APPENDIX B - DATA AND ANALYSIS METHODS

INTRODUCTION

Analyses for economic impacts of alternative plans, timber suitability and capability and livestock capability were completed for the Land Management Plan revision. Computer-generated models were used to analyze the economic impacts of major land management activities of the USFS and BLM upon the local communities; yield-table outputs analyzing future management alternatives for timber on the National Forest; and analyze the effects of alternatives on status of each livestock-grazing allotment

Sections 1and 2 include a description of values used in the financial and economic analyses and a more detailed discussion of the models and analysis methodology used for economic impact analysis. Section 3 is a description of the analysis used to form timber-yield tables for the San Juan National Forest.

ECONOMIC IMPACT ANALYSIS

INTRODUCTION

To estimate the economic impacts to the San Juan area economy, one model covering five counties was developed. The counties included Archuleta, Dolores, La Plata, Montezuma, and San Juan. This area matches both state and local recognition of a functional social and economic planning area. Labor flows between towns and counties are generally contained within these five counties. Interstate flows of labor, goods, and services between this area and San Juan County in New Mexico (Farmington, Bloomfield, and Shiprock) are not captured in the model, but considered as exports or imports along with other parts of the country.

IMPLAN was used to build and run the model. IMPLAN is a software package for personal computers that uses the latest national input-output tables from the Bureau of Economic Analysis, secondary economic data at the county level from a variety of sources, and proprietary procedures to develop input-output models for every county or group of counties in the nation. The software was originally developed by the U.S. Forest Service and is now maintained by the Minnesota IMPLAN Group, Inc (MIG). The model was calibrated to employment estimates in 2004 using data from the Colorado Department of Local Affairs, State Demography Office. The State Demography Office (SDO) works closely with counties in the San Juan planning area to establish mutually agreed-upon estimates of population, employment and personal income for current conditions and projections out to 2025. This was done using ouput per employee and similar ratios from MIG with employment estimates from SDO.

Economic impacts were estimated for the base year (2004) and for each alternative developed associated with the forest plan. The alternatives were evaluated in year 2015 for two reasons: First, the Colorado SDO forecasts are only available in five-year increments; and second, this year represents an approximate mid-point of the first 10-year planning period.

DEPENDENCY ANALYSIS

The IMPLAN model was used to assess the economic dependencies of the San Juan planning area. Economic dependency is a way of assessing the strength of regional or local economies. Regional economies, including the San Juan area, generally depend most on their exports to sustain local income and employment. However, sales to governments, capital investments, and residents with non-labor income must also be examined. A measure of reliance upon each aspect of the area economy was estimated and displayed.

FOREST CONTRIBUTION AND ECONOMIC IMPACT ANALYSES

Impact analysis describes what happens when a change in final sales (e.g., to non-residents — or exports – and governments) occurs for goods and services in the model region. Changes in final sales are the result of multiplying production data (e.g., head months of grazing or recreation visits by non-locals) times sales. Economic impacts were estimated for 2015 using the best available production and sales data. Retail margins were accounted for in the analysis. The initial economic impact prices and data sources of each are listed in Tables B-1 and B-2.

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, full-time or part-time. Jobs represent the annual average of 12 monthly estimates. There is no seasonality in this measure. The income measure used was labor income expressed in 2004 dollars. Labor income includes both employee compensation (pay plus benefits) and proprietor income (e.g., self-employed).

CUMULATIVE EFFECTS

Projections of employment and income to 2015 are made by the SDO. These projections implicitly incorporate some level of forest management, and that level was assumed to be Alternative A, or the no-action alternative. Whether each alternative would increase, decrease, or not affect the projections is the purpose of the cumulative effects analysis. The projections for 2015 were used for this analysis. These projections provided a context for understanding alternative impacts. A full description of cumulative effects was provided in Chapter 3.

DATA AND ASSUMPTIONS

Natural gas & oil

Estimates of well-drilling and natural-gas production were based on oil and gas potential and reasonably foreseeable development scenarios prepared by Gault Group Inc. in December 2006 for the San Juan planning area. Assumptions included wells would be drilled in areas of high potential for oil and gas, and new wells would be drilled in areas with current production first with only a small potential for drilling of wildcat wells. Oil production was assumed to remain unchanged from recent years (1990-2004).

Market prices for domestic natural gas and oil were obtained from the Department of Energy Information web page. The cost of well-drilling was obtained from staff petroleum engineer estimates of normal drilling costs for both conventional and coal-bed methane well-drilling.

