APPENDIX W - ECONOMICS

INTRODUCTION

Analysis of decisions such as designating wilderness could include economic information in several ways. One approach is to quantify economic values of all benefits and all costs of each alternative (a "holistic" approach). Another is to quantify economic costs of selecting one or more alternatives (an "opportunity cost" approach).

The "holistic" approach would quantify in some common unit all benefits and costs of both wilderness and nonwilderness alternatives. Benefits from designating a roadless area as wilderness include: preservation of examples of natural ecosystems, providing habitat for rare and endangered plant and animal species, protection of spectacular or pristine scenic vistas in natural settings, and enhanced pleasure of recreationists. The holistic approach of economic analysis is usually preferred if the major portion of benefits can be valued in economic terms. Because of the inability to properly value wilderness benefits, the RARE II decision process has relied heavily upon an "opportunity cost" approach and impact evaluation that seeks to minimize adverse impacts such as employment losses and community disruption. Benefits from wilderness are being judged by direct quantitative and qualitative measures, such as Wilderness Attribute Ratings (WARS), inclusion of ecosystems, landforms, animal species, and public response. Costs are being measured by physical impacts with specific resource use, opportunity costs of resources withdrawn from development, and impacts on local, regional, and national employment and associated indicators.

Economic impact analysis in the RARE II process includes both a Development Opportunity Rating System (DORS) and an economic impact analysis approach. DORS generates a relative development rating and an estimated present net value for each roadless area. Economic analysis uses input-output models that predict effects of wilderness allocation on certain economic indicators for local and national economies.

THE DEVELOPMENT OPPORTUNITY RATING SYSTEM (DORS)

<u>Summary.</u> Development Opportunity Rating System (DORS) analysis generates relative ratings and present net values for all roadless areas in the National Forest System with the exception of Alaska. These ratings, ranging from 0 to 15, express relative per acre potentials for development of known nonwilderness resources and are similar to a benefit-cost ratio. The analysis develops opportunity costs based on estimates of total present net values of nonwilderness resources foregone by wilderness classification. These measures combine available economic benefit and cost information if the full range of multiple uses was available according to present Forest Service management policy.

Basic data that DORS ratings and present net values incorporate are: physical outputs estimated for each roadless area, values of benefits (either specific to each area or regional averages), and direct costs of construction of transportation facilities, fire protection, and resources management. Most output information is from estimates made during the RARE II inventory of roadless areas. Value and cost information was taken from Forest Service planning and financial records. The following outputs are considered in DORS analysis:

- softwood sawtimber
- hardwood sawtimber
- softwood other products
- hardwood other products
- cattle and sheep grazing
- dispersed motorized and nonmotorized recreation
- developed recreation
- big game and small game hunting
- nonhunting wildlife
- fishing

Benefit and Cost Values. Regional values for benefits are those to be used in the draft 1980 Renewable Resources Program required by the Renewable Resources Planning Act of 1974. They are based on a series of studies commissioned by the Forest Service. These reports attempt to place comparable values on major resource outputs of National Forests by Region. The standards were estimates of willingness to pay for outputs at the point outputs leave the forest site.

Since a "holistic" approach is not used in the economic analysis, DORS present net value do not recognize noncommodity benefits of wilderness. While wilderness commodity items such as grazing are considered in DORS, noncommodity values, such as preservation of ecosystems, have not been considered.

Costs of development are separated into costs that could be identified with producing a specific resource output and those that would be common to all resources. Costs of collector and arterial roads (whether built as specified in timber sale contracts or with appropriated funds) and costs of fire protection are joint or common costs. For each resource, costs are further separated into operational management costs and development costs, with each expressed per unit of output. Operational costs are assumed to be incurred proportional to level of output as long as output is produced. DORS assumes development costs are spread out over a time sequence depending on each resource, ceasing after development is complete. Development costs are only applied to additional output in excess of present levels.

Costs used in DORS are derived from costs used in planning the RPA program for the National Forests System. Specifically, average estimated costs for 1981 to 1985 for Alternative V -- continuation of current program levels -- were tabulated for each of the 11 RPA analysis groups concerned with resource outputs considered by DORS. RPA costs, which represent full appropriation cost levels, are reduced to the proportion likely to be spent for on-the-ground projects or in direct management at ranger district level. Fixed administrative cost at ranger district, National Forests, Regional, and National levels, and program planning at all levels are not included. This deduction of fixed costs assumes that inclusion or exclusion of roadless areas would not seriously affect overall Forest Service management costs.

DORS considers both present impacts of wilderness designation and potential long-term impacts. Essentially, immediate impacts are those that would occur even if no further investment were made. Potential impacts require capital investment in the roadless area. Distinctions between present and potential impacts depend to some extent on the resource. For both impacts for each resource, a combined scheduling and discount factor was computed. Schedules of development were

developed with Forest Service resource staff in terms of what proportion of each total impact would be in effect by year, starting with the present. Discount factors for each year in the future were computed using the then current Water Resource Council discount rate of 6-5/8 percent. The combined factor was computed by summing the schedule proportions times the discount factor for the next 100 years. In the case of timber, three factors were multiplied. In addition to the schedule and discount factors, a price increase factor was the future price divided by the present price by year.

Under nonwilderness management, timber may be cut, sites for intensive recreation (campgrounds, boat ramps, ski runs, and others) developed, and minerals extracted. Development of each roadless area would be integrated into the development plan for the entire forest. For most RARE II areas, land management plans for roadless areas have not been developed. Thus, each roadless area's role in the National Forest's development has usually not been determined and the level of outputs and roads needed could only be estimated. In particular, the time sequence of development of each area not designated as wilderness has not been determined. Some of these areas may be developed immediately, others not for several decades. An appropriate discount factor was considered to account for the time stream of development; however, the overstatement was determined to be less than 10 percent and an arbitrarily chosen discount rate would not improve the accuracy of the data.

Present Net Values and Rating System. Following evaluation of each resource or resource component by roadless area (by ecosystem within roadless areas if the data were available), benefit values and resource-related costs were totaled. If costs of some resource components exceeded the value of benefits, benefits and costs were set to zero assuming that resource would not be developed. Thus the total of resource benefit values had to equal or exceed resource costs. The DORS rating was computed directly from the ratio of total resource benefit values, to combined total costs of resource management and roads and protection. The following formula was used with an upper limit of 15:

$$\text{DORS} = 16.60964 \log_{10} \left(\frac{\text{total benefits}}{\text{total costs}} + 1 \right)$$

The logarithmic form of the DORS ratings was selected to give each division in the rating scale approximately the same significance. More ratios of benefits and costs fell closer to zero and one than to higher values. This required more distinction between low values (such as between 0 and 1) than between high values (such as between 5 and 6). Present net values were calculated by subtracting discounted costs from discounted benefits.

DORS ratings are essentially indexes of relative profitability of development per unit of land. Areas, regardless of size, with highly valuable resources per acre and with low per acre management and road costs have high DORS ratings. In particular, roadless areas with relatively high per acre road requirements may have low DORS ratings. DORS ratings do not consider size of roadless areas.

DORS present net value information does consider size of roadless areas. Present net value is the differences between total discounted resource benefits and combined discounted resource and common costs, all of which are influenced by size of area. A high present net value could result from a very profitable development opportunity on a limited area, or a relatively low per acre profitability on an extensive area.

