis was from secondary data for the eighteen counties considered to be in the forests impact areas. The assumption used in this modeling process was that the impact area comprised the counties within the forests' designated county boundaries and represents a functional economic area. The data source used in developing the OSFNFs models for impact purposes was the 2002 IMPLAN data set available from MIG. Model construction within IMPLAN aggregates all the counties selected for inclusion within the impact area.

Input/output analysis gives estimates of employment and income for an increase in final demand on certain sectors of the economy. For Forest Service timber, for example, we looked at the saw mill and pulpwood industries where our timber goes as the first processing step in manufacturing. Impacts include all those industries initially impacted as well as those industries linked with supplying inputs to production, as well as workers in those industries who spend wages in their households (known as direct, indirect and induced effects). Thus, the impact assumes a new demand is made on the economy and estimates what the new increase in final demand will mean in employment and income to the economy. Input/output modeling (an equity analysis which tells how income and jobs are distributed throughout and economy for a given economic impact) has nothing to do with benefit cost (an efficiency analysis which estimates how efficient monies are spent on investment activities).

Dependency Analysis

The IMPLAN model was used to assess the economic dependencies of the OSFNFs planning area. Economic dependency is a way of assessing the strength (what drives the economy) of regional or local economies. Regional economies generally depend on their exports to grow most local income and employment. Based on this data, it is reasonable to estimate economic dependency by examining an area's export base. The export base analysis done for this EIS measured the total contribution of one sector, or industry to the economy. Industries can import and export similar commodities. Those industries having more exports than imports are considered "basic", and thereby allow "new" money to enter the economy. Basic industries allow an economy to grow.

Diversity Analysis

Using IMPLAN employment and income reports, forest planners illustrated the relative importance of major sectors and industries, such as wood products, and

tourism. Employment, industrial output, and labor income to workers and proprietors were contrasted to the total for the entire forest economy to gauge the percentage relationship between the two. Using IMPLAN models from two years (1990 and 2000) a change in economic characteristics in illustrated. The Shannon Weaver Entropy Indexes were also used to show relative diversity of counties, and the state.

Forest Contribution and Economic Impact Analyses

An impact analysis describes what happens when a change in final demand sales occurs for goods and services in the model region. Changes in final demand sales are the result of multiplying production data (e.g., head months of grazing or recreation visitor trips) times sales. Economic impacts were estimated for 2005, using the expenditure data for recreation, wildlife and hunting (U.S. Forest Service's National Visitor Use and Monitoring data, (NVUM); stumpage estimates for timber, market prices for minerals, and estimated animal allotment prices for Range. NVUM data were used by Daniel J. Stynes and Eric White, Michigan State University, July 2002 to estimate spending profiles of recreation users.

Impacts to local economies are measured in two ways: employment and labor income. Employment is expressed in jobs. A job can be seasonal or year-round, fulltime or part time. Labor income includes both employee compensation (pay plus benefits) and proprietor's income (i.e. self employed).

Data Sources

The IMPLAN model was used to determine economic (employment and labor income) consequences in selected sectors. Because input/output models are linear, multipliers or response coefficients need only be calculated once per model and then applied to the direct change in final demand. A Forest Service developed spreadsheet known as "FEAST" (Forest Economic Analysis Spreadsheet Tool) was used to organize the resource data by alternative and IMPLAN response coefficients to derive the economic consequences by alternative and resource. In other words, FEAST uses the response coefficients from IMPLAN and the resource data by alternative to estimate the economic consequences.

TIMBER

Sales Data: Timber revenue was estimated by using timber stumpage values ($ per CCF) multiplied by estimated production harvest levels for each alternative.

Use of the Model: Hardwood and softwood sawtimber are processed through the sawmill industry. Hardwood and softwood round wood are assumed to be processed at the pulp mill. In the absence of a pulp mill in the local economy, round wood is assumed to be exported out of the analysis area. Impacts represent the economic activity occurring in all backward linking sectors associated with the final demand output of the timber industries described above. For the OSFNFs, pulp mills do not

exist in the analysis area. Therefore it was assumed round wood was exported out of the impact area.

