National Forest Health Restoration

An Economic Assessment of Forest Restoration on Oregon's Eastside National Forests

Prepared for:
Governor John Kitzhaber and Oregon's Legislative Leaders

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Please see Appendix I for a listing of people who participated in this study.

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Executive Summary

Increasing the scale and pace of forest health restoration on U.S. Forest Service (USFS) managed forests in eastern and south central Oregon will contribute to the health and resiliency of Oregon's dry-side forest ecosystems. Restoring fire-resilient forest landscapes will provide clean air, clean water, wildlife habitat, recreational opportunities, and other critical ecosystem services.

In addition, eastern Oregon's rural communities will benefit through the creation and retention of thousands of jobs that generate local income, produce commercial wood products and contribute millions of dollars to state tax revenue. These environmental and economic impacts help sustain and enhance the overall quality of life in the entire State of Oregon.

Governor Kitzhaber and members of the Oregon legislature called on the Federal Forest Advisory Committee – a*d hoc* Implementation Work Group to complete an economic assessment of National Forest health restoration activities on Oregon's dry-side National Forests. This report responds to that call. It provides elected officials, public and private forest sector leaders, members of the conservation community, and the electorate information needed to evaluate the challenges and opportunities of forest health restoration.

Economic impacts of USFS' current forest restoration program

Doubling the scale and pace of forest health restoration on USFS-managed forests in eastern Oregon to 258,000 acres annually and sustaining this pace over the next 20 years will allow businesses to invest, restoration contractors to hire more workers, and mills to maintain their operations and employees.

- The USFS' current average annual forest restoration activities on Oregon's eastside provides the following economic impacts:
    - Accounts for a total of 2,310 jobs,
    - Generates $90.5 million in total income,
    - Accounts for $231.5 million in total industrial output, and
    - Contributes $3.6 million in total state tax revenue.

- Currently, the USFS implements forest restoration treatments on about 129,000 acres annually in eastern Oregon, or just 1.4 percent of the USFS forestland in eastern Oregon not restricted from active forest management.

- The USFS spends, on average, $40.8 million in forest restoration activities per year in eastern Oregon. Doubling the acreage would likely require a doubling of this amount.

- Doubling the current pace of restoration proportionate to the current distribution of treatments would then double the volume of commercial production to 282 million board feet of sawlogs and 450,000 green tons of non-sawlogs and biomass material annually.

- The total impact of increasing restoration activity on employment depends on existing use of capacity for restoration work. To the extent that workers are not currently full-time and other equipment is not being fully utilized, we will not see both workers and equipment double with the doubling of the pace of restoration. Doubling of restoration will undoubtedly save existing jobs and increase working hours moving employment numbers in eastern Oregon in a positive direction.

- Industrial output will increase from $231.5 to $463 million alongside commercial production expansion because more product sales will occur and more goods and services are being traded among economic sectors.

- The total contribution of forest restoration activities to state tax revenue will increase from $3.6 to $7.2 million because state tax revenue is strongly correlated to commercial production (income, corporate, fuels, and harvest tax).

Summary data of National Forest health economic assessment

Summary Data	Northeast	Southeast	Interior Central	Interior South	Total Eastern Oregon
Total Acres (1,000)	2,646	2,905	2,016	3,801	**11,368**
Available Acres (1,000)	1,879	2,556	1,451	3,307	**9,193**
Footprint Acres (1,000)*	33	22	37	37	**129**
Cost ($1,000)*	$ 6,687	$ 5,171	$ 10,474	$ 18,452	**$ 40,784**
Sawlogs (MMBF)*	18	25	32	66	**141**
Non-saw/Biomass (1,000 GT)*	73	38	57	57	**225**
Jobs (#)*	397	329	319	1,265	**2,310**
Output ($1,000)*	$ 36,898	$ 35,186	$ 25,106	$ 134,322	**$ 231,512**
Income ($1,000)*	$ 16,102	$ 14,019	$ 12,875	$ 47,521	**$ 90,517**
State Tax Revenue ($1,000)*	$ 778	$ 518	$ 1,125	$ 1,191	**$ 3,612**

*On an average annual basis

- In coordination with forest restoration activities, the USFS conducts watershed restoration in order to improve aquatic and terrestrial wildlife habitat and ecosystem function. These restoration activities include fish passage improvement, road drainage, road decommissioning, riparian restoration, and stream channel improvements.

Economic impact of the USFS spending $1 million on watershed restoration in each economic region

Summary	Northeast	Southeast	Interior Central	Interior South
Jobs (#)	17	24	7	20
Output ($1,000)	$1,500	$ 1,400	$ 470	$ 1,600
Income ($1,000)	$ 678	$ 615	$261	$644
State Tax Revenue ($1,000)	$ 34	$18	$ 39	$9

*The chart shows what $1 million spent on watershed restoration would return in each economic region - the rows are not additive.

Avoided costs of federal forest restoration activities

An investment in forest health restoration has the potential to save millions of dollars in state and federal funds by avoiding costs associated with fire suppression, social service programs and unemployment benefits.

- The difference between the cost of implementing restoration and conducting fire suppression in eastern Oregon represents a potential $59.2 million annual savings for the USFS if 129,000 acres were left untreated and burned by wildfire each year. For every $1 the USFS spends on forest restoration, the agency avoids a potential loss of $1.45. This avoided cost could be higher because untreated acres are likely to be protected from crown fires by nearby acres that are treated, further reducing the potential for fire suppression expenditures.

