

A photograph of a forest with tall, thin trees and a path covered in fallen leaves. The trees have yellow and green foliage, suggesting autumn. The path is made of dirt and is covered with a thick layer of fallen leaves. The sky is visible through the trees, showing a clear blue color.

## Website Analysis Methods Guide

# The Estimated Economic Contributions of National Forests and Grasslands

Prepared by the staff economists of Ecosystem Management Coordination, May 2016.

## Overview

America's forests, grasslands, and other open spaces are integral to the social, ecological, and economic well-being of the Nation. The Forest Service plays a vital role in providing public benefits and services such as clean air, clean water, minerals and energy, and fertile soils for supporting timber, forage, carbon storage, food and fiber, fish and wildlife habitat, and opportunities for outdoor recreation. We deliver a valuable service to the public by restoring and improving forest, grassland, and watershed health; by producing new knowledge through our research; and by providing financial and technical assistance to partners, including private forest landowners (USDA Forest Service, Fiscal Year 2014 Budget Overview, April 2013)

National Forests and Grasslands contribute to economic activity nation-wide by providing recreational opportunities as well as commodities such as timber, energy and minerals, and grazing. Payments to states and counties such as those from the Secure Rural Schools Act (SRS), Payment in Lieu of Taxes (PILT), 25% Fund, and minerals and energy royalty payments to states and counties also support schools, road maintenance, stewardship management projects and general county government operations. Additionally, Forest Service investments in infrastructure, ecosystem and watershed restoration, forest health, and workforce salaries further support jobs that generate income and spur economic activity across local economic sectors ("ripple effects"). The Forest Service plays a particularly valuable role in rural economies where the economic base may be limited. For these reasons (in addition to legislative / agency mandates), it is useful to quantify the economic contributions of national forests to the American public.

Ecosystem Management Coordination (EMC) has recently released the ["Economic Contribution Website"](#) – a Forest Service intranet site designed to display economic contributions to local communities, as measured by jobs and income, of natural resource management on National Forests and Grasslands. The analysis underlying the Economic Contribution Website employs regional economic impact analysis techniques in order to estimate Gross Regional Product (GRP), labor income and jobs supported by Forest Service management activities. Using FY2009 - 2013 expenditure data, resource output data, and other economic information, this analysis estimates the economic contributions of existing programs and activities from 122 national forest units in the National Forest System (NFS) as well as the 9 Forest Service Regions.

Note: The term "contribution" refers to a subset of economic "benefits." "Benefits" is a broad economic measure that can include many aspects of economic activity, e.g. nonmarket values. Economic "contributions" is used to describe the role Forest Service natural resource management plays in the local market economy as measured by jobs and income.



## Analysis Objectives

For decades, the Forest Service has produced estimates of the economic contribution (measured in jobs and income) of current natural resource management as well as estimates of the possible economic contributions of proposed management alternatives. Historically, these estimates were completed as needed by each region or forest based on local needs, or on a national level for such things as Resource Planning Act (RPA) reports or the Forest Service Strategic Plan. To streamline this process, EMC has developed a standardized approach to estimate the economic contributions for each administrative national forest. Results are displayed on the [Economic Contribution Website](http://fsweb.wo.fs.fed.us/economic_contribution/index.shtml) ([http://fsweb.wo.fs.fed.us/economic\\_contribution/index.shtml](http://fsweb.wo.fs.fed.us/economic_contribution/index.shtml)). Website estimates are generated using a widely accepted and sophisticated methodology employed for decades by Forest Service economists as well as by the BLM, USGS, and US Park Service, among others. Agency management data are applied to models of the economic structure and interactions in the zone of economic influence for each national forest and grassland or Forest Service Region. The contribution of the Forest Service is measured in terms of the average annual number of local jobs, income and Gross Regional Product supported in the area. These forest-level results are generic, and will inform analysis carried out by individual forest units and regions for specific purposes such as for forest plan revision.