DISTRIBUTION OF AREAS ACCORDING TO DORS RATINGS

DORS Rating	Total Number of areas	Number of areas by allocation: Wilderness	Further Planning	Nonwilderness
0	542	109	74	359
1	138	25	14	99
2	103	14	10	79
3	109	19	21	69
4	86	16	9	61
5	103	23	10	70
6	116	15	17	84
7	135	19	19	97
8	126	20	22	84
9	128	19	29	80
10	111	19	18	74
11	80	8	13	59
12	60	3	11	46
13	49	6	4	39
14	25	3	3	19
15	110	11	7	92
Subtotals	2,021	329	281	1,411
Areas with no DORS ratings*	155	52	14	89
TOTALS #	2,176	381	295	1,500

* Several areas added to the inventory during the last several weeks, and several areas subdivided in the latest stages of RARE II did not have DORS ratings computed.

\# DORS was not used for the roadless areas in Alaska, so the totals do not include areas on the Tongass and Chugach National Forests.

Limitations of DORS. Except for the supplemental survey for roads to be built with appropriated funds, DORS uses only data collected or already in existence. For some resources, detail and coverage of information available to National Forest personnel or which could be reasonably estimated is more complete than others. Since some information collected is based on subjective estimates and ratings, information from one forest or region may vary slightly from others despite precautions taken in making instructions explicit.

For each roadless area, resource specialists estimated levels of output based on recent experience and judgements of likely trends in demand and cost. With intensive land management planning, initial output estimates are generally modified based on results of analyses. In the RARE II process there was little opportunity to make such "feedback" modifications.

Value and cost information used to value resources was primarily regional with the important exception of timber. Values and costs are not adjusted for differences between National Forests or between individual roadless areas. It is likely, for example, that average unit values of resources obtained from generally high altitude and inaccessible roadless areas may be less valuable than average unit values for the region as a whole. In particular, logging by timber purchasers may be relatively costly, thereby reducing prices bid for timber. Likewise, costs of management of roadless areas, even with roads constructed, may be generally higher than Forest or Regional average costs. Thus DORS ratings and opportunity costs are relative and not absolute values.

Timber values foregone used in DORS may not fully reflect changes in allowable harvests. Harvest schedules depend on factors such as distribution of remaining old age and high productivity classes of timber, and must be computed by mathematical programming. Withdrawal of roadless areas may not be additive, and may be partially offset by increased investment in silvicultural treatments on remaining areas. Because most forest timber management plans already assume rather intensive management, amount of intensification may be limited by extent of opportunites. Other constraints on the extent that accelerated harvesting on remaining lands may compensate for withdrawal of roadless areas are the requirement for nondeclining allowable harvest schedules and environmental impacts resulting from an increased proportion of remaining commercial forest being currently harvested and undergoing regeneration.

Roadless areas considered in RARE II vary from several thousand acres to hundreds of thousands of acres. Resource unit or per acre costs of road-building, resource utilization, and land management are affected by size of tract or project. DORS does not consider these economies of scale.

Within the area tributary to a National Forest the amount of resource output offered for sale or use affects its value, particularly if final demands for resource outputs come primarily from the local community. This is often the case for many types of recreation. Increases in availability of resources may also affect demands for resource outputs on near-by public or private forests. Even in the case of forest outputs with an essentially national demand for final outputs (lumber and plywood from timber, and meat from grazing), it may take a number of years before local utilization expands to absorb additional supplies from newly opened roadless areas.

DORS ratings and present net value reflect management of public lands, not development of private forest land. DORS uses net values to society in general rather than those which can be captured by private firms. Costs represent typical Forest Service operations constrained by sustained yield and various environmental factors.

IMPACT ANALYSIS

Overview. Input-output models were used to determine economic impacts resulting from wilderness and nonwilderness allocations. These models were used to calculate impacts (changes) upon:

- total dollar value of output
- total income
- value added
- employment
- population (related to employment changes)

Impacts may be estimated for the economy in total and also for various segments of the economy which are most heavily influenced by Forest Service actions e.g., the wood products sector. Thus, both total effects and incidence of these effects are estimated.

The link between land allocations and economic effects is change in production of goods and services resulting from different kinds and levels of activity permitted under wilderness, further planning, and nonwilderness management. Production or use changes result in expenditure changes within the economy. The RARE II impact models translate resource output and use changes into expenditure changes. These expenditure changes are then used with input-output models to estimate changes in output, income, value added, employment, and population. All production and use changes are net changes from present management, outputs, and use levels. Economic effects that are estimated do not represent projections of the total economy, only changes from present situation.

Resource Changes. Changes in production or use levels on an annual basis for sixteen resource items were used for economic impact analysis. Resources and units of measurement are:

- hardwood sawtimber (MBF)
- hardwood products (MCF)
- softwood sawtimber (MBF)
- softwood products (MCF)
- picnicking (RVD)
- camping (RVD)
- skiing (RVD)
- water-based recreation (RVD)
- motorized dispersed (RVD)
- nonmotorized dispersed (RVD)
- big game hunting (RVD)
- small game hunting (RVD)

- nonhunting wildlife (RVD)
- fishing (RVD)
- sheep grazing (AUM)
- cattle grazing (AUM)

These sixteen resource outputs were estimated for each roadless area for three different levels of management: 1) present management - goods, products, and services currently derived from an area, 2) potential management - goods, products, and services that could be provided if current land and resource management plans were fully implemented, and 3) wilderness management - goods, products, and services that could be provided if the area were designated as wilderness.

Opportunities Foregone. By using resource change information and input-output models, it is possible to estimate economic impacts associated with various land allocations. For example, if a particular roadless area is designated as wilderness, the "immediate" effects of such a designation would be calculated as the difference between wilderness output levels and present output levels. This difference could conceivably be positive or negative; however, it is far more likely to be negative for most resources. Assuming a more "long-term" outlook, effects of wilderness designation would be described as the difference between wilderness outputs and potential outputs. Thus, for each individual roadless area, it is possible to estimate a range of outputs or uses foregone as a result of wilderness allocation. This range of potential opportunities foregone could be described as the difference between wilderness outputs and present outputs ("immediate") and the difference between wilderness outputs and potential outputs ("long-term"). It is important to note that, in all cases, it is assumed that resources are harvested, used, or marketed in exactly the same way as done presently.

Small Area Models. Input-output models were constructed to estimate effects of land allocations upon local communities most directly affected by the allocations. These small economies were broadly defined as the primary market area for products originating from roadless areas in combination with the supply area for employees who work in the primary market operations. These models largely conform to either a single county or a small collection of counties which reflect local economy. One hundred sixty-seven unique small area models were constructed. The primary analytical function of these small area models was to help identify local communities which could be adversely impacted by wilderness area designations. Since resource changes are identified by individual roadless area, effects associated with wilderness designation of any of the 2,700 roadless areas could be examined using small area models. Estimated impacts from small area models was used in conjunction with the "Community Stability" evaluation criteria.

Community Stability Analysis. Community stability is one decision criteria in the RARE II evaluation process. That is, if an adverse impact on community stability could be predicted as a result of allocation of roadless areas to wilderness, this was considered sufficient cause to reconsider such an allocation.