- Taxpayers currently spending about $298 million on social services in eastern and south central Oregon through the Temporary Assistance for Needy Families Program and the Supplemental Nutrition Assistance Programs. Increased forest heath restoration has the potential to reduce community dependence on these services by creating jobs that generate additional income to help people become less reliant on social services.

- Eastern Oregon's average unemployment rate (10.8 percent) and poverty rate (19.1 percent) are the highest in the state. Any increase in economic activity in the region from forest health restoration will contribute to the region's long-term economic health and stability.

- In 2010, the Oregon Employment Department distributed $470 million in unemployment benefits through 29,000 unemployment insurance claims.

- In areas of eastern Oregon, forest health restoration is also benefiting communities through an increase in the property tax base. For example, restoration within the Wildland-Urban Interface enables the construction of high value homes for families wanting to live near the forest. This construction is adding to the local property tax base.

- Forest health restoration presents an opportunity to improve the condition of eastern Oregon's forested landscape which will help to protect, restore, and manage a full suite of sustainable non-timber resources and services.

- A program to increase the pace of forest restoration will protect and retain invaluable ecosystem services that provide clean air, clean water, wildlife habitat, recreational opportunities, and other services that are threatened by degraded forest health.

The opportunity ahead

Without an increased public investment in a robust federal forest restoration program, the economic health of Oregon's rural communities will continue to decline and environmental issues will worsen. Achieving a substantial increase in forest restoration activity across eastern Oregon is a challenging endeavor and will take time to develop. Below are steps that can be taken at the local, regional and state level to help advance this goal.

- Any effort to 'scale up' the pace of forest restoration on Oregon's eastside National Forests will have to be accompanied by an increase in large-scale planning efforts led by the USFS.

- Improving the efficiency of the USFS' planning and implementation will reduce total management costs creating the potential to accomplish more forest restoration. The USFS is working to improve the efficiency of the National Environmental Policy Act (NEPA) planning process by increasing the use of landscape-scale NEPA, proposing the use of new Categorical Exclusions for restoration activities, and the use of an adaptive Environmental Impact Statement process – support of these efforts will be beneficial.

- Reauthorizing the U.S. Forest Service's authority to use stewardship contracting is imperative. Congressional approval granting this authority expires September 30, 2013.

- Determining the differences in the cost of litigation and associated planning between projects supported by collaboratives and those not supported by collaboratives is necessary to determine to what extent the collaborative process helps reduce USFS restoration costs.

- Some forest collaboratives have a decade or more experience cooperative planning with the USFS. The effects of this engagement should be analyzed to help document the value of collaborative efforts. The analysis should be based on specific projects that have been implemented through the collaborative process through individual case studies.

- Priority should be given to supporting existing infrastructure that supports forest restoration work. This infrastructure and workforce helps implement restoration activities and provides markets that can help reduce the per acre costs.

- Developing markets that use products and byproducts of forest restoration will support expansion of landscape scale forest restoration activities. Woody biomass utilization is currently hampered by a lack of available markets. Without sufficient markets, this material will be underutilized.

- Oregon's Forest Biomass Working Group[1] has identified four market development initiatives that should be pursued and supported at the state level. They are biomass thermal (on-site heat at commercial and institutional facilities), distributed generation (heat and electricity at existing wood product facilities), existing markets (landscape bark, shavings, bedding, etc.), and emerging markets (biofuels, biochar, cellulosic ethanol, etc.).

[1] The Oregon Forest Biomass Working Group has proposed these initiatives through its recent document, "Growing Oregon's Biomass Industry: Oregon's Forest Biomass Strategy".

Chapter 1: Introduction

A resilient ponderosa pine stand on the Deschutes National Forest

Purpose

The purpose of this study is to provide an accurate economic impact assessment of forest health restoration on Oregon's eastside National Forests. In particular, the study is guided by the following question:

> **"If Oregon were to double the average number of acres treated annually to benefit and restore forest ecosystem health on Oregon's dry-side national forestlands, then what would that cost and what would be the economic benefit?"**

The study was initiated at the request of the Governor of Oregon and leadership within Oregon's legislature.

The study is intended to assist in determining a strategic path toward formulating the most efficient and effective strategy to cause an acceleration of forest restoration on Oregon's federal forestlands. Furthermore, this study will provide elected officials, public and private forest sector leaders, members of the conservation community, and the electorate information needed to evaluate the challenges and opportunities of forest health restoration.

While the focus of this report is on forestland administered by the United States Forest Service (USFS), we recognize that significant other watershed restoration activities are occurring throughout eastern Oregon funded by the Oregon Watershed Enhancement Board, Bureau of Land Management, Natural Resource Conservation Service, Bureau of Reclamation, Bonneville Power Administration, and other organizations. These additional projects are not specifically assessed through this report, but it is anticipated that the results and economic benefits would mirror those found in this report.

Study Background

In 2004, Governor Ted Kulongoski called upon the Board of Forestry to "create a unified vision of how federal land should contribute" to sustainability, and to "make that vision action-oriented and comprehensive – following through to the last step including implementation". The Federal Forestlands Advisory Committee (FFAC) was created in 2006 to assist the Board of Forestry in completing the Governor's charge. The FFAC, working through the Board of Forestry, developed a set of recommendations that appear in the report, "Achieving Oregon's Vision for Federal Forestlands", which was released in 2008.