Range

Sales Data: The best available data for agriculture is found in the *2002 Census of Agriculture*. From this census, data for county level inventory and animals sold were used. This information was used to estimate the market value of animals sold in the local economy (total sales) and the proportion that was attributable to the Forest Service. Animal months of grazing on forest land were provided by alternative by the resource specialists. This unit of use information was placed in FEAST to link with IMPLAN impact response coefficients to yield an impact for the range resource per unit of grazing (AUM).

Recreation Wildlife & Fish

Expenditure Data: Recreation and Wildlife and Hunting trips were derived from the 2001 National Visitor Use and monitoring survey (NVUM). The NVUM survey is conducted for one quarter of national forests each year. The resulting calculations yielded trips for local and non-local Day use, on National Forest Overnight use, and off National Forest Overnight Use. These use metrics were entered into FEAST to link with IMPLAN impact response coefficients to yield an impact for recreation and wildlife resources.

While some analysts may not include resident (people within 50 miles of the impact area) participation in local economy impacts because there may be substitution opportunities for local residents to spend their discretionary dollar, we decided to include resident expenditures in the local economy with the caveat that these expenditures were “associated” with the impacts not “responsible” for causing the impacts. The logic for making this statement is that local recreation users have many choices for their recreation expenditures. If some people choose not to recreate on national forest level land, they may recreate in another manner such as go to sporting events or a movie. The dollars would still be spent in the local economy causing a similar impact, but the provider of recreation would be a different party.

Federal Expenditures & Employment

Forest Service Expenditure Data: Planners applied budget constraints to every alternative. This budget constraint was used to estimate total forest expenditures (salary and non-salary) expenditures, some of which had local economic effects. Budget object codes from the National Finance Center for 2002 to 2004 were averaged and used to constrain total forest expenditures. The proportion of funds spent by resource programs varies by the alternative according to the theme for that alternative. Forest Service employment was estimated by the forest staff based on examination of historical Forest Service obligations.

Use of the Model: To obtain an estimate of economic impacts related to Forest Service spending, salary and non-salary portions of the impact were handled separately. Non-salary expenditures were determined by using the budget object code information noted above. This spending profile was run through the model for non-salary expenditures to develop response coefficients (jobs and income) per one million dollars, and the results multiplied by total forest non-salary expenditures. FEAST was again used to perform these calculations.

IMPLAN includes a profile of personal consumption expenditures for several income categories; the average compensation for an employee on the OSFNFs fell in the category of $30,000-$39,999. An IMPLAN profile for this spending range was used to estimate the economic effects of employee expenditures in the economy (induced effects).

Revenue Sharing –Payments to States

Expenditure Data: Until September 30, 2001, Federal law required that 25 percent Fund Payments be used for only schools or roads or both. A split of 75 percent for schools and 25 percent for roads was used for this analysis. An IMPLAN profile of expenditures was developed from within the county forest boundary model for 1) the highway construction sector and 2) local educational institutions. Because counties can choose to continue payments under this formula, traditional payments were analyzed. Should counties choose fixed payments under the new law, the impacts would not vary by alternative. The impact of the fixed payment was not calculated.

Use of the Model: The national expenditure profile for state/local government education (schools) and local model estimates for road construction (roads) are provided within IMPLAN. An IMPLAN project consisting of these two sectors was developed. The IMPLAN model was used to estimate a response coefficient (jobs and labor income per $1 million of payments to states) These response coefficients were loaded into FEAST and linked to the estimated payments to states by alternative to estimate employment and labor income effects.

Output Levels

Output levels for each item listed above can be viewed in various Forest FEAST spreadsheets files contained in the administrative record. These amounts are also located in the corresponding resource sections of the FEIS.

Present Net Value

The 1982 National Forest Management Act (NFMA) implementing regulations (*36 CFR 219.1*) state that forest plans must "…provide for multiple use and sustained yield of goods and services from the National Forest System in a way that maximizes long term net public benefits in an environmentally sound manner." Net public benefits is defined as the overall value to the Nation of all outputs and positive

effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not.

Present net value (PNV) is one of the criteria used to determine net public benefits (NPB) in benchmarks and alternatives. It is the difference between the discounted value of all outputs which were assigned a price in the revision and all Forest Service management and investment costs over the analysis period. The PNV converts all costs and benefits over the 50 year planning period to a common point in time. Other benefits of public land management cannot be measured using dollar values. These non-priced benefits are another criteria used to determine NPB. Each alternative used the same values to determine PNV so each alternative can then be compared directly.