Community stability does not imply the Forest Service is committed to maintaining status quo. Community stability requires an orderly process of change rather

than those processes that may cause large disruptions to the community. In order to evaluate concerns for community stability, it was necessary to have some indicators regarding how well communities can absorb change and make necessary socio-economic adjustments.

Three indicators were used to characterize communities with respect to absorbing potential changes stemming from RARE II. The first indicator was percent change in total person-years of employment projected for alternative J in the DES. Multi-county areas were grouped into those with less than three percent change and all others. Three percent was judged to be a threshold above which disruption to community stability might occur. The second indicator was the percent of total employment engaged in either timber or nontimber (range, recreation, etc.) resource-related industries (logging, primary wood processing, secondary wood-based manufacturing, agricultural livestock, etc.). Ten percent was judged to be a threshold where a change in resource supply may have significant effects. The third indicator was population growth rate of the slowest growing county in the multi-county area. Counties with growth rates less than the state average growth rate were judged to be less able to absorb potential changes and make adjustments.

The procedure employed to determine areas with a potential for exhibiting disruptions in community stability involved a screening process. Multi-county areas were evaluated according to the three indicators noted above. Those that exceeded the threshold for any of the indicators were considered to have significant potential for adverse community stability impacts. Multi-county areas not exceeding thresholds were not subjected to further analysis.

All roadless areas within multi-county areas exceeding indicator thresholds were then subjected to analysis using input-output models. Resource supply changes that would occur with wilderness allocation for each roadless area were used to estimate the contribution to community stability that each would make to the multi-county economy. The primary indicator for these impacts was change in employment.

Any other substantiated information concerning potential impacts upon individual communities or unique social conditions was also used to identify either multi-county areas or individual roadless areas as having potential for community stability impacts. Results of this analysis were used as part of the RARE II allocation process, and are available for the interested reader of the Forest Service Regional offices.

National and State Impacts. Economic impact analysis was conducted at both the local and national level. Impacts which are estimated via the small area models cannot be aggregated to reflect total impact upon a larger area such as a state or the nation for three major reasons. First, there is incomplete coverage of entire states by local area models. Only those economies primarily affected by potential wilderness allocation were included. Second, multi-county impact area input-output models are mutually exclusive. That is, gains in employment and income in one multi-county area may or may not be offset by compensating losses in another area. The small area models do not take these linkages into account in any explicit manner. As a result, it is incorrect to assume that total change in employment in any state is the sum of the employment changes occuring in multi-county impact areas within the state. Third, small area models were designed to reflect local impacts only. Expenditure data used for small area models accounts

only for localized expenditures and margined wholesale and retail purchases. As a result, total expenditures, and consequently, total expenditures are not estimated by these models.

A national input-output model was employed to determine economic impacts at a higher level. This model was constructed using basically the same methodology as that used for small area models. The primary difference between the national model and small area models is that the national model accounts for all sectors and all expenditures in the economy including the unmargined portions of wholesale and retail trade expenditures. The national model thus includes all interregional ties.

All output and use changes arising from land allocations throughout the nation were totaled and these figures used to determine economic effects upon the nation as a whole. Finally, the national total was partitioned to state subtotals to estimate total effects that might occur in individual states. Input-output models were not developed for individual states. Subtotals for output changes arising from land allocations within each state were calculated and these subtotals were used as input data for the national model. State impacts are simply the estimated effects upon the national economy that result from land allocations occuring within an individual state or that state's contribution to the total national impact.

Three assumption sets are employed to illustrate economic effects. The first assumption, identified as "Potential Immediate Effects" represents the economic effects of wilderness allocations. That is, roadless areas allocated to wilderness change from present to wilderness management strategy. All areas allocated to non-wilderness remain in present management. Production and utilization changes in this case are largely negative although some gains in certain recreation uses may be obtained. Also, deferred timber from areas allocated to nonwilderness may cause positive gains in production. It should be noted that although the term "immediate" is used to describe this assumption set, it is not intended to convey the passage of time, but rather to describe wilderness allocation without compensating gains from production on nonwilderness areas.

The second assumption set, with two variations, is referred to as "Potential Long Term Effects." Under this assumption set, areas allocated to wilderness change from present management to wilderness management. Areas allocated to nonwilderness change from present to potential management, all with attendant changes in production and utilization. The two variations reflect the disposition of areas allocated to further planning. In the first case, these areas are treated as if they have been allocated to nonwilderness use and in the second case they are allocated to wilderness. These two variations show the range within which economic effects will lie dependent upon the eventual allocation of areas in the further planning category to either wilderness or nonwilderness use. For any impact area, the results under this assumption show the net economic effects that occur as a result of allocating all roadless areas within the impact area to either wilderness or nonwilderness use. Again, the term "long-term" does not refer specifically to the pasage of time but rather to the assumption underlying the analysis.

The first set of three tables display the detailed economic effects at the national level for each alternative. Changes in total income, output and value added plus total population affected is also displayed, along with disaggregated employment effects among twenty-one of the principal sectors. The disaggregation of employment effects is intended to display the incidence of effects as they differentially affect various segments of society. The totals which are presented in these tables are net effects for the national economy. Individual multi-county areas or other geographic areas could incur greater gains or losses in any of the categories listed. For example, an individual state could incur an employment loss of several hundred workers in a particular industry, while another area might increase by a like number. The net national effect would be small or even zero; however, this would be an incomplete picture of potential impacts.

The first table, "Potential Immediate Effects," illustrates the effects of wilderness designation only. Alternative J (all roadless areas allocated to wilderness) shows the greatest impacts with about seventy-four thousand employment opportunities affected. Logging and sawmills sector shows the greatest loss; however, every sector in the economy has some less. This is largely because of the inter-relationship between sectors in the economy.

The proposed action has insignificant potential immediate impacts. In fact the -283 job opportunities are not significantly different from zero from the national perspective. However, there is a significant increase in job opportunities in the potential long-term impacts. These opportunities are due to development and use of appropriate nonwilderness resources in areas allocated to nonwilderness.

The long-term impacts from PA alternative are evenly spread between the several sectors affected by forest activity. Agriculture increases because of livestock grazing, wood products sectors increase because of timber and retail trade, transportation and service sectors increase because of recreation.

The second set of three tables illustrates disaggregated employment effects for each state. Since state level models were not constructed, these effects do not represent impacts which would necessarily occur in a particular state. These effects are based upon resource changes for each state and show that state's contribution to total national impact. Allocated employment effects for all alternatives are displayed. A more detailed summary for the proposed action is shown in Appendices A-T.

Potential immediate effects exhibit a wide variation among areas and alternatives. This variation is of course, largely attributable to distribution of the roadless areas being considered. Alternative J shows the greatest negative impacts, a total of about seventy-four thousand affected opportunities. The proposed action shows significant impacts for only two areas - Colorado and Washington. The Colorado negative allocation is the result of rather large estimated losses in "wood products other than sawtimber" and it is highly unlikely this impact would actually occur in Colorado. Employment opportunity gains for Washington are overstated perhaps; however, some real gains are likely.