In 2009, the Federal Forestlands Advisory Committee – *ad hoc* Implementation Working Group (FFAC-IWG) was formed by a group of key stakeholders to execute on the Board of Forestry's vision and to break through any barriers to implementation of the recommendations. The FFAC-IWG is convened by Governor John Kitzhaber's Natural Resources Office.

The vision and purpose of the FFAC-IWG as published on March 4, 2011, reads:

> "The FFAC-IWG is focused on supporting landscape-scale, active restoration of federal forestlands by identifying and removing barriers to restoration of forest and watershed health. We will:
>
> - Help collaboratives identify local forest health priorities, develop landscape-scale forest restoration plans, and find agreement for active management;
> - Advocate for sustainable and predictable supply of biomass and merchantable timber, and
> - Advocate for supportive state and federal policy.
>
> These activities will restore forests, help sustain communities by creating jobs and maintaining forest sector infrastructure, and will enhance Oregon's energy independence. The FFAC-IWG will initially focus on the dry, fire prone forests found east of the Cascades and in the southern interior of Oregon."

The FFAC-IWG believes that there is broad public consensus that a solution to improving the health of Oregon's forest conditions and rural economies is to put Oregonians to work restoring forest ecosystem health – producing direct restoration and logging jobs, products from merchantable timber, thinning for fire-risk reduction and biomass production, and creating additional jobs through watershed restoration such as aquatic and habitat improvement work.

Among those who have expressed formal agreement on the need for restoration on Oregon's eastside National Forests are:

- Western Governors' Association, Policy Resolution 11-01
- The Federal Forestlands Advisory Committee Recommendations of 2009, adopted by the Oregon Board of Forestry and accepted by the Governor's Office
- The ad hoc Oregon Forest Cluster Working Group's recommendations of May 2011, adopted by the Oregon Board of Forestry
- Governor Kitzhaber, policy speech to the Oregon Board of Forestry, November 2011

Governor Kitzhaber, in his policy speech to the Board of Forestry (November 2011), succinctly summed up the problem and the opportunity:

> *The legacy of these management practices – particularly in Eastern Oregon – is forests overstocked with stands of younger fir and pine; the loss of older fire-resilient forest structure; a mammoth road system that has disconnected healthy hydrologic function and fragmented habitat; a significant reduction in watershed health; the destruction of habitat for sensitive species; a steep decline in employment for timber dependent communities; and a high risk of catastrophic fire.*
>
> *…Reversing this legacy requires environmentally sound active management to restore the health of these federal forests. Active management requires local mill infrastructure and a skilled contractor base; an operational market which rests upon a predictable and sustainable supply of wood and other products of restoration work; and adequate capacity for management within the federal agencies.*

The Study Area

Our investigation focused on all National Forests east of the Cascade Crest (except for Mt. Hood National Forest) and the western portion of the Rogue-Siskiyou National Forest, collectively, the "Study Area".[1] The Study Area is similar in scope to other projects, including research related to the Dry Forest Investment Zone (Sustainable Northwest 2012).

In order to capture ecological and economic variability across the study area we established the following regions, which represent functional economies across eastern Oregon (Figure 1.2-1):

- Northeast Economic Region: Umatilla and Wallowa-Whitman National Forests
  - Morrow, Umatilla, Union, Wallowa, and Wheeler counties
- Interior Central Economic Region: Deschutes and Ochoco National Forests
  - Crook, Deschutes, and Jefferson counties
- Southeast Economic Region: Malheur National Forest
  - Baker, Grant, Harney, and Malheur counties
- Interior South Economic Region: Winema-Fremont and eastern portion of Rogue-Siskiyou National Forests (High Cascades Ranger District only)
  - Jackson, Klamath, and Lake counties

These areas contain private forestland, Bureau of Land Management (BLM) forestland and State Forests, but the scope of this study was restricted to USFS National Forests. Table 1.2-1 shows the amount of forestland administered by the USFS within the study area.

Table 1.2-1: Acres of USFS forestland within each economic region

Economic Region	Acres
Northeast	2,646,000
Southeast	2,905,000
Interior Central	2,016,000
Interior South	3,801,000
Total	**11,368,000**

Source: Institute for Natural Resources (INR), 2012

[1] The study includes the High Cascades Ranger District from the Rogue-Siskiyou National Forest in Jackson County.