Financial and Economic Efficiency Analysis

Financial efficiency is defined as how well the dollars invested in each alternative produce revenues to the agency. Economic efficiency is defined as how well the dollars invested in each alternative produce benefits to society. Present Net Value (PNV) is used as an indicator of financial and economic efficiency.

The OSFNFs used a Microsoft Office Excel electronic spreadsheet to calculate PNV for each alternative over a 50-year period. A four percent real discount rate, prescribed by Forest Service Handbook (FSH) 1909.17, was used. Decadal and 50-year cumulative present values for program benefits and costs as well as present net values are the product of this spreadsheet. For each decade, an average annual resource value was estimated; an annuity was created for the decade and discounted from the mid-point of the decade to the first year of the decade; and then each decade annuity was discounted to 2005.

The financial values for range came from RPA estimates and updated to 2005 dollars; for timber from average stumpage prices provided by the Forests; for minerals from market prices for minerals from the Minerals Management Agency; and prices for recreation and wildlife from RPA updated to 2005 dollars and transformed to NVUM unit measurements. All values are in 2005 constant dollars.

Table B-22: Displays Economic Values That Were Used to Determine Present Net Value.

Economic Benefits And Financial Revenue Values	
Range ($/AUM)	
Cattle/Horses	$4.53
Timber ($/MCF):	
Sawtimber Softwood	$259.30
Sawtimber Hardwood	$267.00
Roundwood Softwood	$15.90
Roundwood Hardwood	$15.90
Minerals:	
Dimension Stone ($/Short Ton)	$10.00
Crushed Stone ($/Short Ton)	$1.00
Limestone ($/Metric Ton)	NA
Clay ($/Ton)	NA
Petroleum ($/Barrel)	NA
Natural Gas ($/MCF)	$4.43
Recreation ($/Visit):	
Camping, Picnicking, Swim.	$5.05
Mech. Travel, Viewing Scenery	$3.92
Horseback Riding, Water Travel	$1.76
Resorts	$28.92
Wilderness (backpacking)	$10.87
Other Recreation	$31.48
Wildlife ($/Visit):	
Hunting	$16.91
Fishing	$33.55
Wildlife Watching	$20.15

Timber values are based on Forest harvest values; Recreation and Wildlife are values based on non-market values in the USDA Forest Service "Resource Pricing and Valuation Procedures for the Recommended 1990 RPA Program". These values were taken from the RPA Program document, and then converted from a "per RVD value" to a "per Visit value". This was accomplished by using the forests NVUM data from which the forest estimated that the average length of stay was 8.1 hours. Then the values were converted from a 12 hour/RVD basis to an 8.1 hours/visit basis. Mineral value taken from historical prices from the U.S. Minerals Management Service

The following sets of tables were used in the FEIS Chapter 3 pages 3-410 to 3-4-28 to determine an economic and social analysis of the OSFNFs demographic (social) changes; economic trends; values, attitudes, and beliefs; effects of national forest management on the local economy; and the efficiency of national forest programs to the tax-paying public.

Table B-23: County and State Population Characteristics

County and State Population Characteristics of Counties with National Forest Land, 1980						
	Persons	White	Black	Hispanic	Other Race	% Minority
State of Arkansas	2,286,435	1,890,322	373,768	17,904	63,803	17.75
Ozark NF Counties						
Baxter County	27,529	27,252	26	148	103	1.01
Benton County	78,456	76,644	50	568	1,194	2.31
Conway County	19,577	16,414	2,974	110	79	16.16
Crawford County	37,084	35,412	460	252	959	4.51
Franklin County	14,785	14,319	154	139	173	3.15
Johnson County	17,482	16,970	273	88	151	2.93
Logan County	20,233	19,630	307	128	168	2.98
Madison County	11,406	11,277	0	54	75	1.13
Marion County	11,378	11,246	2	62	68	1.16
Newton County	7,797	7,700	5	53	39	1.24
Pope County	39,200	37,758	836	250	356	3.68
Searcy County	8,886	8,808	0	46	32	.88
Stone County	9,045	8,961	7	28	49	.93
Van Buren County	13,248	13,258	51	93	26	1.27
Washington County	100,901	97,229	1,475	916	1,281	3.64
Yell County	17,083	16,551	352	93	87	3.11
Forest County Totals	434,090	419,429	6,972	3028	4,840	3.4
St. Francis NF Counties						
Lee County	15,697	6,912	8,520	196	69	55.97
Phillips County	35,142	16,100	18,410	472	160	54.19
Forest County Totals	50,839	23,012	26,930	668	229	54.74

Source: U.S. Bureau of Census.