The Contribution Website complements other Agency efforts. The National Visitor Use Monitoring annual report uses EMC protocols to estimate the jobs and income supported by recreation on National Forest Lands. The national level contribution analysis carried out by the Strategic Planning and Budget Analysis staff (SPBA), Research and EMC for the Forest Service Strategic Plan employs the same analysis methodology as for the Contribution Website, though the scope of the national analysis was broadened to include State and Private Forestry and Research. The Economic Profile System – Human Dimensions Toolkit (EPS-HDT) – a data gathering tool of secondary source demographic and economic information – can be used to give background descriptions of areas surrounding National Forests and grasslands, giving context to the economic contribution numbers.

The Contribution Website also complements analyses in other Agencies e.g. the annual DOI Contribution Report and the Park Service's annual calculation of the economic contribution of visits to the National Park system. Forest Service economists have been involved in both of these efforts and Forest Service tools and methods have been used by the BLM for many of their Resource Management Plans.

This report provides a brief description of the methods used to conduct an economic contribution analysis, including the concept of Input-Output modeling and the protocol for analysis area delineation.

## Analysis Methods

### Analysis area delineation

Before constructing an economic model, the geographic area that forms the underlying local economic structure of the analysis must be determined. The geographic area should represent a functional economic area where there are activities supported by Forest Service land management. In the past the Forest Service used Component Economic Areas (CEAs) developed by the Bureau of Economic Analysis to identify the analysis area, but CEAs are urban focused, while analyses conducted by the Forest Service often address economic issues in rural areas. At other times, analysts used their 'gut feelings' or looked only at counties with Forest Service land. In order to delineate economic analysis areas in a consistent, defensible and appropriate manner, a more rigorous protocol was developed (METI and EIC 2010). The contribution website analysis utilizes the protocol to systemically delineate the analysis area for each administrative unit in the NFS. This process involves two steps: (1) identifying counties with direct expenditures, and (2) performing a labor shed analysis.

### Identifying counties with direct expenditures

Counties with Forest Service lands are a good place to begin the delineation process, but it is not a reliable guide for the final delineation (METI and EIC 2010). The first step in delineating an economic analysis area is to identify the counties where actual market transactions are likely to occur. This analysis relies on three different sets of data to identify the occurrences of transactions associated with activities supported by Forest Service land management. These datasets contain information on (1) range permittee location, (2) timber bid winner location and (3) visitor market area data.

Range and timber data are obtained through the Natural Resource Manager (NRM). For range, grazing permittees' addresses and associated AUMs are recorded; for timber, bid winner's information and CCF are used. A county qualifies as an expenditure county if it contains at least 5% of all range permittees / timber bid winners from the national forest unit.

The *visitor market area* data comes from the National Visitor Use Monitoring survey (NVUM). It shows counties from which about 50% of the visits originated. Distance zones are based on travel distances reported in the NVUM survey. To be considered as a recreation expenditure county, the market area county must be (1) classified as part of the forest's 50% market area, (2) within 50 road miles (leading to a nearby town) from the forest boundary, and (3) be contiguous with the rest of the analysis area counties. Also, if the 50% market area county is a metro area, one additional criterion applies: the county must contain National Forest land.

## Labor shed analysis

The theoretical basis for defining economic areas is founded on labor and trade relationships. Because labor is a strong component of most industrial clusters, labor market concepts (“Functional Economic Areas” or FEAs) offer a credible means for identifying the analysis area. In our study area delineation process, after the direct expenditure counties are identified, a Labor Shed Analysis is then performed to ensure that the selected counties contain a sufficient share of the labor market in the area. This detailed process is documented in ‘USDA Forest Service Protocols for Delineation of Economic Impact Analysis Areas’ (METI and EIC 2010).

## Input-Output Models and Contribution Calculations

An “Input-Output” economic model is a matrix representation of a regional (local) economy, capable of examining the relationships both among businesses and between businesses and final consumers, capturing all monetary market transactions for consumption in a given time period. Nobel laureate Wassily Leontief (1905-1999) is credited with the development of this technique. The Input-Output modeling technique is well-suited for this analysis because it is able to estimate the ripple effects throughout the economy from an infusion of money stemming from National Forests products, services and amenities.