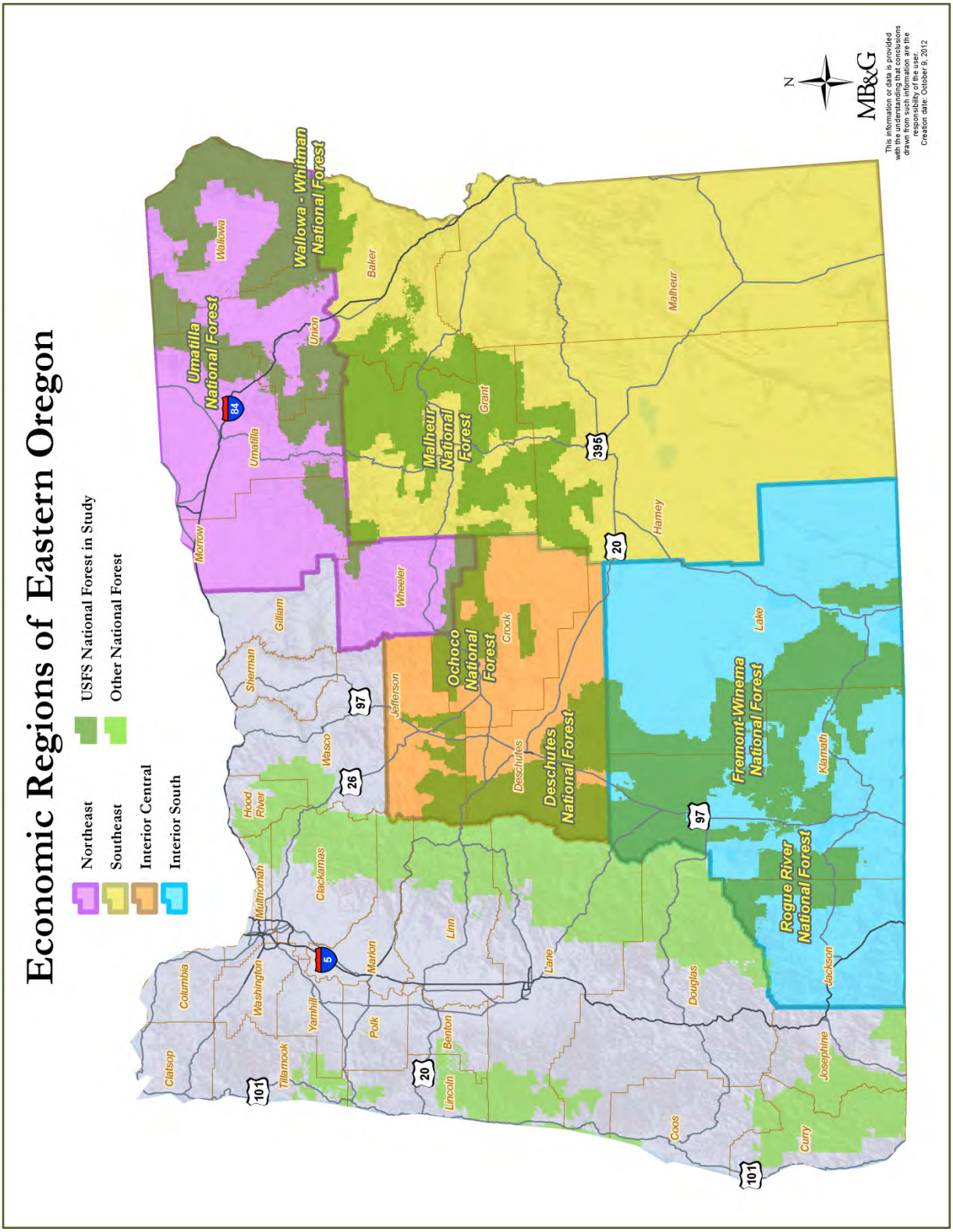

Figure 1.2-1: Economic regions of eastern Oregon

Source: Regions represent functional economies of the study area developed by MB&G and Forest Econ Inc., 2012; base features are from Environmental Science Research Institute (ESRI), 2008.

What is forest health restoration?
Before defining forest health restoration, it's important to consider the broader term of ecological restoration. The Society for Ecological Restoration International (SERI) defines ecological restoration as "an intentional activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity and sustainability...Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed." (Society for Ecological Restoration International 2004).

The terms degraded, damaged, and destroyed all represent deviations from a desired ecosystem state. Degraded refers to subtle or gradual changes that reduce ecological integrity and health. Damaged pertains to acute and obvious changes in an ecosystem. An ecosystem is destroyed when severe degradation or damage drastically alters the physical environment. These terms are used collectively to represent a continuum of conditions.

In 2006, the United States Forest Service (USFS) adopted "a strategic, integrated, science-based framework for restoring and maintaining forest and grassland ecological condition" (USDA Forest Service 2006). The policy recommendations included in the framework rely on SERI's definition of ecological restoration, as defined above. Applying this broader definition of ecological restoration to forested ecosystems helps us in defining forest health restoration. As such, we can consider forest health restoration as a process attempting to regain ecological integrity and enhance human well-being within a degraded, damaged, or destroyed forested ecosystem. Forest health restoration focuses on "restoring forest functionality…the goods, services and ecological processes that forests can provide at the landscape level" (Maginnis and Jackson 2004).

Throughout the forests of eastern Oregon, forest health restoration on national forestland incorporates current, historic and new scientific information to return forest ecosystems in frequent fire forests to more normalized levels of resilience to catastrophic fire, insects, disease and other disturbances as well as forest structure as might be seen prior to modern fire suppression policy and methods. The ultimate goal of forest health restoration is to reestablish a healthy forested landscape that is capable of maximizing the benefits that society receives from its forests – ecosystem services such as clean water and air, recreational opportunity, wildlife habitat, and carbon sequestration as well as economic goods and services.

Restoration activities may include thinning trees, removing merchantable timber and reintroducing prescribed fire where appropriate. In addition to these vegetation management activities, forest health restoration presents opportunities to improve the overall condition of forested watersheds and related habitat through watershed restoration activities such as upgrading stream crossing structures, improving and reducing road networks, stabilizing stream banks and reintroducing native plant species.

Forest health restoration on Oregon's eastside National Forests aims to create functional terrestrial and aquatic conditions with greater ecological resilience to disturbance while creating a predictable flow of work that retains current manufacturing infrastructure, supports new and emerging markets, and produces local economic benefits.

Why is forest health restoration such a critical issue for Oregon and the nation?
Of Oregon's 63 million acres, nearly half – some 30 million acres – are forested. At 18 million acres, or 60 percent of the forestland base, the federal government is by far Oregon's largest land manager. This forest is managed by the United States Department of Agriculture Forest Service (14.3 million acres) and United States Depart of Interior Bureau of Land Management (3.7 million acres).