Long-term increases for the proposed action are substantial and are most apparent for California, Colorado and Washington. These increased opportunities are the result of output and activity gains from multiple use management of some of the existing roadless areas.

POTENTIAL IMMEDIATE EFFECTS
SUMMARY OF ECONOMIC IMPACTS-NATIONAL TOTALS BY ALTERNATIVES

A. EMPLOYMENT EFFECTS-CHANGE FROM PRESENT

SECTOR NAME	(1974) NATIONAL PRESENT	ALT B	ALT C	ALT D	ALT E	ALT F	ALT G	ALT H	ALT I	ALT J	ALT PA
AGRICULTURE	2602900.	228.	-531.	-252.	147.	26.	-675.	-124.	-438.	-3207.	54.
MINING	695100.	46.	-164.	-88.	51.	27.	-218.	6.	-44.	-574.	22.
CONSTRUCTION	3962000.	236.	-399.	-80.	180.	111.	-314.	-26.	-227.	-2138.	128.
FOOD AND PRODUCTS	1784100.	99.	-322.	-248.	88.	13.	-472.	-16.	-165.	-1359.	52.
TEXTILE AND APPAREL	26135000.	196.	-279.	-35.	148.	97.	-208.	-20.	-172.	-1626.	92.
LOGGING AND SAWMILLS	626500.	2128.	-3972.	236.	1387.	1150.	-572.	-244.	-2128.	-20480.	2044.
FURNITURE	516800.	37.	-65.	-5.	26.	18.	-31.	-4.	-36.	-344.	27.
PULP AND PAPER	702900.	1342.	-249.	543.	1061.	828.	-361.	-38.	-547.	-6016.	-90.
PRINTING AND PUBLISHING	1110500.	93.	-132.	-23.	71.	46.	-111.	-8.	-80.	-764.	39.
CHEMICALS AND RUBBER	1733600.	193.	-249.	-15.	148.	104.	-178.	-14.	-152.	-1505.	79.
PETROLEUM REFINING	195400.	13.	-105.	-71.	22.	9.	-157.	7.	-17.	-283.	9.
STONE CLAY AND GLASS	688800.	69.	-134.	-25.	52.	34.	-89.	-6.	-69.	-668.	48.
PRIMARY METAL	37337700.	65.	-111.	-21.	50.	32.	-84.	-6.	-61.	-587.	37.
FAB METAL AND MACH	128725100.	220.	-359.	-47.	165.	112.	-235.	-19.	-200.	-1936.	128.
ELECTRICAL	2029500.	74.	-128.	-27.	57.	36.	-101.	-7.	-71.	-676.	42.
ALL OTHER MFG	2966700.	91.	-214.	-101.	77.	35.	-240.	-8.	-106.	-980.	54.
TRANS COMM UTIL	4695900.	459.	-738.	-101.	348.	203.	-549.	-64.	-443.	-4064.	248.
WHOLESALE	4219700.	402.	-645.	-81.	300.	201.	-424.	-41.	-371.	-3542.	229.
RETAIL	12789100.	811.	-2386.	-1667.	708.	199.	-3229.	-85.	-1174.	-10267.	466.
FIRE	4206600.	315.	-559.	-132.	244.	147.	-469.	-33.	-308.	-2916.	171.
SERVICES	13687400.	1079.	-1781.	-329.	838.	380.	-1572.	-204.	-1131.	-9882.	607.
TOTAL PRIVATE SECTOR	66890200.	8195.	-13522.	-2568.	6169.	3807.	-10289.	-953.	-7940.	-73817.	4485.

B. OTHER EFFECTS-CHANGE FROM PRESENT

CATEGORY	(1974) NATIONAL PRESENT	ALT B	ALT C	ALT D	ALT E	ALT F	ALT G	ALT H	ALT I	ALT J	ALT PA
INCOME ($MILLION)	833479.	104.	-164.	-25.	79.	51.	-119.	-11.	-96.	-911.	55.
OUTPUT ($MILLION)	2780403.	391.	-637.	-100.	298.	197.	-464.	-35.	-355.	-3441.	210.
VALUE ADDED ($MILLION)	92343193.	168.	-280.	-50.	129.	83.	-212.	-16.	-156.	-1498.	92.
POPULATION	211352172	21365.	-35254.	-6694.	16084.	9925.	-26825.	-2483.	-20702.	-192449.	11693.

1

POTENTIAL LONG-TERM EFFECTS (FURTHER PLANNING AS NON-WILDERNESS)
SUMMARY OF ECONOMIC IMPACTS-NATIONAL TOTALS BY ALTERNATIVES

A. EMPLOYMENT EFFECTS-CHANGE FROM PRESENT

SECTOR NAME	(1974) NATIONAL PRESENT	ALT B	ALT C	ALT D	ALT E	ALT F	ALT G	ALT H	ALT I	ALT J	ALT PA
AGRICULTURE	2602900.	10018.	9253.	9331.	9562.	9156.	7529.	6154.	5632.	-3207.	8731.
MINING	695100.	1840.	1558.	1624.	1698.	1630.	1191.	1168.	1067.	-574.	1769.
CONSTRUCTION	3962000.	6484.	5888.	6036.	6197.	5947.	4894.	4127.	3594.	-2138.	5791.
FOOD AND PRODUCTS	1784100.	8934.	8415.	8434.	8602.	8286.	7034.	5250.	5367.	-1359.	7449.
TEXTILE AND APPAREL	26135000.	4541.	4085.	4217.	4337.	4160.	3410.	2914.	2489.	-1626.	4079.
LOGGING AND SAWMILLS	626500.	-664.	-3576.	-2827.	-1719.	-2145.	-4806.	5318.	-6476.	-20480.	8459.
FURNITURE	516800.	562.	489.	507.	529.	504.	393.	402.	264.	-344.	571.
PULP AND PAPER	702900.	7422.	4715.	6243.	6815.	6514.	4319.	5103.	3751.	-6016.	7174.
PRINTING AND PUBLISHING	1110500.	2207.	1977.	2043.	2104.	2019.	1646.	1405.	1221.	-764.	1978.
CHEMICALS AND RUBBER	1733600.	2937.	2495.	2645.	2763.	2641.	2041.	1987.	1511.	-1505.	2834.
PETROLEUM REFINING	195400.	1093.	917.	953.	999.	959.	678.	683.	655.	-283.	1063.
STONE CLAY AND GLASS	688800.	1359.	1191.	1230.	1280.	1223.	956.	927.	691.	-668.	1331.
PRIMARY METAL	1337700.	1553.	1390.	1431.	1477.	1415.	1144.	1009.	842.	-587.	1428.
FAB METAL AND MACH	3725100.	4029.	3523.	3660.	3805.	3637.	2867.	2723.	2072.	-1936.	3879.
ELECTRICAL	2029500.	2020.	1831.	1876.	1928.	1850.	1517.	1292.	1117.	-676.	1817.
ALL OTHER MFG	2966700.	4853.	4520.	4570.	4662.	4486.	3774.	2937.	2854.	-980.	4132.
TRANS COMM UTIL	4695900.	18794.	17697.	17988.	18216.	17534.	15087.	11461.	10937.	-4064.	15618.
WHOLESALE	4219700.	7903.	6988.	7237.	7494.	7170.	5732.	5269.	4128.	-3542.	7456.
RETAIL	12789100.	54226.	50468.	50668.	51954.	49997.	41813.	32346.	32065.	-10267.	46451.
FIRE	4206600.	9279.	8439.	8639.	8865.	8510.	7003.	5871.	5186.	-2916.	8258.
SERVICES	13687400.	76372.	73600.	74177.	74556.	71910.	63419.	45143.	46068.	-9882.	60547.
TOTAL PRIVATE SECTOR	66890200.	225762.	205861.	210681.	216124.	207403.	171641.	143490.	125034.	-73817.	200816.