For example, a visitor on a camping trip to a National Forest incurs several expenditures (fuel for the vehicle, food and other incidental supplies). These expenditures represent the recreationist’s final demand for gas, groceries and other local retail sectors, or in Input-Output terms, the direct effect of recreation spending. This in turn generates demand by each retail store for the goods and services and labor to run their businesses and sell to consumers. In this case, other industries supply inputs to the gas stations, grocery stores and local retail sectors, supporting the local economy. These are called indirect effects. Additionally, people spending wages earned in any of these industries also provide income to other goods and service industries; they are the ‘induced effect’. These direct, indirect and induced effects are measured with “multipliers” which measure the rate of direct and indirect GRP, jobs and income stimulated by direct demand for goods and services. Three groups of multipliers are estimated: employment, income and GRP coefficients. These coefficients represent how jobs/income/spending cause ripples of activity as expenditures are spent and re-spent in the economy. The resulting model of the local economy is enhanced by adding national forest specific data such as recreation visitor expenditures and National Forest budget profiles for salary and non-salary expenditures. This step generates “response coefficients” or rates of response of the local economy to each dollar spent by the Forest Service or by users of National Forest resources (i.e. recreation visitors) in private sector businesses.

All models and national forest-specific response coefficients were generated using a commercially available software and data system – IMPLAN – and its 2009 - 2013 county-level data. IMPLAN (IMpact analysis for PLANing, The IMPLAN Group,

LLC) is a regional economic impact analysis system first developed by the Forest Service and now updated and supported by the [IMPLAN Group](http://www.implan.com) (www.implan.com). IMPLAN estimates rates of economic response. To calculate the total economic contribution, IMPLAN results are paired with a Forest Service Microsoft Excel spreadsheet application. The spreadsheet multiplies Forest Service resource output figures by IMPLAN model results to derive the employment, income and GRP estimates by national forest and Forest Service Region. The next section documents the forest level resource data inputs are used in the spreadsheet.

#### Assumptions and caveats of input-output analysis:

For an excellent, easy to read overview of the history and assumptions of I-O, see [Input-Output Models for Impact Analysis: Suggestions for Practitioners Using RIMS II Multipliers \(Bess and Amargin 2011\)](#) ([https://www.bea.gov/papers/pdf/WP\\_IOMIA\\_RIMSII\\_020612.pdf](https://www.bea.gov/papers/pdf/WP_IOMIA_RIMSII_020612.pdf)). This paper is written about the Bureau of Economics' RIMS II input output system, but the general background information is nicely summarized and there are good descriptions of how multipliers can be misused.

1. The I-O model
  - a. Backward linkages
  - b. Driven by Final Demand, FD vs TIO
  - c. Industry homogeneity
  - d. Local supply conditions
  - e. No Regional feedback attempts
  - f. Time dimension
  - g. Linear
    - i. Fixed production patterns
    - ii. I-O vs CGE
2. Snapshot in time
3. No supply side constraints
4. Margins and retail
5. Descriptive (contribution) vs Predictive (impact) models

## Data Inputs

Forest-level resource data are used as inputs for the spreadsheet. Table 1 presents an example of what data are required, using Region 6 data from 2010 as an example. These resource data are used to calculate the employment, labor income and GRP contributed from different programs.