Over the past twenty years, reduced management activity and aggressive fire suppression on federal forestland has resulted in higher timber stocking and higher per-acre timber mortality than found on private forestland in eastern Oregon. Insect and disease losses have also increased in these forests as a result of higher stocking, slower growth, and reduced vigor. The consequence is a higher potential for significant loss of key ecosystem components to a wildfire.

Fires have become larger resulting in increased in fire suppression costs to both the federal governmental and the State of Oregon, and fire risk to residential communities in the Wildland Urban Interface (WUI). Data show that wildfire size is increasing. From 1980 to 2000 (20 years), wildfires in eastern Oregon burned about 553,000 acres with an average fire size of 26,000 acres. From 2001 to 2011 (10 years), wildfires burned a total of 1 million acres averaging 93,000 acres per fire incident (ODF 2012).

Recent data from the USFS indicates that from 2007 to 2011, fires in eastern Oregon greater than 100 acres (large fires) burned an estimated 279,000 acres of national forestland costing the agency $218 million ($780 per acre) in fire suppression costs (USFS 2012a).

During the 2012 fire season, large fires burned approximately 202,000 acres of national forestland in eastern Oregon costing the agency approximately $60.5 million. One of those fires, the Pole Creek Fire, burned about 27,000 acres with an estimated fire suppression cost of $17 million (USFS 2012a).[2]

The nature of wildfire has changed many of these eastern Oregon National Forests over the past 30 years. Due largely to fire suppression and past management practices, forests that would have experienced low intensity surface fires have become forests that commonly experience crown fire under extreme fire conditions. Due to this change, Crown Fire Potential[3] can be used as a measure of the need for restoration on many eastern Oregon forest types. This study uses Crown Fire Potential as one measure to generally describe the condition of eastern Oregon's National Forests with regards to forest restoration.[4]

[2] The USFS is still calculating the data from the 2012 fire season and these estimates are preliminary and subject to change.
[3] Crown Fire Potential (CFP) is a calculated index based on canopy fuels and canopy base height, with a few other factors, using inventory plots as data. High CFP means that an area could easily support crown fires, if there was an ignition and the fire weather was right. Calculated CFP in dry forests may not be as high, but the likelihood for dry fuels and hot, windy fire weather is often high.
[4] There are other measures that are commonly used such as Fire Regime Condition Class and forest mortality trends. A detailed study focused on the condition of these forests and where restoration should be prioritized should take these other measures into consideration.

Across eastern Oregon there are approximately 19.8 million acres of forestland – 11.3 million of which is administered by the USFS. Approximately 9.2 million acres of USFS forest land is not legally dedicated to the protection and preservation of the natural landscape (wilderness, congressional reserves, etc.) that would restrict management activities; categorized in this report as 'Available Acres' (Table 1.2-2).

The potential for crown fire on these forested acres is significant. Across the acres classified as available, about 78 percent have a moderate to high potential for crown fire (Figure 1.2-2).

The focus on available acres is intended to provide context to forest health concerns in eastern Oregon. From the estimated 11.3 million acres of forestland administered by the USFS, about 81 percent are available for USFS restoration treatments. The Land Use Allocation for these acres will determine the type of restoration that is most appropriate – some may be more suitable for commercial treatments while some acres will be more suitable for non-commercial treatments and watershed restoration work. Overall, there are 9.2 million acres of national forestland in eastern Oregon that the USFS can include in its restoration planning and implementation.

For a detailed discussion of Available Acres see Appendix II.

Table 1.2-2: Crown Fire Potential on Oregon's dry-side National Forests

Eastern Oregon	Crown Fire Potential (Acres)			
	Low	Moderate	High	Total
USFS administered - all	2,269,000	4,030,000	5,069,000	11,368,000
USFS administered - reserved	248,000	838,000	1,089,000	2,175,000
USFS administered – available acres	2,021,000	3,192,000	3,980,000	9,193,000