B. OTHER EFFECTS-CHANGE FROM PRESENT

CATEGORY	(1974) NATIONAL PRESENT	ALT B	ALT C	ALT D	ALT E	ALT F	ALT G	ALT H	ALT I	ALT J	ALT PA
INCOME ($MILLION)	833479.	2458.	2212.	2278.	2345.	2248.	1835.	1589.	1336.	-911.	2232.
OUTPUT ($MILLION)	2780403.	7911.	6960.	7222.	7486.	7165.	5689.	5240.	4181.	-3441.	7484.
VALUE ADDED ($MILLION)	1343193.	3966.	3548.	3658.	3772.	3616.	2926.	2572.	2151.	-1498.	3635.
POPULATION	211352172	588590.	536705.	549272.	563461.	540724.	447490.	374097.	325979.	-192449.	523552.

1

POTENTIAL LONG-TERM EFFECTS (FURTHER PLANNING AS WILDERNESS)
SUMMARY OF ECONOMIC IMPACTS-NATIONAL TOTALS BY ALTERNATIVES

A. EMPLOYMENT EFFECTS-CHANGE FROM PRESENT

SECTOR NAME	(1974) NATIONAL PRESENT	ALT B	ALT C	ALT D	ALT E	ALT F	ALT G	ALT H	ALT I	ALT J	ALT PA
AGRICULTURE	2602900.	10018.	6379.	1489.	9561.	2155.	7528.	4910.	-291.	-3207.	7517.
MINING	695100.	1840.	1029.	442.	1698.	473.	1191.	964.	84.	-574.	1560.
CONSTRUCTION	3962000.	6484.	3933.	751.	6196.	1310.	4894.	3239.	-404.	-2138.	5013.
FOOD AND PRODUCTS	1784100.	8934.	6064.	2098.	8601.	2572.	7034.	4356.	667.	-1359.	6568.
TEXTILE AND APPAREL	26135000.	4541.	2682.	420.	4337.	850.	3410.	2252.	-403.	-1626.	3519.
LOGGING AND SAWMILLS	626500.	-664.	-8153.	-13058.	-1727.	-10510.	-4815.	2116.	-15219.	-20480.	6155.
FURNITURE	516800.	562.	282.	-37.	529.	33.	393.	299.	-154.	-344.	485.
PULP AND PAPER	702900.	7422.	1570.	-1532.	6815.	17.	4319.	2832.	-3405.	-6016.	5921.
PRINTING AND PUBLISHING	1110500.	2207.	1300.	235.	2104.	432.	1646.	1090.	-166.	-764.	1712.
CHEMICALS AND RUBBER	1733600.	2937.	1485.	36.	2762.	355.	2041.	1474.	-561.	-1505.	2423.
PETROLEUM REFINING	195400.	1093.	621.	346.	999.	327.	678.	585.	134.	-283.	947.
STONE CLAY AND GLASS	688800.	1359.	731.	44.	1280.	173.	956.	712.	-227.	-668.	1144.
PRIMARY METAL	1337700.	1553.	903.	143.	1477.	281.	1144.	785.	-144.	-587.	1234.
FAB METAL AND MACH	3725100.	4029.	2166.	121.	3804.	528.	2866.	2071.	-674.	-1936.	3328.
ELECTRICAL	2029500.	2020.	1219.	234.	1928.	405.	1517.	1015.	-128.	-676.	1574.
ALL OTHER MFG	2966700.	4853.	3196.	982.	4661.	1289.	3774.	2398.	183.	-980.	3622.
TRANS COMM UTIL	4695900.	18794.	12517.	3112.	18215.	4699.	15086.	9193.	88.	-4064.	13597.
WHOLESALE	4219700.	7903.	4387.	349.	7493.	1144.	5731.	4025.	-1172.	-3542.	6402.
RETAIL	12789100.	54226.	35688.	11850.	51952.	14708.	41811.	26668.	2822.	-10267.	40911.
FIRE	4206600.	9279.	5676.	1202.	8865.	1958.	7002.	4637.	-441.	-2916.	7162.
SERVICES	13687400.	76372.	54090.	16233.	74554.	22203.	63416.	36917.	4876.	-9882.	52964.
TOTAL PRIVATE SECTOR	66890200.	225762.	137765.	25461.	216104.	45402.	171618.	112540.	-14535.	-73817.	173758.

B. OTHER EFFECTS-CHANGE FROM PRESENT

CATEGORY	(1974) NATIONAL PRESENT	ALT B	ALT C	ALT D	ALT E	ALT F	ALT G	ALT H	ALT I	ALT J	ALT PA
INCOME ($MILLION)	833479.	2458.	1446.	218.	2344.	446.	1835.	1232.	-232.	-911.	1926.
OUTPUT ($MILLION)	2780403.	7911.	4385.	481.	7485.	1227.	5688.	4020.	-1042.	-3441.	6415.
VALUE ADDED ($MILLION)	1343193.	3966.	2308.	362.	3772.	717.	2925.	1999.	-371.	-1498.	3139.
POPULATION	211352172	588590.	359170.	66379.	563409.	118370.	447431.	293406.	-37896.	-192449.	453008.