Table B-24: Total Population Changes by County

Location	1980	1990	2000	% change 1980 1990	% change 1990 2000
Ozark NF Counties					
Baxter County	27,409	31,186	38,386	13.8	23.1
Benton County	78,115	97,499	153,406	24.8	57.3
Conway County	19,505	19,151	20,336	1.8	6.2
Crawford County	36,892	42,493	53,247	15.2	25.3
Franklin County	14,705	14,897	17,771	1.3	19.3
Johnson County	17,423	18,221	22,781	4.6	25.0
Logan County	20,144	20,557	22,486	2.1	9.4
Madison County	11,373	11,618	14,243	2.2	22.6
Marion County	11,334	12,001	16,140	5.9	34.5
Newton County	7,756	7,666	8,608	1.2	12.3
Pope County	39,021	45,883	54,469	17.6	18.7
Searcy County	8,847	7,841	8,261	11.4	5.4
Stone County	9,022	9,775	11,499	8.3	17.6
Van Buren County	13,357	14,008	16,192	4.9	15.6
Washington County	100,494	113,409	157,715	12.9	39.1
Yell County	17,026	17,759	21,139	4.3	19.0
St. Francis NF Counties					
Lee County	15,539	13,053	12,580	16.0	3.6
Phillips County	34,772	28,838	26,445	17.1	8.3
State of Arkansas	2,286,435	2,350,725	2,673,400	2.8	13.7

Source: U.S. Bureau of Census.

Table B-25: Minority Trends by County

Location	% White 2000	% Black 2000	% Hispanic 2000	% Other 2000	% Minority 1990	% Minority 2000
Ozark NF Counties						
Baxter County	98%	<1%	1%	<1%	1%	2%
Benton County	88%	<1%	9%	3%	4%	12%
Conway County	84%	13%	2%	2%		
Crawford County	93%	<1%	3%	5%	4%	7%
Franklin County	97%	<1%	2%	1%	2%	4%
Johnson County	91%	1%	7%	<1%	4%	9%
Logan County	97%	1%	1%	<1%	3%	3%
Madison County	95%	<1%	3%	1%	2%	5%
Marion County	98%	<1%	<1%	1%	1%	2%
Newton County	98%	<1%	1%	<1%	<1%	2%
Pope County	94%	3%	2%	1%	4%	6%
Searcy County	98%	<1%	1%	1%	1%	2%
Stone County	98%	<1%	1%	<1%	1%	2%
Van Buren County	97%	<1%	1%	1%	1%	3%
Washington County	87%	2%	8%	3%	5%	14%
Yell County	85%	1%	12%	1%	4%	15%
St. Francis NF Counties						
Lee County	41%	57%	2%	<1%	59%	59%
Phillips County	39%	59%	1%	<1%	56%	61%
State of Arkansas	80%	16%	3%	1%	18%	20%

Source: U.S. Bureau of Census.

Table B-26: Population Density by County

Location	1990 Persons/ Sq Mile	2000 Persons/ Sq Mile	% Change 1990-2000
Ozark NF Counties			
Baxter County	56	69	23%
Benton County	116	181	57%
Conway County	34	37	6%
Crawford County	71	89	25%
Franklin County	24	29	19%
Johnson County	28	34	25%
Logan County	29	32	9%
Madison County	14	17	23%
Marion County	20	27	34%
Newton County	9	10	12%
Pope County	57	67	19%
Searcy County	12	12	5%
Stone County	16	19	18%
Van Buren County	20	23	16%
Washington County	119	166	39%
Yell County	19	23	19%
St. Francis NF Counties			
Lee County	22	21	4%
Phillips County	42	38	8%
State of Arkansas	45	51	14%

Source: U.S. Bureau of Census.