Recreation

Data from the National Visitor Use Monitoring Project (NVUM) for the San Juan National Forest (2001) was used to estimate recreational use on the forest. This data was collected from October 2000 through September 2001. The data indicated a total of 2,221,000 recreation visits to the San Juan National Forest annually. The Bureau of Land Management (BLM) measures recreation use in recreation visitor days (RVD) – a 12-hour day of recreation participation. Most activities are engaged in for far less than 12 hours at a time, so one RVD often includes many occasions of the activity. This differs from the NVUM measure of recreation visits, which has no time element. A recreation visit can range from a few minutes to several days. For analysis purposes, BLM recreation use was converted to recreation visits.

To estimate the economic impact of recreation, it was necessary to first separate local resident visits from other Colorado residents and non-resident (out-of-state) visits.For purposes of this analysis, Colorado residents from outside the five-county area and out-of-state residents were considered as non-locals. This distinction was necessary since economic impacts are based on new dollars flowing into the economy. Resident recreation expenditures, on the other hand, represent a part of the current distribution of existing dollars already in the regional economy. Information for the San Juan National Forest indicated that 66 percent of the visits to the forest were by local residents with 34 percent being either non-local residents of Colorado or non-residents of Colorado.

The visitor expenditure profiles used in the analysis were obtained from two sources. Expenditures for non-local, non-skiing recreation were obtained from the NVUM system, a national survey of recreation visitors to national forests. Each national forest is classified as a high, average, or low spending area by comparing local spending with national averages. Spending on the San Juan National Forest best matched national averages. It was assumed that spending by BLM visitors was similar to those visiting the national forest. Spending profiles from NVUM were based on "trip segments" rather than activities.

Downhill-skiing expenditures were based on survey data from multiple studies obtained during development of the White River National Forest plan revision. The spending totals were compared with non-local ski spending from the NVUM system, which provides a national average across all ski areas on National Forest System lands. The Colorado-based skier spending totals were higher than the NVUM national averages and resulted in a relatively high share of total tourism spending in the area. To better match local spending, the Colorado-based spending totals were moderated somewhat to provide a better fit in the San Juan area. All expenditures were adjusted to 2004 dollars to be compatible with the economic models.

Timber production

Timber harvest from the SJPL was based on a 10-year average. This was done to account for annual variations in timber harvest from National Forest System and BLM lands. On this basis, it was estimated that the SJPL currently produce 0.8 MMCF of softwood sawtimber and 1.6 MMCF of all other products and species. All timber activity was assumed to involve local logging. Approximately 80 percent of softwood sawtimber and 90 percent of all of the products and species are processed in the five-county area. These distributions were used for the analysis of each alternative in the plan.

Due to the price fluctuations associated with lumber products, the economic impact of timber production was based on quantities of timber production. Estimates of direct employment and labor income per MMCF were provided by the Bureau of Business and Economic Research, University of Montana and by a local timber-industry assessment. See Table B-2 below. Estimates of the total employment associated with timber production from the SJPL were developed using IMPLAN employment multipliers from wood-products sectors in the model. Multipliers for "other" wood-products sectors were obtained from the miscellaneous-wood-processing sector for the state of Colorado.

Livestock-grazing

SJPL records indicate that there are over 148,000 animal-unit-months (AUM) of livestock permitted on public lands in the area. Ninety-three percent of the total AUMs were cattle-grazing and 7 percent were sheep-grazing. Livestock prices were estimated using inventory and marketing data from the National Agricultural Statistics Service for Colorado in 2004.

SJPL operating budget and employment

SJPL data indicate that the three-year average (2004-2006) budget totals for both the Forest Service and BLM combined is $17 million. The budget is split between salary and non-salary expenditures in approximately a 60/40 ratio. The budget supports 265 Forest Service employees in the five-county area. Two hundred twenty-seven of these workers are permanent employees and 38 are seasonal.

Table B.1- Direct Economic Activity Used in Economic Impact Analysis

Description	Units	Direct Economic Activity
Tourism/Recreation Spending		
Downhill Skiing		
Non-Local Day	Skier-day	$46.23
Non-Local Overnight	Skier-day	$173.15
All Other Recreation		
Non-Local Day Trip	Visit	$23.37
Non-Local Overnight	Visit	$90.54
Livestock Market Values		
Cattle	Head-month	$41.16
Sheep	Head-month	$6.03
Oil & Gas Market Values		
Natural Gas (@wellhead)	MCF	$6.46
Oil (@ wellhead)	Barrel	$50.08
Dry Hole	Well	$1,200,000
Producer	Well	$1,500,000
San Juan Public Lands Operations		
Budget in 2006	Dollars	$18,400,000
Budget in 2015	Dollars	$17,000,000
Employment in 2006	Jobs	265
Employment in 2015	Jobs	245
Wood-Products Processing		
Logging	Jobs/MMCF	25
Sawmills	Jobs/MMCF	30
Other	Jobs/MMCF	77

Table B.2 - References for Direct Economic Activity Used in Economic Impact Analysis