POTENTIAL IMMEDIATE EFFECTS
SUMMARY OF ECONOMIC IMPACTS-EMPLOYMENT EFFECTS BY ALTERNATIVE BY AREA

AREA	ALT B	ALT C	ALT D	ALT E	ALT F	ALT G	ALT H	ALT I	ALT J	ALT PA
ALABAMA	0.	-288.	-150.	-39.	-39.	-124.	-331.	-683.	-900.	-32.
ALASKA	0.	-14454.	-6682.	0.	-726.	-8054.	0.	-2923.	-34689.	4220.
ARIZONA	115.	183.	117.	172.	167.	199.	76.	82.	-111.	107.
ARKANSAS	14.	-32.	4.	-13.	-8.	-29.	-43.	-44.	-143.	-5.
CALIFORNIA	694.	-23.	320.	203.	-582.	-1365.	-918.	-1197.	-4769.	-217.
COLORADO	815.	443.	397.	746.	755.	350.	-2674.	-1994.	-7813.	-164.
FLORIDA	0.	-77.	0.	-111.	-129.	-273.	-104.	-49.	-621.	-69.
GEORGIA	0.	-137.	-150.	0.	0.	0.	-65.	-150.	-288.	-26.
IDAHO	342.	-80.	-210.	298.	281.	-562.	-565.	-686.	-4088.	-167.
ILLINOIS	0.	-21.	-21.	-63.	-133.	-148.	-20.	-21.	-149.	-1.
INDIANA	0.	0.	0.	0.	0.	0.	0.	0.	0.	-59.
KENTUCKY	0.	0.	0.	-9.	-20.	-20.	-9.	-11.	-20.	-12.
LOUISIANA	0.	0.	0.	0.	-113.	-122.	-113.	0.	-166.	-12.
MICHIGAN	40.	79.	26.	50.	37.	49.	21.	-14.	35.	2.
MINNESOTA	116.	116.	101.	116.	100.	116.	116.	45.	-166.	21.
MISSISSIPPI	0.	0.	0.	-80.	-186.	-186.	-15.	-186.	-186.	-12.
MISSOURI	73.	36.	23.	14.	-11.	-8.	-4.	-4.	-8.	20.
MONTANA	1377.	930.	529.	970.	954.	-112.	492.	511.	-2818.	526.
NEBRASKA	0.	0.	0.	1.	1.	-2.	0.	0.	-2.	-2.
NEVADA	0.	-11.	19.	2.	-17.	-31.	11.	-3.	-179.	4.
NEW HAMPSHIRE	0.	-9.	1.	-18.	-19.	-30.	-25.	0.	-101.	-54.
NEW MEXICO	288.	301.	310.	262.	262.	260.	41.	200.	-133.	18.
NORTH CAROLINA	0.	-125.	-150.	-1.	-1.	-85.	-95.	-157.	-518.	-43.
NORTH DAKOTA	0.	0.	0.	-2.	-2.	-7.	0.	0.	-72.	-2.
OKLAHOMA	0.	-6.	-3.	-2.	-2.	-9.	-2.	-3.	-9.	-2.
OREGON	696.	-653.	454.	523.	484.	242.	660.	-1305.	-6151.	-175.
PENNSYLVANIA	0.	-11.	-9.	0.	-29.	-25.	-18.	-9.	-40.	-17.
SOUTH CAROLINA	0.	-38.	-43.	-19.	-179.	-190.	-23.	-233.	-245.	-19.
SOUTH DAKOTA	0.	0.	-9.	-18.	-18.	-18.	-4.	-18.	-17.	-6.
TENNESSEE	28.	-78.	3.	28.	28.	28.	-24.	-91.	-204.	14.
TEXAS	426.	426.	426.	262.	165.	-185.	83.	350.	-300.	-16.
UTAH	0.	0.	12.	-8.	-5.	-14.	17.	-41.	-120.	72.
VERMONT	0.	0.	-16.	0.	-16.	-28.	-16.	-16.	-52.	0.
VIRGINIA	42.	-82.	-97.	31.	14.	16.	-78.	-123.	-254.	-34.
WASHINGTON	2909.	-27.	2213.	2867.	2866.	306.	2867.	1131.	-6282.	736.
WEST VIRGINIA	26.	-52.	-25.	28.	-16.	-14.	-5.	-3.	-125.	21.
WISCONSIN	3.	-7.	-10.	-11.	-26.	-29.	-28.	-22.	-38.	-17.
WYOMING	193.	161.	39.	-23.	-41.	-199.	-172.	-286.	-2087.	-118.
PUERTO RICO	0.	15.	15.	15.	15.	15.	15.	15.	15.	4.
NATIONAL TOTAL	8195.	-13522.	-2568.	6169.	3807.	-10289.	-953.	-7940.	-73817.	4485.

POTENTIAL LONG-TERM EFFECTS (FURTHER PLANNING AS NONWILDERNESS)
SUMMARY OF ECONOMIC IMPACTS-EMPLOYMENT EFFECTS BY ALTERNATIVE BY AREA

AREA	ALT B	ALT C	ALT D	ALT E	ALT F	ALT G	ALT H	ALT I	ALT J	ALT PA
ALABAMA	-580.	-672.	-662.	-597.	-597.	-645.	-710.	-852.	-900.	46.
ALASKA	-19727.	-26202.	-26541.	-19727.	-20572.	-28889.	0.	-23038.	-34689.	5759.
ARIZONA	2001.	1938.	1887.	1967.	1934.	326.	1758.	1760.	-111.	1930.
ARKANSAS	336.	179.	261.	244.	231.	149.	155.	117.	-143.	263.
CALIFORNIA	66466.	65205.	65538.	60176.	57041.	52090.	42284.	30750.	-4769.	70320.
COLORADO	126882.	126332.	126399.	126694.	123193.	115887.	65394.	85003.	-7813.	53859.
FLORIDA	141.	53.	141.	-28.	-87.	-287.	13.	-7.	-621.	69.
GEORGIA	166.	10.	-22.	166.	166.	166.	106.	-22.	-288.	392.
IDAHO	4815.	3975.	3877.	4678.	4557.	2773.	2312.	2741.	-4088.	3890.
ILLINOIS	-82.	-115.	-115.	-97.	-134.	-140.	-107.	-115.	-149.	164.
INDIANA	0.	0.	0.	0.	0.	0.	0.	0.	0.	-35.
KENTUCKY	89.	89.	89.	20.	0.	0.	20.	68.	-20.	-6.
LOUISIANA	-82.	-82.	-82.	-82.	-113.	-122.	-113.	-82.	-166.	-12.
MICHIGAN	306.	227.	274.	269.	237.	243.	177.	82.	35.	133.
MINNESOTA	358.	355.	332.	358.	309.	356.	337.	275.	-166.	310.
MISSISSIPPI	-138.	-138.	-138.	-149.	-186.	-186.	-141.	-186.	-186.	-9.
MISSOURI	108.	76.	70.	20.	4.	-8.	41.	41.	-8.	96.
MONTANA	8696.	7911.	6877.	7542.	7515.	3384.	6377.	4468.	-2818.	3652.
NEBRASKA	5.	5.	5.	3.	3.	-2.	5.	5.	-2.	1.
NEVADA	128.	97.	101.	127.	105.	75.	119.	55.	-179.	981.
NEW HAMPSHIRE	302.	279.	301.	260.	254.	157.	169.	288.	-101.	57.
NEW MEXICO	8870.	8746.	8635.	8754.	8754.	7628.	472.	8583.	-133.	8953.
NORTH CAROLINA	129.	-17.	-30.	79.	74.	12.	-27.	-166.	-518.	377.
NORTH DAKOTA	29.	29.	29.	26.	26.	18.	29.	29.	-72.	26.
OKLAHOMA	79.	64.	6.	16.	16.	-9.	49.	6.	-9.	38.
OREGON	8529.	5103.	7697.	8312.	8232.	7416.	8482.	2793.	-6151.	6655.
PENNSYLVANIA	60.	43.	50.	60.	-11.	-2.	13.	50.	-40.	15.
SOUTH CAROLINA	-106.	-145.	-150.	-125.	-176.	-188.	-130.	-233.	-245.	-7.
SOUTH DAKOTA	1.	1.	-10.	-17.	-17.	-17.	-6.	-17.	-17.	-3.
TENNESSEE	181.	-2.	138.	181.	181.	181.	86.	-22.	-204.	301.
TEXAS	167.	167.	167.	125.	-54.	-116.	42.	142.	-300.	291.
UTAH	1852.	1816.	1767.	1766.	1641.	1455.	1745.	1516.	-120.	1865.
VERMONT	235.	235.	207.	235.	207.	131.	207.	207.	-52.	240.
VIRGINIA	296.	208.	-42.	252.	213.	159.	92.	-62.	-254.	209.
WASHINGTON	12234.	7335.	10968.	12068.	12066.	7766.	12068.	8962.	-6282.	39420.
WEST VIRGINIA	414.	254.	279.	271.	199.	110.	227.	316.	-125.	278.
WISCONSIN	144.	106.	85.	105.	48.	41.	-13.	65.	-38.	1.
WYOMING	2444.	2382.	2278.	2159.	2131.	1715.	1943.	1501.	-2087.	3477.
PUERTO RICO	15.	15.	15.	15.	15.	15.	15.	15.	15.	4.
NATIONAL TOTAL	225762.	205861.	210681.	216124.	207403.	171641.	143490.	125034.	-73817.	200816.