Table 1: Forest Level Program Resources Data

Administrative Unit	Recreation (Annual Visits)	Range (Cattle and Sheep AUMs)	Timber (CCFs)	Mineral (Short Tons)				Payments to States/Countries (2010 USD)	F S Expenditures (3-yr average, 2010 USD)
				Crushed Stone	Dimension Stone	Sand and Gravel	Other		
Deschutes	1,894,886	8,624	103,792	32,400			5,306	\$ 6,847,062.90	\$ 53,742,432.56
Fremont-Winema	422,425	59,130	110,529	40			431	\$ 14,337,166.30	\$ 30,373,817.10
Gifford Pinchot*	588,295	1,366	31,636	2	65		79	\$ 12,317,012.00	\$ 25,651,697.83
Malheur	261,435	69,419	39,841	29,440		5	11	\$ 7,187,342.10	\$ 32,098,696.83
Mt Baker-Snoqualmie*	1,995,353		31,117	10		8	2	\$ 9,832,626.10	\$ 23,818,128.51
Mt. Hood*	1,946,801	882	53,567				138	\$ 11,447,267.00	\$ 37,309,846.76
Ochoco	247,004	30,809	14,897				105	\$ 4,986,521.50	\$ 14,431,887.68
Olympic*	461,870		41,396					\$ 5,383,106.70	\$ 19,771,313.56
Rogue River-Siskiyou	902,065	9,493	40,669	39		62	627	\$ 13,060,952.20	\$ 49,742,597.44
Siuslaw*	945,652		96,449	9			55	\$ 12,783,925.40	\$ 22,671,085.17
Umatilla	379,758	36,385	75,093	126			150	\$ 2,837,453.70	\$ 28,489,073.00
Umpqua	534,744	846	49,121	37,875		32	555	\$ 15,437,492.70	\$ 41,769,013.41
Wallowa-Whitman	447,430	89,399	33,709	460			41	\$ 2,855,691.70	\$ 33,989,076.30
Okanogan-Wenatchee*	1,367,538	43,904	73,136	1,959		19	0	\$ 4,475,449.90	\$ 54,012,562.14
Willamette	1,346,556		108,795	1,400	35	700	1,364	\$ 29,598,558.40	\$ 48,363,036.53
Colville	335,706	24,453	79,995			1,600	110	\$ 1,480,559.30	\$ 18,833,579.77
Columbia River Gorge NSA*	1,366,634	118	1,538						\$ 5,366,748.96
<b>Total</b>	<b>15,444,152</b>	<b>374,828</b>	<b>985,280</b>	<b>103,760</b>	<b>100</b>	<b>2,426</b>	<b>8,974</b>	<b>154,868,188</b>	<b>540,434,594</b>

\*NVUM Round 3 data

For **recreation**, the number of annual visits came from the National Visitor Use Monitoring (NVUM) survey. NVUM Round 3 visitation estimates were used where available (as of August 2012, denoted by \* in the table), otherwise round 2 data were used. **PLEASE NOTE:** when comparing years abrupt changes will be observed between results based on Round 2 and Round 3 data from NVUM. For **range**, the AUMs (Animal Unit Months) for both cattle and sheep came from the '2010 Annual Grazing Statistical Forest/Grassland Detail at Forest Level' report, obtainable through I-Web. For **timber**, the cut volume (CCF) came from 2010 Region 6 cut and sold report. For **minerals and energy**, all locatable mineral production information was obtained from the USDA Forest Service 2010 Mineral Materials Production Report (currently no leasable in Region 6). Eichman et al. (2011) detailed the process of mineral contribution analysis. **Forest Service salary and non-salary budget expenditure data** were obtained from the USDA National Finance Center (NFC). **Payments to States/Countries** information came from the Forest Service Secure Rural Schools Act State Payments report ASR-10-02.

## Results Interpretation

Detailed results from 122 national forest units and 9 Forest Service Regions can be found on EMC's [Economic Contribution Website](http://fsweb.wo.fs.fed.us/economic_contribution/index.shtml) ([http://fsweb.wo.fs.fed.us/economic\\_contribution/index.shtml](http://fsweb.wo.fs.fed.us/economic_contribution/index.shtml)).

The economic contributions from natural resource management activities are calculated using the resource outputs and budget data (as in Table 1, above). Results are expressed in terms of jobs, labor income and value added (Gross Regional Product, or GRP). For jobs, results are reported as the average annual full and part time, seasonal and temporary employment supported by natural resource management activities in the local economy. The estimated employment under the "Forest Service Resource Mgmt Investments" category reflects jobs generated from Forest Service program budget expenditures for Forest Service salaries and benefits as well as investments in such things as forest and watershed restoration, and facilities construction and maintenance (roads, trails, campgrounds, etc.).

In order to get the total contribution for each Forest Service Region, a regional model including all the forest study areas in the Region was built. Due to overlapping analysis areas and trade flow calculations, forest level results CANNOT be added up to get state, regional or national totals. Regional models were specified and estimated to avoid this.