Source: INR, 2012

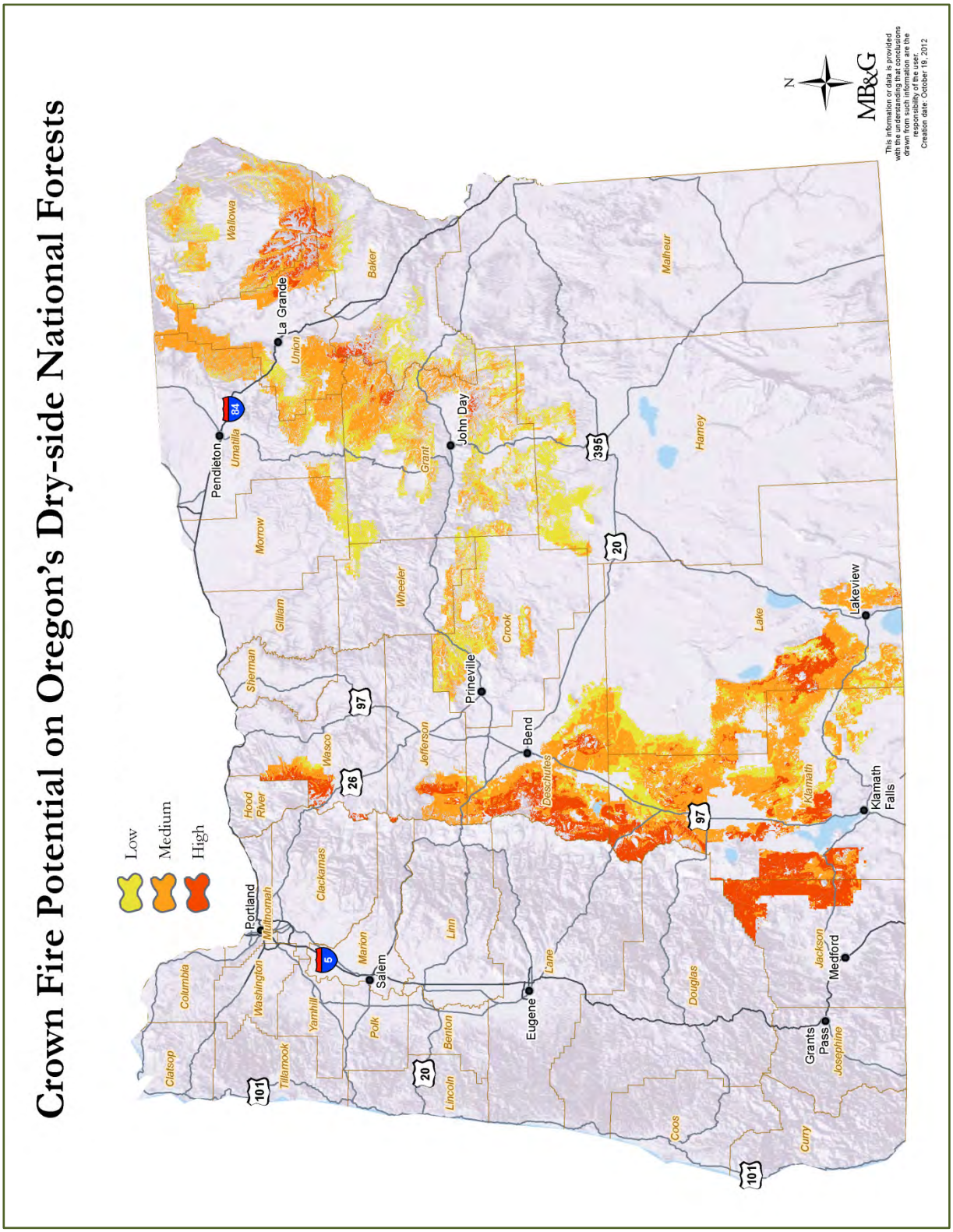

Figure 1.2-2: Crown Fire Potential on Oregon's dry-side National Forests.
Source: Crown Fire Potential classes are from INR, 2012; base features are from ESRI, 2008.

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Chapter 2: Forest Health Economic Assessment

Chipping small diameter lodgepole and ponderosa pine at Sycan Marsh in Lake County, Oregon.

Section 2.1: Methodology

The primary objective of this study is to provide an economic impact assessment of National Forest health restoration in eastern Oregon. This study was not designed to result in a forest restoration plan; we do not provide management recommendations on how to achieve the desired level of forest restoration with specific treatment types or priority locations. Instead, we explore the current level of USFS restoration activities and related economic outputs to provide a baseline of economic impacts from which to evaluate the effects of increased restoration activity.

To understand the potential costs and benefits from a substantially larger forest restoration effort, we needed to first understand the costs and benefits of current programs. This study began by investigating recent and current efforts – the economics of projects (including cost of planning and preparation), the flow and use of products, and the contracting system.

To understand the USFS's current level of forest health restoration and the associated costs and benefits, we worked closely with representatives from the USFS Pacific Northwest Regional Office and agency staff at individual National Forests. With their assistance, we collected and analyzed USFS data over a five year period (2007-2011) from the following sources:

- Timber Information Manager Database (TIM): the TIM database contains information related to commercial timber sales and stewardship contracts such as product type (sawlog, non-sawlog, poles, biomass, fuel wood, etc.), product bid value, and cruise acres for each project.

  Cruise acres as reported in the TIM database determined the footprint[5] acreage associated with timber sales and stewardship contracts.

- Forest Service Activity Tracking System (FACTS): the FACTS database contains information related to each treatment activity occurring within a particular treatment area such as treatment acres and activity type.

  We isolated individual treatment units to determine the footprint acreage associated with service contracts.

- Administrative and Treatment Cost Survey: the cost survey was administered to a key contact at each of the seven National Forests within the study area.

  A TIM database report was generated for each forest containing timber sales and stewardship projects in progress during the 2007-2011 time period. From that list, each forest provided estimated National Environmental Policy Act (NEPA) planning, sale/contract preparation, and administrative costs on a per-acre basis and/or on a per-volume (thousand board feet) basis.

[5] Section 3.1 provides details and definition of footprint acres.

We also provided a list of non-commercial restoration activities implemented on those forests during the same time period and each forest provided the implementation costs for those activities on a per-acre basis.

- Estimated Funding Needs for Watershed Restoration: we received data from the USFS Pacific Northwest Regional Hydrologist pertaining to planned costs associated with completing essential watershed restoration work in priority subwatersheds in eastern Oregon.

  These data provide the estimated costs for watershed restoration activities such as stream improvements, road improvements and decommissioning, and fish passage work for priority subwatersheds within the study area.

These data provide the foundation to construct Input/Output (I/O) models used to quantify the economic impacts from USFS forest health restoration activity. I/O analysis is the most common and widely accepted methodology for conducting regional economic impact analyses among academics, government and private firms.