Table B-27: Unemployment Rate and Poverty Rate by County

Location	Unemployment Rate % 1995	Unemployment Rate % 2000	Poverty Rate % 1990	Poverty Rate % 2000
Ozark NF Counties				
Baxter County	3.3	3.9	16	11
Benton County	2.2	2.0	10	10
Conway County	5.1	8.2	17	16
Crawford County	5.1	3.5	16	14
Franklin County	3.8	3.1	20	15
Johnson County	4.0	3.8	20	16
Logan County	4.9	4.1	19	15
Madison County	3	2.7	20	19
Marion County	3.2	2.7	19	15
Newton County	5.5	5.2	30	20
Pope County	4.7	4.3	15	15
Searcy County	5.1	5.2	30	24
Stone County	5.4	3.7	26	19
Van Buren County	6.8	5.8	22	15
Washington County	2.5	2.3	15	15
Yell County	3.6	4.0	17	15
St. Francis NF Counties				
Lee County	9.4	7.9	47	30
Phillips County	10.6	8.3	43	33
State of Arkansas	4.9	4.4	19	16

Source: U.S. Bureau of Census.

Table B-28: Housing Units and Median Housing Value by County

Location	Total Housing Units 1990	Total Housing Units 2000	Percent Change Housing Units 1990-2000	Median Value Housing Units 1990	Median Value Housing Units 2000	Avg. Annual Percent Change in Median Value 1990-2000
Ozark NF Counties						
Baxter County	15,549	19,891	28%	$52,800	$84,500	1.94%
Benton County	41,444	64,281	55%	$58,500	$94,800	2.07%
Conway County	8,009	9,028	13%	$38,500	$59,400	1.57%
Crawford County	16,711	21,315	28%	$43,500	$71,600	2.23%
Franklin County	6,228	7,673	23%	$36,300	$58,500	2.02%
Johnson County	7,984	9,926	24%	$38,200	$59,300	1.63%
Logan County	8,539	9,942	16%	$33,900	$54,000	1.90%
Madison County	5,182	6,537	26%	$34,800	$62,300	3.09%
Marion County	6,139	8,235	34%	$42,100	$73,200	2.79%
Newton County	3,439	4,316	26%	$34,200	$50,100	1.05%
Pope County	18,430	22,851	24%	$47,300	$71,100	1.31%
Searcy County	3,739	4,292	15%	$30,000	$45,600	1.42%
Stone County	4,548	5,715	26%	$37,100	$64,200	2.74%
Van Buren County	7,580	9,164	21%	$43,300	$63,700	1.09%
Washington County	47,349	64,330	36%	$56,100	$90,100	1.98%
Yell County	7,868	9,157	16%	$37,600	$60,600	2.02%
St. Francis NF Counties						
Lee County	5,085	4,768	6%	$32,300	$42,800	0.04%
Phillips County	11,094	10,859	2%	$36,000	$46,900	0.13%
State of Arkansas	1,000,667	1,173,043	17%	$46,000	$72,800	1.83%

Source: U.S. Bureau of Census.

Table B-29: Shannon Weaver Entropy Diversity Index by County

Location	1990 Four Digit SIC*	2000 Four Digit SIC*	% Change 19902000
Ozark NF Counties			
Baxter County	0.63195	0.653223	3.37%
Benton County	0.64424	0.644889	0.10%
Conway County	0.59842	0.631409	5.51%
Crawford County	0.62893	0.63584	1.10%
Franklin County	0.60327	0.616637	2.22%
Johnson County	0.60217	0.592787	1.56%
Logan County	0.63554	0.625572	1.57%
Madison County	0.55660	0.599156	7.65%
Marion County	0.57018	0.593658	4.12%
Newton County	0.57559	0.560637	2.60%
Pope County	0.65598	0.667461	1.75%
Searcy County	0.59264	0.58764	0.84%
Stone County	0.59687	0.61845	3.62%
Van Buren County	0.58895	0.617419	4.83%
Washington County	0.65718	0.662683	0.84%
Yell County	0.50439	0.551486	9.34%
St. Francis NF Counties			
Lee County	0.55459	0.572026	3.14%
Phillips County	0.61847	0.616232	0.36%
State of Arkansas	0.74039	0.73580	0.62%