It is important to note that this analysis used IMPLAN to estimate employment response coefficients; therefore, jobs as reported here are expressed in annual averages of both full and part time total wage and salary employees, as well as self-employed jobs. This method of counting employment is a standard convention and consistent with methods used by the U.S. Bureau of Labor Statistics. One cannot discern the number of hours worked or the proportion that is full time vs. part time. It also important to reiterate the employment contributions calculated are reported simply as jobs, not full time equivalents (FTE's). The impacts include both full time and part time employment, so a person with more than one job could show up more than once in the data. This prohibits comparisons to population data and inferences about the effect on unemployment rates.

Besides employment effects, the Contribution Website also displays Labor Income effects, interpreted as the value of wages, benefits and proprietor's income supported by natural resource management activities in a particular forest unit. Again, the estimated labor income under the "Forest Service Resource Management Investments" category reflects income generated from Forest Service program budget expenditures. All other Program results reflect the private sector activity stimulated by Forest Service natural resource management (including recreation visitor spending) entering the local economy.

Finally, the Contribution Website displays the value-added, or GRP supported by natural resource management activities. Like the jobs and labor income figures the



estimated value-added contribution under the “Forest Service Expenditures” column reflects value-added generated from Forest Service programs and budget expenditures.

The (GRP) contributions consist of (1) employee compensation –wages and salaries plus benefits paid by local industries; (2) proprietor income – income from self-employment; (3) other property income – corporate income, rental income, interest and corporate transfer payments; and (4) indirect business taxes – sales, excise, fees, licenses and other taxes paid, including non-income based payments to the government. GRP (or value-added in IMPLAN) is a popular and widely used measure of economic growth, taking into account the incremental value added to a product or service at each step of the production process.

IMPLAN generates a static model representing a snapshot in time. If you have chosen to display the 2010 results on the Contribution Website, the results will be based on the 2010 IMPLAN model and therefore, reflects only the structure and state of the economy in 2010. Moreover, IMPLAN is used to examine “marginal” changes, therefore, results in this analysis is valid only for relatively small changes to the local economy. In other words, the above results hold with the assumption that there is no substantial resource management action in the region large enough to change the underlying structure and trade relationships of the local economies.

## Other considerations

### *Local vs. non-local recreation*

All economic effects generated from recreation visitor spending are split by local vs. non-local visitors. Many analysts maintain that since recreation spending by people within the impact area does not constitute ‘new money’ entering the economy, their contributions should be left out. Other analysts however, argue that when conducting a contribution analysis, it is appropriate to include results from local or resident visitors since the objective of a contribution analysis is not to examine proposed or anticipated changes, but rather what is the share of current economic activity in the area that can be attributed to recreation on Forest Service lands – a clear “what is” question rather than a “what if” analysis. In this case, it means accounting for all visits which are estimated to have occurred on national forest lands, which reveals people’s preference toward the amenities and natural settings of a national forest. This preference translates to visitors (residents and non-residents alike) spending their disposable income as well as valuable leisure time on trips to national forests, versus trips to private fishing ponds or the outlet mall. Nevertheless, considering the dichotomy in rationale, this analysis reports both local and non-local recreation contribution separately, offering readers the liberty to determine which one to include/exclude.

### *Results by program area*

Although the Contribution Website splits out the economic effects by some of the major program areas that interact with the local economy, it does not imply that the economic effects can be fully attributed to individual program areas or that economic effects can be meaningfully compared across programs. There exist joint products or services that are not easily separated along clearly identified input-and-output relationships. For example, existing roads originally built for timber harvesting also provide access for recreation visits. This report splits out the economic effects by program areas simply because it provides a convenient way of displaying the economic effects of agency activities associated with the production of specific resource outputs.

### **For More Information**

For more information, please contact Doug Smith ([dhsmith@fs.fed.us](mailto:dhsmith@fs.fed.us)), Susan Winter ([swinter@fs.fed.us](mailto:swinter@fs.fed.us)), or Henry Eichman ([henryeichman@fs.fed.us](mailto:henryeichman@fs.fed.us)).

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