Input-Output Modeling

Through our preliminary investigation into USFS forest management activity and with conversations with agency staff at the forest and regional level, we determined that the entire program of work on eastern Oregon's national forestlands has a restoration component and therefore, defined forest restoration activity as all current USFS forest management activity occurring within the study area except for work associated with salvage and hazard tree removal.

We developed three individual I/O models in order to capture the economic impacts of restoration work being accomplished on eastern Oregon's National Forests based on two broad categories; ***forest restoration*** *and* ***watershed restoration***. These restoration scenarios produce differing levels of economic activity influencing the degree to which goods and services are sold and purchased within and across economic sectors.

- The impacts of forest restoration (commercial and non-commercial) were calculated through the ***Timber Sale*** *and* ***Stewardship Contract*** *models.*

  The timber sale model captures the economic impacts associated with traditional timber sales. Timber sales generally have a high sawlog component which requires logging equipment to harvest and transport the product for processing.

  The stewardship contract model captures the economic impacts associated with stewardship contracts. This work involves the use of logging and other mechanized equipment for harvesting and treatments such as mowing, mastication, and thinning. Stewardship contracts also require manual labor to perform activities such as hand-piling, burning, lop and scattering and low-thinning. Depending on market conditions, non-sawlog and biomass will be transported to processing facilities.

The stewardship contract model was also used to capture economic impacts associated with restoration treatments accomplished through service contracts, which do not produce any commercial products. Restoration accomplished through service contracts requires the use of mechanized equipment and manual labor to conduct the planned treatments.

In all scenarios, the USFS plans and coordinates the activities while contractors implement restoration treatments.

- The impacts of watershed restoration were calculated through a stand-alone watershed restoration model. Watershed restoration includes stream and riparian improvements, road maintenance and decommissioning, and fish passage improvements. This work primarily involves construction equipment to replace culverts, improve roadbeds to alter hydrology and sediment routing, and to protect in-stream flow.

  As with forest restoration, the USFS plans and coordinates watershed restoration work while implementation is accomplished by contractors.

Production functions for the forest and watershed restoration models were developed based on research data provided by Cassandra Moseley (Personal communication, 2012; Nielsen-Pincus and Moseley, 2010; Nielsen-Pincus and Moseley, in press). Small adjustments were made to these production functions to account for occasional expenditures in various business services (legal services, accounting services, real estate rental).

Production functions were also needed for chips which were integrated into miscellaneous wood products. The production function for this sector was modified to account for the sale of chips to pulp and paper mills (exports from the region).

A production function was also created for biomass utilization facilities based on interviews with biomass operators. This included both power generating facilities, dry kilns, and brick and pellet mills.

Appendix III includes a detailed description of the I/O modeling assumptions, production functions, and data sources.

Forest Restoration Inputs and Outputs
The data analysis and forest restoration modeling allow us to compare the costs and benefits of each restoration scenario across the study area by reporting the following results on an average annual basis:

- USFS costs – direct USFS costs including NEPA planning, contract and sale preparation, administration, and implementation costs associated with timber sales, stewardship contracts, and service contracts.

- Product volume - Sawlog, non-sawlog, and biomass volume produced through commercial forest restoration.

- Employment (jobs) – the total employment effects (direct, indirect, and induced) generated by forest restoration activities throughout regional economic sectors.

- Industrial Output – the secondary effects (direct, indirect, and induced) generated by forest restoration activities measured as industrial output. Industrial output is a measure of the total value of all goods produced by sawmills, veneer and plywood mills, biomass facilities, chip facilities, and miscellaneous wood product facilities. Industrial output also includes the spending of money for services throughout the economy. For example, non-commercial forest restoration contractors create industrial output as they purchase equipment, supplies and materials necessary to complete their work.

- Income – the total income effects (direct, indirect, and induced) generated by forest restoration activities throughout regional economic sectors. Total income includes employee payroll (wages or salary), all benefits (e.g., health, retirement, etc.), and employer-paid taxes. Total income also includes profits for sole proprietors such as independent contractors.

- State Tax Revenue – includes state income, corporate, fuels, and harvest taxes generated through forest restoration activities.

Watershed Restoration Inputs and Outputs
The watershed restoration data analyzed in this study did not provide an annual average level of activity, but rather planned expenditures to restore priority subwatersheds within the study area. As such, we do not report results from the watershed restoration modeling as total annual impacts. Alternatively, for each economic region, we report employment, output, income, and tax revenue as defined above for every $1 million the USFS spends on watershed restoration.

Direct effects = the direct impact of forest and watershed restoration activity within the economy.

Indirect effects = the impact of local industries buying goods and services from other local industries to support forest and watershed activities.

Induced effects = the response by an economy that occurs through re-spending of income generated through forest and watershed restoration activity. This money is recirculated through household spending patterns causing further local economic activity.

Section 2.2: Economic Impacts of Forest and Watershed Restoration

How much does the USFS spend on forest restoration annually?

On an average annual basis, the USFS spends about $40.8 million in forest restoration across the entire study area.[6] The agency spends most of this budget on non-commercial forest restoration through service contracting (Table 2.2-1). The USFS spends an average of $460 per acre on timber sales, $330 per acre on stewardship contracting, and $265 per acre on service contracting. Timber sales involve more in-depth planning processes, sale preparation, and administration as compared to the other categories of restoration.

On a per-acre basis, service contracting is the least expensive category for the agency to implement due to the nature of planning for and administering service contracts. For instance, a thinning or lop and scatter contract will not involve the level of preparation and administration needed to implement a timber sale or stewardship contract.