Source: U.S. Bureau of Census.
***Standard Industrial Classification**

Table B-30: Payments in Lieu of Taxes

Location	1992 Payments	1995 Payments	1998 Payments	2001 Payments
Ozark NF Counties				
Baxter County	$61,661	$78,447	$73,013	$117,769
Benton County	$27,100	$30,513	$28,691	$45,754
Conway County	$3,978	$4,308	$3,960	$7,065
Crawford County	$37,022	$55,712	$51,490	$89,592
Franklin County	$49,949	$68,428	$61,592	$116,119
Johnson County	$79,298	$102,833	$96,985	$185,176
Logan County	$11,551	$70,096	$66,608	$111,391
Madison County	$18,638	$29,234	$26,622	$46,812
Marion County	$54,645	$58,517	$55,215	$87,911
Newton County	$106,645	$152,876	No Data	$241,294
Pope County	$81,856	$122,584	$91,016	$197,227
Searcy County	$29,779	$37,950	$159,599	$59,722
Stone County	$23,447	$37,280	$34,100	$59,533
Van Buren County	$19,944	$27,437	$25,340	$43,112
Washington County	$11,042	$16,727	$15,181	$26,588
Yell County	$81,720	$113,428	$122,219	$187,802
St. Francis NF Counties				
Lee County	$2,074	$5,247	$2,988	$12,733
Phillips County	$1,587	$4,180	$44,889	$10,531
State of Arkansas	1,257,446	1,703,768	1,723,721	2,445,372

Source: U.S. Bureau of Census.

Table B-31: Payments to States by County (1000s of Dollars)

Location	1994 Payments	1995 Payments	1996 Payments	1997 Payments	1998 Payments	% Average Annual Change 1994-1998
Ozark NF Counties						
Baxter County	85	109	97	131	110	5.1%
Benton County	11	14	13	17	14	5.1%
Conway County	9	12	11	14	12	5.2%
Crawford County	117	149	133	179	150	5.1%
Franklin County	141	180	161	216	181	5.1%
Johnson County	245	312	280	376	316	5.2%
Logan County	145	187	162	196	198	6.4%
Madison County	65	83	74	99	83	5.1%
Marion County	5	6	5	7	6	5.1%
Newton County	268	341	305	409	343	5.1%
Pope County	260	331	296	397	333	5.1%
Searcy County	42	54	48	65	56	5.7%
Stone County	83	106	95	127	106	5.1%
Van Buren County	44	56	50	67	56	5.1%
Washington County	30	38	34	45	38	5.1%
Yell County	584	767	635	637	872	8.4%
St. Francis NF Counties						
Lee County	33	23	58	42	3	38.9%
Phillips County	27	19	47	35	2	38.8%
State of Arkansas	2,133	2,743	2,400	2,983	2,875	10.5%

Source: U.S. Bureau of Census.

Table B-32: Heads of Households by County

Location	Persons per Household 1990	Persons per Household 2000	Percent of Households Female only with Children 2000
Ozark NF Counties			
Baxter County	2.31	2.21	7.7%
Benton County	2.60	2.60	8.2%
Conway County	2.67	2.51	11.5%
Crawford County	2.79	2.68	10.9%
Franklin County	2.67	2.51	8.8%
Johnson County	2.58	2.54	9.5%
Logan County	2.69	2.53	10.1%
Madison County	2.65	2.59	7.9%
Marion County	2.41	2.36	7.4%
Newton County	2.72	2.44	7.7%
Pope County	2.73	2.55	10.2%
Searcy County	2.52	2.33	7.7%
Stone County	2.53	2.38	7.1%
Van Buren County	2.46	2.33	7.7%
Washington County	2.61	2.52	9.4%
Yell County	2.57	2.61	10.1%
St. Francis NF Counties			
Lee County	2.85	2.59	23.1%
Phillips County	2.83	2.69	25.1%
State of Arkansas	2.6	2.5	7.4%

Source: U.S. Bureau of Census.