POTENTIAL LONG-TERM EFFECTS (FURTHER PLANNING AS WILDERNESS)
SUMMARY OF ECONOMIC IMPACTS-EMPLOYMENT EFFECTS BY ALTERNATIVE BY AREA

AREA	ALT B	ALT C	ALT D	ALT E	ALT F	ALT G	ALT H	ALT I	ALT J	ALT PA
ALABAMA	-580.	-672.	-833.	-597.	-747.	-645.	-710.	-857.	-900.	-142.
ALASKA	-19727.	-33017.	-27470.	-19727.	-28187.	-28889.	0.	-29041.	-34689.	5293.
ARIZONA	2001.	1860.	1692.	1967.	1683.	326.	1758.	75.	-111.	1699.
ARKANSAS	336.	121.	198.	244.	174.	149.	155.	117.	-143.	155.
CALIFORNIA	66466.	37416.	7828.	60176.	7963.	52090.	27779.	1993.	-4769.	54946.
COLORADO	126882.	115258.	46124.	126694.	52553.	115887.	62685.	21776.	-7813.	51327.
FLORIDA	141.	53.	25.	-28.	-87.	-287.	-103.	-7.	-621.	-61.
GEORGIA	166.	-75.	-151.	166.	-149.	166.	-91.	-151.	-288.	149.
IDAHO	4815.	407.	-1881.	4678.	-967.	2773.	1977.	-2180.	-4088.	3329.
ILLINOIS	-82.	-115.	-149.	-97.	-149.	-140.	-107.	-149.	-149.	79.
INDIANA	0.	0.	0.	0.	0.	0.	0.	0.	0.	-35.
KENTUCKY	89.	-20.	-20.	0.	-20.	-20.	0.	-20.	-20.	-11.
LOUISIANA	-82.	-82.	-82.	-82.	-113.	-122.	-113.	-82.	-166.	-12.
MICHIGAN	306.	194.	143.	269.	79.	243.	177.	82.	35.	133.
MINNESOTA	358.	318.	66.	358.	43.	356.	205.	66.	-166.	310.
MISSISSIPPI	-138.	-149.	-186.	-149.	-186.	-186.	-141.	-186.	-186.	-20.
MISSOURI	108.	76.	35.	20.	4.	-8.	29.	5.	-8.	70.
MONTANA	8696.	6834.	-202.	7542.	2949.	3384.	6206.	-609.	-2818.	2259.
NEBRASKA	5.	5.	5.	3.	3.	-2.	5.	5.	-2.	1.
NEVADA	128.	83.	86.	127.	75.	75.	84.	26.	-179.	762.
NEW HAMPSHIRE	302.	189.	53.	260.	47.	157.	169.	-8.	-101.	-75.
NEW MEXICO	8870.	1629.	165.	8754.	163.	7625.	472.	149.	-133.	7558.
NORTH CAROLINA	129.	-75.	-109.	79.	-103.	12.	-154.	-195.	-518.	285.
NORTH DAKOTA	29.	29.	29.	26.	26.	18.	29.	29.	-72.	26.
OKLAHOMA	79.	64.	6.	16.	16.	-9.	49.	6.	-9.	38.
OREGON	8529.	3018.	3574.	8312.	7501.	7416.	4693.	-979.	-6151.	6047.
PENNSYLVANIA	60.	-4.	-23.	60.	-32.	-2.	13.	-23.	-40.	-25.
SOUTH CAROLINA	-106.	-150.	-150.	-125.	-202.	-188.	-130.	-233.	-245.	-27.
SOUTH DAKOTA	1.	1.	-17.	-17.	-17.	-17.	-6.	-17.	-17.	-3.
TENNESSEE	181.	-2.	93.	181.	92.	181.	17.	-22.	-204.	175.
TEXAS	167.	167.	167.	125.	-54.	-116.	42.	142.	-300.	157.
UTAH	1852.	1529.	1035.	1766.	1113.	1455.	1252.	804.	-120.	1761.
VERMONT	235.	235.	207.	235.	207.	131.	207.	207.	-52.	240.
VIRGINIA	296.	119.	-42.	252.	-1.	159.	92.	-62.	-254.	105.
WASHINGTON	12234.	1249.	-4416.	12068.	1743.	7766.	4906.	-4646.	-6282.	36773.
WEST VIRGINIA	414.	111.	98.	271.	86.	110.	211.	64.	-125.	263.
WISCONSIN	144.	88.	85.	105.	40.	41.	-13.	65.	-38.	1.
WYOMING	2444.	1058.	-537.	2159.	-157.	1715.	880.	-698.	-2087.	2786.
PUERTO RICO	15.	15.	15.	15.	15.	15.	15.	15.	15.	4.
NATIONAL TOTAL	225762.	137765.	25461.	216104.	45402.	171618.	112540.	-14535.	-73817.	173758.

Methodology. Impact analysis for RARE II was accomplished using economic input-output (I-O) models for multi-county impact areas. The models were designed specifically for each area, modeling the 1974 economy and showing the area's production and employment by sector and national average technology. Prices were inflated to 1976 with the consumer price index. These models were used to estimate impacts on employment, income, gross regional product, and population resulting from alternative management strategies on each roadless area within impact areas.

When it was determined that an alternative management strategy would change resource availability from the present situation, change in employment and population that could be supported and income generated were estimated assuming that all change in resources was harvested and marketed in the local economy in exactly the same manner as is done in the present economy.

The resource outputs were estimated for three levels of management - 1) present management strategy, defined as goods, products or services currently being derived from the area; 2) potential management strategy, defined as goods, products or services which could be provided if current multiple use management plans were fully implemented; and 3) wilderness management strategy, defined as the goods, products or services which could be provided if the area were designated as wilderness. I-O analysis is designed to make consistent estimates of resource impacts, and allow comparison between alternatives. The I-O models used in the RARE II analysis were built using secondary data sources. The required data and procedures include:

- An existing I-O model of a larger area, of which the area being modeled is a part. The 484 sector national I-O model for 1967 was used for the RARE II models. The 484 sector or disaggregated model is preferred to a more aggregated model. The aggregation process combines similar sectors to reduce the model from 484 sectors to some smaller size. However, sectors are combined on a weighted national average, or some sectors not existing in a region are combined with sectors that do exist in the region. The resulting coefficient is a source of substantial error. By using a very disaggregated model, a weighted regional average can be calculated which makes the model specific to the region.