Description	References
Tourism / Recreation Spending	
Downhill Skiing	Composite spending profiles developed from studies by RRC Consulting, Boulder, CO. 1997-1999.
All Other Recreation	Stynes, Daniel J. and Eric M. White. Spending Profiles for National Forest Recreation Visitors by Activity and NVUM2003NFForestSpendingEstimates2.xls. Michigan State University. East Lansing, MI. Feb. 1, 2006.
Livestock Market Values	Colorado State Level Data - Livestock Statistics : Meat Animals Production, Disposition, and Income, 2002 Summary. National Agricultural Statistics Service, April 2003 http://www.nass.usda.gov:8080/QuickStats/index2.jsp
Oil & Gas Market Values	
Natural Gas	Energy Information Agency web page. http://www.eia.doe.gov/ -- US Nat Gas wellhead prices 3-yr avg (March 2004-Feb 2007)
Oil	Energy Information Agency webpage. http://www.eia.doe.gov/ -- US crude oil domestic production prices 3-yr avg (May 2004-May 2007)
Dry Hole, Producer	Thrash, Gary & Jim Powers. San Juan Public Lands. Durango, CO. 2007.
San Juan Public Lands Operations	Wilson, Thurman. Unpublished data. San Juan Public Lands. Durango, CO. 2007.
Wood-Products Processing	
Logging & Sawmills	Keegan, Charles. Unpublished data. Bureau of Business & Economic Research, University of Montana. Missoula, MT. 2006.
Other	Preston, Michael. Timber industry assessment for San Juan Public Lands plan revision (Western Excelsior production & employment). Office of Community Services, Fort Lewis College. Durango, CO. 2006.

FINANCIAL AND ECONOMIC EFFICIENCY ANALYSIS

Financial efficiency is defined as how well the dollars invested in each alternative produce revenues to the government. 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.

Quick-Silver, a public domain Windows-based program, was used to discount revenues, benefits, and costs over a 50-year period (2008-2057). A 4 percent discount rate is specified by agency policy and was used for these analyses.

Revenues from recreation permittees are highly variable and therefore not estimated, except for downhill skiing and grazing where historical averages are available. Revenues for grazing are set by law. Sawtimber revenues are shown below and discussed in more detail elsewhere in this appendix.

Some economic values are based on actual revenues where markets exist. For timber, these values are based on harvest values by product between 2001 and 2004. For grazing, these values are computed by the Washington Office and provided to the field on an annual basis. Range values sent to the field in early 2007 are used in these analyses. Values for recreation represent a market-clearing estimate of willingness-to-pay evaluations. These economic values were developed by the SPRA staff of the Washington Office and updated to current values by the Regional Office of the Rocky Mountain Region. As discussed in the FEIS, willingness-to-pay estimates for non-use values (scenery, existence values, bequest values, etc.) have not been established by the agency, and are therefore excluded from this analysis. All values have been adjusted to 2004 dollars. The table below displays the economic values and revenues that were used for each resource.

Table B.3 - Economic Benefits and Financial Revenue Values

Activity	Unit	Economic Benefit	Financial Value
Cross-Country Skiing	RVD	$14.77	N/A
Snowmobiling	RVD	$13.29	N/A
Downhill Skiing	Skier-Day	$43.00	N/A
Hunting	RVD	$60.00	N/A
Fishing	RVD	$87.15	N/A
Viewing Scenery/Wildlife	RVD	$68.18	N/A
OHV Use	RVD	$13.29	N/A
Driving	RVD	$13.29	N/A
Developed Camping	RVD	$10.34	N/A
Primitive Camp/Backpacking	RVD	$18.74	N/A
Hiking	RVD	$14.77	N/A
Other	RVD	$14.77	N/A
Grazing – Cattle	HM	N/A	$1.35
Grazing – Sheep	HM	N/A	$0.27
Grazing – Permittee Costs- Cattle	HM	$12.28	N/A
Grazing – Permittee Costs - Sheep	HM	$5.44	N/A
Grazing – Cattle & Sheep	AUM	$13.65	N/A
Timber Harvest – Softwood Sawtimber	CCF	$42.99	$42.99
Timber Harvest – Softwood POL	CCF	$6.00	$6.00
Timber Harvest – Aspen	CCF	$38.08	$38.08
Timber Harvest – Posts & Poles	CCF	$11.25	$11.25
Timber Harvest - Firewood	CCF	$9.00	$9.00
Natural Gas – Cost of Drilling	Well	$1,500,000	N/A
Natural Gas	MCF	$6.00	N/A
Natural Gas – Royalties	MCF	$0.75	N/A
Natural Gas – Operation & Maintenance	MCF	$1.50	N/A

Detailed costs were not developed for this analysis. Total budgets for public lands management were held constant and assumed to be fully spent for each alternative. An analysis of individual program contributions to benefits, revenues, and costs was not conducted.