Table B-33: Major Industry Outputs in the OSFNFs Local Economy

	Industry Output 1990	Percent of Total 1990	Industry Output 2000	Percent of Total 2000
Industry				
Other Agriculture	$1,606	8%	$1,562	5%
Range	$171	1%	$172	1%
Total Agriculture	$1,778	9%	$1,733	6%
Minerals	164	1%	142	0%
Construction	1,511	8%	2,762	9%
Other Manufacturing	7,477	39%	9,561	31%
Wood Products	250	1%	424	1%
Pulp & Paper	136	1%	279	1%
Furniture & Fixtures	75	0%	41	0%
Total Wood Based Industries	460	2%	744	2%
Total Manufacturing	7,937	41%	10,305	33%
Transportation & Public Utilities	1,964	10%	3,073	10%
Wholesale & Retail Trade	1,701	9%	4,599	15%
Finance, Insurance, Real Estate	1,511	8%	3,073	10%
Services	1,935	10%	3,718	12%
Government	710	4%	1,602	5%
Other Misc.	18	0%	9	0%

Source: 2000 IMPLAN Data

Table B-34: Employment by Major Industry in the OSFNFs Local Economy

	Employment 1990	Percent of Total 1990	Employment 2000	Percent of Total 2000
Industry				
Other Agriculture	918	9%	18,041	5%
Range	189	2%	4,089	1%
Total Agriculture	1107	10%	22,130	6%
Minerals	18	0%	850	0%
Construction	695	6%	28,034	8%
Other Manufacturing	1896	18%	60,405	17%
Wood Products	237	2%	3,677	1%
Pulp & Paper	0	0%	763	0%
Furniture & Fixtures	0	0%	321	0%
Total Wood Based Industries	237	2%	4,761	1%
Total Manufacturing	2133	20%	65,166	18%
Transportation & Public Utilities	221	2%	21,218	6%
Wholesale & Retail Trade	1486	14%	78,723	22%
Finance, Insurance, Real Estate	486	5%	16,759	5%
Services	1217	11%	79,863	23%
Government	3379	31%	40,141	11%
Other Misc.	37	0%	1,787	1%

Source: 2000 IMPLAN Data

Table B-35: Income by Major Industry in the OSFNFs Local Economy

	Income 1990	Percent of Total 1990	Income 2000	Percent of Total 2000
Industry				
Other Agriculture	$103	2%	$95	1%
Range	$7	0%	$10	0%
Total Agriculture	$110	2%	$105	1%
Minerals	11	0%	20	0%
Construction	295	6%	607	7%
Other Manufacturing	1,635	32%	1,916	22%
Wood Products	55	1%	82	1%
Pulp & Paper	27	1%	43	1%
Furniture & Fixtures	24	0%	7	0%
Total Wood Based Industries	105	2%	132	2%
Total Manufacturing	1,741	34%	2,049	24%
Transportation & Public Utilities	521	10%	704	8%
Wholesale & Retail Trade	892	17%	1,970	23%
Finance, Insurance, Real Estate	205	4%	328	4%
Services	836	16%	1,497	17%
Government	527	10%	1,268	15%
Other Misc.	9	0%	14	0%

Source: 2000 IMPLAN Data

Table B-36: Net Exports for the Local Economy

Ozark-St. Francis NFs Commodity Trade	1990 Net Exports	2000 Net Exports	1990 Imports % of Total	2000 Exports % of Total
Other Agriculture	$162.2	$247.3	5%	2%
Range	$84.9	$3.8	1%	1%
Total Agriculture	77.2	243.6	6%	2%
Minerals	273.2	179.9	4%	0%
Construction	151.6	376.0	0%	3%
Wood Products	49.0	96.0	1%	2%
Furniture & Fixtures	15.5	41.9	0%	0%
Pulp & Paper	85.9	82.1	2%	2%
Other Manufacturing	1,671.2	1,372.8	39%	58%
Total Manufacturing	1,649.8	1,344.9	42%	61%
Transportation, & Utilities	342.2	316.5	6%	9%
Wholesale & Retail Trade	207.1	529.3	9%	14%
Finance, Insurance, Real Estate	581.8	1,271.4	13%	6%
Services	954.6	2,204.6	17%	4%
Government	98.8	42.4	1%	0%
Other Misc.	96.2	179.7	3%	1%

Source USDA IMPLAN Data, 2000

STAKEHOLDER AND DEMOGRAPHICS ANALYSES

In recent years, the amount and level of conflict over natural resource issues has increased substantially. As a result, much attention has been devoted to increasing our understanding of the dynamics of these conflicts, what they mean for stakeholders and natural resource managers, and what can be done to help managers and stakeholders better understand each other and work together to find ways to resolve conflicts before they occur.