- The second group of data needed was a set of regional total gross outputs (TGO), i.e., total sales of each industry within the region. TGO includes sales from one industry to another within region, sales to consumers within region, and sales to industries or consumers outside the region (exports). For most industries TGO is not published. It was calculated from employment data, which is available by sector from the U.S. census or state employment departments, and an estimated output per employee. The total gross output data was available for many sectors such as agriculture or sawmills. It is simply the physical quantity produced times the prices.

- The third set of data required to build the multi-county models from secondary data was an estimate of domestic final demand. Domestic final demand includes personal consumption, gross private capital formation (purchases by industry for capital equipment), state, local and federal government purchases, and in some cases, inventory additions or depletions. Estimates were based on the national model, and then regionalized by the region's population, income, and government spending data.

Assumptions and Qualifications. Several specific assumptions relating to economic analysis were made when building the I-O models from secondary data. First, one must assume that the production function (input-output relationship) is the same in the smaller area from which the model is being developed as it is in the large area from which the model is being reduced. In other words, technology is the the same in both regions. The second assumption necessary to developing an I-O model from secondary data is that a sector, including final demand sectors, will import a production input from outside the region if industries within the region cannot supply sufficient quantities. Direct coefficients will be reduced by the amount of the necessary import. A third assumption in this procedure is that a sector in the region cannot produce products which are imported by the national economy in any larger proportion than is exhibited in the national model. With this assumption, the regional direct coefficients can only be equal to or less than the national coefficients. A fourth assumption relates to instances where more than one sector and/or final demand is buying from another sector in the region, and that sector is not large enough to meet all demands for its product. All purchasing sectors, including final demand, import equal to the proportion of product they are buying from the deficient sector. The fifth assumption requires that in the event that regional sectors and domestic final demand do not purchase the entire TGO of a sector, the residual production of that sector is assumed exported.

It should be noted that impact on the national economy is not the same as impact on a local or multi-county area. In the national economy, there will be no change in population, and likely no change in national income, gross national product, or employment. These variables on the national basis are controlled by fertility rate, the state of the economy and macro-economy policy, and are largely unaffected by wilderness resource availability. There could be shifts in employment between sectors of the economy or among regions in the country. These changes can be estimated using the same assumptions as used in the local area analysis. That is, if the resources nationwide were harvested and marketed in the same manner as similar resources are being harvested and marketed today, they would support a specified number of jobs, provide a specified amount of income, and support a specified number of people. These impacts have been presented; however, it should be remembered that these impacts are predicated upon the assumptions noted above.

The impacts from the multi-county models cannot be summed to obtain state or national impact. There are several reasons why results from local area models cannot be added to a larger area impact. First, expenditures consumers pay for goods or services are different in the larger area. For example, a New Yorker who skis in Colorado pays for meals, lodging, ski lift tickets, etc. locally. In the national economy, he buys airplane tickets, renta-car, buys skis, clothes, etc., in addition to local area expenditures. Only the local expenditures have a major impact in the county or community; however, to show impacts for the nation, all expenditures should be included in the model.

The second difference is that indirect effect or economic multipliers are larger, i.e., the economic activity ripples through more sectors in the state or national economy than local area. There are more sectors endogenous in the state or national economy than in a local area. A sector providing a production input to a local economy is an import when not present in the local economy, but if present in the state, it is added into the multiplier effect in the state or national economy.

A third difference is the induced effect. Induced effect is generated when owners and employees of industries spend their incomes. This generates more jobs and income for owners and employees of the industries providing goods and services purchased. People in a small local area will often go to other areas to spend part of their income. However, fewer go outside the state or nation to spend, so the induced effect is sometimes much smaller in local areas than in larger areas.

Changes in final demand by sector were determined by combining regional consumer expenditure data for Forest Service outputs with the industry making the sale to obtain the change in final demand by sector associated with the outputs or activities. Expenditure data must be independently estimated and must be consistent with the impact area being modeled. When the actual product is sold, expenditure is the sale price when the product is sold to the final consumer or exported out of the area. For those activities where a product is not actually sold, one must account for expenditures the user incurs to participate in the activity. Camping, for example, requires expenditures for gas, food, sleeping equipment, etc. However, only those purchases that happen in the region should be included. Any food, gas, or sleeping bag purchased outside the area would not be included for the local area analysis. The RARE II regional and national expenditure estimates appear to be reasonable; however, they are based upon relatively small samples and limited studies.

An important point to make when accounting for expenditure data is to count only the margin above the purchase price for all retail and wholesale products. Actual product purchased in the area was most likely produced in some other region and the only product sold by the regional industry was the margin or amount of markup they applied to the product to provide for the service of selling the product. Therefore, if gas is purchased from a service station, only the 28 percent margin is added to the retail sector, not the 100 percent of the gas price. If gas is produced in the area, the remaining 72 percent is shown as a purchase from the gas refinery sector or the sector that produces the product.

The required calculations for final demand changes include simply multiplying number of units produced under an alternative management strategy by sales by industry to the final consumers. Obviously, size of the area makes considerable difference as to expenditure associated with a product. Timber could be exported as logs in a very small region. It could be sold as rough lumber if a sawmill were in the impact area. It may go through a dry kiln, planes, or prefabrication plant if these are located in the area. The price used in the expenditure data should be the industry that sells it to final consumer or exports it out of the region. The I-O model accounts for an input sales if the product goes through many refining industries before it is exported or sold to final consumers.

Many books have been written on the actual workings of the input-output model. Only the unique procedures of how the models were used in the RARE II process are explained here. The interested reader will want to consult one of the books on input-output analysis for further details of the model.

Definitions.

- Direct effect: Change in economic indicators (employment, income, value added, etc.) because of industries that use the forest resource as input to production

or have sales to consumers when they participate in forest related activities. Direct employment, income, or value added coefficients times change in sales to final demand, i.e., output sold to final consumers.

- Indirect effect: Change in economic indicators because of industries that have a change in sales initiated by industries directly effected. These industries have sales because of second and succeeding rounds of purchases among the endogenous (producing) industries.

- Induced effect: Changes in economic indicators because of change in households (employees of direct and indirect effected industries) spending. A change in household spending is a change in producing industries sales.

- Economic indicators: Economic variables which measure size, stability, and condition of an economy. In input-output economics, employment, income, and value added (gross regional product) are the main variables measured.

- Employment: measured in person-years for approximately 2000 hours of one person working for a specified industry in producing a saleable product.

- Income: Compensation to the household sector for inputs provided to the purchasing industry. Includes wages, salaries, profit, rents, royalties, etc.

- Value added (gross regional product): The value of resources from the region used in production of products sold within and from the region. Total sales to final consumers minus imports. The value added method of estimating GRP is the summation of payments to government (taxes), household (income), and to industry investments (depreciation) resulting from each sale of an industry in the region.

- Gross national product (GNP): Same as GRP but on the national level.

References:

USDA Economics, Statistics and Cooperatives Service, "Regional Development and Plan Evaluation: The Use of Input-Output Analysis," Agriculture Handbook No. 530, May 1978.

Clark Row, Paul Teese, Terry Colbert, "Development Opportunity Rating System (DORS): project description and methods." USDA Forest Service, Washington, D.C. - Unpublished report. Draft Oct. 6, 1978.