Further details of the analysis, such as source references and software, are available in the administrative record.

TIMBER ANALYSIS

The San Juan National Forest used the forest vegetation simulator (FVS) to create yield tables to aid current forest plan revision efforts. The yield-table outputs from FVS were used in analyzing future management alternatives. FVS yield-table development is comprised of five steps. First, forest inventory data is assigned to the forest land stratification scheme used to delineate similar stands types. Second, FVS needs to be calibrated and adjusted for local conditions. Third, FVS code needs to be written to compute important tracking variables needed by the planning model. Fourth, natural growth simulations need to be constructed that show tracking variable yields over the projection period. And finally, treatments need to be simulated for each stratum. Further detail on yield-table development can be found in the planning record in the document titled San Juan National Forest Plan Revision Summary of Yield Table, Long Term Sustained Yield Capacity (LTSYC), ASQ, and Timber Sale Program Quantity (TSPQ) development.

FOREST LAND STRATIFICATION AND SAMPLING SCHEME

Yield tables were constructed for five forest cover types, four size classes and three density classes. Forest inventory data assembled by the San Juan National Forest were assigned to one of the 60 possible strata combinations (forest cover type x size class x density class). Stand exams were chosen based on recommendations in Donnelly and Krueger (1994). Density classes were combined for the seedling/sapling and medium classes and in the very large size classes where sample sizes were small. The end result is that 993 stand exams in 35 strata were selected to create the yield tables to be used in the San Juan National Forest plan revision effort.

Stand age is a variable that is important in aggregating FVS output into yield tables. Stand ages were determined based on R2 RMSTAND methodologies, which assign the average age of the largest size class as stand age. Stands were then assigned their average age based on the dominant size class call in FVS.

Average annual yields for each stratum were then entered into a spreadsheet and applied to acres in each stratum that had been determined to be suitable, roaded, and less than 35 percent slope. The volume yields were then compared to the outputs from the 1992 plan amendment outputs

LTSYC DEVELOPMENT

Long-term sustained-yield capacity calculations were based on the LTSYC calculated for the 1992 timber amendment done for the San Juan National Forest LMP. The calculation was developed using a spreadsheet that compared the average annual yield for each stratum described above and the yield curve developed for each stratum, then expanded by the suitable acres for each stratum developed for the 2007 San Juan National Forest plan revision. The results of the yield calculations were then adjusted by the 1992 amendment calculations and the changes in suitable acres in the 2007 revision.

TSPQ AND ASQ DEVELOPMENT

TSPQ and ASQ were developed for the anticipated budget levels using current program levels adjusted by the 2006 suitable acres outside of inventoried roadless acres (2007 inventory) on slopes less than 35 percent. Historical harvest levels based on past Silva 99 reporting and actual per-acre volumes generated were used to calibrate the yield curves.

BENCHMARK ANALYSIS

In accordance with 219.12(e)(1). Based on comparisons of FVS yields generated for the current revision adjusted for changes in suitable acres, the benchmarks run for the 1992 San Juan LMP amendment are still valid and useful to provide a frame of reference for decisions made in this revision.

(See Appendix B Final Supplemental EIS for San Juan LRMP 1992 pB-64—pB-85)

> Minimum timber output to meet legal requirements is zero since there are no long-term contracts or legal requirements to produce timber on the San Juan National Forest.
>
> Max Timber Benchmark # 4 - 15 decade maximization, first period yield is 80MMBF/YR.
>
> Max PNV Benchmark #3 - revised 15 decade maximization, first period yield is 30.6 MMBF/YR.

STAGE II ECONOMIC ANALYSIS

In accordance with 219.14(b). The financial analysis of existing stands found on page B-171, and B-172 of the Final Supplemental EIS for the 1992 amendment to the Land and Resource Management Plan for the San Juan National Forest, indicates that "the bulk of the representative stands with positive PNV are, as expected are spruce-fir, and Douglas fir sawtimber with volumes per acre in excess of 15 MBF per acre". This is still valid today and can be relied upon.

Table B.4 Suitability of Areas for Timber Summary

Category	Acres	Acres Generally Suitable for Timber Harvest	Acres Generally Not Suitable for Timber Harvest	Acres Not Suitable for Timber Production
Total National Forest Lands	1,878,022			
Lands Generally Not Suitable for Timber Harvest				
Total Lands Generally Not Suitable for Timber Harvest			1,168,231	1,168,231
Lands Tentatively Suitable for Timber Harvest	813,366			
Lands Generally Suitable for Timber Harvest		709,791		
Timber Production Achieves or is Compatible with Desired Conditions and Objectives (Suitable Lands)		313,812		
Other Lands Where Harvest is Compatible with Desired Conditions and Objectives		395,979		395,979
Lands Not Suitable for Timber Production				1,564,210