The Ouachita and Ozark-St. Francis National Forests commissioned the USFS Southern Research station to conduct a values, attitudes, and beliefs random telephone survey of populations within 150 miles of the center of the Ozark and Ouachita National Forests and within 50 miles of the St. Francis National Forest to learn of the public's general feelings for these issues. In conducting a random telephone survey, we are able to learn what the so-called "silent majority", those who may not attend forest public involvement meetings, are thinking. A summary of the results can be found in the following three tables, B-37, B-38, and B-39.

Table B-37: Values of Local Residents from the National Survey on Recreation

Personal and Household Characteristics Ozark NF Market Area	Market Area Percent	Region 8 Percent
Protect streams & sources of clean water	94.1	93.6
Maintain NFs for future generations' use	85.9	92.4
Provide habitat for wildlife & fish	84.2	87.0
Protect rare plant & animal species	83.9	85.0
Use forest areas so they're left natural	82.5	85.1
Provide access, facilities. & services for OR	79.4	75.9
Emphasize planting & management of trees	78.7	77.4
Provide info & education services re: forests	72.9	78.8
Provide quiet, natural places	65.6	74.3
Provide roads & service for local business	63.5	60.1
Provide raw materials/prod. for industry	49.3	48.9
Provide grazing permits to ranchers	43.9	51.6
Inform public about recreation concerns	80.2	85.8
Develop volunteer programs: maintenance	67.1	71.7
Increase law enforcement efforts	64.7	69.1
Preserve 'wilderness' experience on F&G	64.1	66.9
Designate more wilderness areas	61.5	57.2
Designate trails for specific rec. uses	59.9	50.0
Develop paved roads on F&G for access	45.9	26.2
Expand commercial recreation on F&G	36.0	39.1
Expand access for motorized OHVs on F&G	35.4	21.2
Develop trail systems (non-motorized rec)	28.0	55.2
Develop trail systems (motorized rec.)	26.7	29.5
Make easier to get permits for some uses	24.7	36.3
Introduce a recreation fee	18.4	60.4

Source: Recreation Realignment Report, Ozark and Ouachita National Forests, 2001

Table B-38: Environmental Attitudes of Users in the OSFNFs Market Area

Attitude	Strongly Agree	Somewhat Agree
Environmental Species Act Strengthened	30%	31%
Protect Streams for Recreation	22%	28%
More Controls on Tourism & 2nd Homes	34%	33%
U.S. Should Rely on Imported Wood Pds.	13%	25%
There are No Reasons to Cut NF Trees	31%	17%
Trained Professionals should Manage Public Lands	48%	30%

Source: Survey on Values, Attitudes, and Beliefs

Table B-39: Perceived Choices for Forest Management on Public Lands

Management Activity	Very Important	Important
Restrict Access for Motorized OHV	33%	20%
Develop & Maintain Trail System	34%	29%
Provide Challenging Motorized Trails	20%	16%
Develop New Paved Roads	20%	12%
Develop Primitive Only Backcountry Areas	41%	22%
Use Control Fires to Restore Natural Conditions	36%	27%
Protect Areas that are Sources of Water	80%	10%
Manage Forests for Historical Ecosystems	46%	22%
Manage Forests to Maintain Today's Conditions	58%	24%
Protect Important Wildlife Habitats	67%	17%
Restrict Harvesting & Mining	24%	19%
Expand Commercial Recreation Services	21%	17%
Introduce Recreation Fees	35%	27%
Introduce a Rec. Fee for ORV to Maintain Trails	30%	18%
Increase Law Enforcement	50%	16%
Create Open Areas in the National Forest	43%	26%
Manage Forests to Increase Wildlife Populations	36%	19%
Protect Older or Continuous Forest Areas	63%	20%
Limit Number of People on Rivers at One Time	28%	18%
Use Controlled Fires to Reduce Threat of Wildfires	52%	22%

Source: Survey on Values, Attitudes, and Beliefs