The costs associated with timber sales and stewardship projects are based on estimated NEPA planning costs, sale/contract preparation, and administrative costs only. Treatments associated with timber sales and stewardship projects were not assigned implementation costs because implementation is completed by the contractor through the value of commercial products removed from the sale area.

The costs associated with service contracts are based on implementation cost estimates for all restoration treatments within the study area. We accounted for the cost of conducting multiple treatments within a single treatment unit, including contract administration and treatment implementation costs. We did not include any NEPA planning or sale preparation costs in this category.

Table 2.2-1: USFS's average annual (2007-2011) forest restoration costs ($)

Economic Regions	Commercial		Non-Commercial	TOTAL (129,000 acres)
	Timber Sales (30,000 acres)	Stewardship Contracts (10,000 acres)	Service Contracts (89,000 acres)	
Northeast	1,867,000	1,030,000	3,790,000	6,687,000
Southeast	2,431,000	420,000	2,320,000	5,171,000
Interior Central	3,734,000	320,000	6,420,000	10,474,000
Interior South	5,959,000	1,453,000	11,040,000	18,452,000
Eastern Oregon	**$ 13,991,000**	**$ 3,223,000**	**$ 23,570,000**	**$ 40,784,000**

Source: USFS TIM and FACTS database, 2012; USFS Cost Survey, 2012.

Please see Appendix V for a detailed summary of these costs.

[6] This average annual cost of forest restoration includes NEPA planning, sale/contract preparation, implementation, and administrative costs only. We did not include litigation costs or factor in timber sale revenue. In addition, these cost estimates may be less than other estimates because we only include planning and preparation at the forest level and not at the regional level. With any NEPA process, there is work completed at the Regional Office that we did not include.

What are the average annual economic impacts of the USFS forest restoration activities?

Total Jobs
Across the entire study area, the USFS's forest restoration program has an employment impact of 2,310 jobs created or retained throughout the economy.

Total Output
In all, the USFS's forest restoration activities produce about $232 million in total industrial output, 64 percent of which is generated through timber sale contracts. Commercial forest restoration has secondary impacts from processing logs that are harvested and this supports industrial output in the existing primary wood product industries such as sawmills. Restoration activities that produce a significant volume of timber will result in higher levels of industrial output because of the secondary impact on the wood products industry.

Those economic regions with a strong wood products sector will capture output value from those areas that do not. For instance, the Interior South Economic Region has a several large sawmills and veneer mills that are capturing a significant amount of timber from the Interior Central and Southeast Economic Regions. Those economic regions are exporting the output value to the Interior South because of limited wood product infrastructure – the Interior South generates about 58 percent of the total industrial output in the study area, which explains why this economic region has higher total jobs.

Non-commercial forest restoration activities produce about $40.9 million of total industrial output in eastern Oregon. This output is generated when contractors purchase equipment, supplies and materials.

Total Income
Across the study area, forest restoration on national forestland creates approximately $90.5 million of total annual income. The average wage (annualized) for these jobs is approximately $40,000. Restoration associated with timber sale contracts creates 58 percent ($52.3 million) of the total income and provides for the highest paying jobs compared to the other types of restoration with an average annualized wage of $43,000. In addition, there is a significant amount of proprietor's income generated by independent contractors such as loggers and truck drivers that is associated with timber sales.

Stewardship and service contracts create a similar amount of income totaling approximately $38.1 million with an average annualized wage of $35,000. This labor intensive restoration often involves lower wage scale projects and does not provide comparable income and impacts compared to equipment intensive restoration through timber sales. In general, these projects involve treating a large area that results in minimal commercial product volume.

Total State Tax Revenue
Commercial and non-commercial forest restoration generates approximately $3.6 million in annual state tax revenue from income, corporate, fuels, and harvest taxes. Timber sales generate 62 percent ($2.2 million) of the total state revenue associated with forest restoration due to the higher income jobs they support, the proprietors' income they generate, and transportation activities that generates fuels tax. Stewardship contracting generates less in state tax revenue from fuel and harvest tax because the volume of timber harvested on these projects is generally less.

Table 2.2-2 shows the average annual economic impact of the current forest restoration program on Oregon's eastside National Forests. These impacts represent each regional economy as well as the eastern Oregon study area.

Table 2.2-2: USFS's average annual (2007-2011) economic impacts from forest restoration activities

	Commercial		Non-Commercial	
Economic Impact	Timber Sales	Stewardship Contracts	Service Contracts	**TOTAL**
Jobs (#)*				
Northeast	167	117	113	397
Southeast	215	50	63	329
Interior Central	129	28	162	319
Interior South	717	236	313	1,265
Eastern Oregon	**1,228**	**431**	**651**	**2,310**
Output ($)*				
Northeast	21,139,000	9,390,000	6,369,000	36,898,000
Southeast	27,382,000	4,075,000	3,729,000	35,186,000
Interior Central	12,400,000	2,079,000	10,627,000	25,106,000
Interior South	86,659,000	27,480,000	20,183,000	134,322,000
Eastern Oregon	**147,580,000**	**43,024,000**	**40,908,000**	**231,512,000**
Income ($)*				
Northeast	8,051,000	4,595,000	3,456,000	16,102,000
Southeast	10,271,000	1,807,000	1,941,000	14,019,000
Interior Central	5,902,000	1,065,000	5,908,000	12,875,000
Interior South	28,129,000	8,983,000	10,409,000	47,521,000
Eastern Oregon	**52,353,000**	**16,450,000**	**21,714,000**	**90,517,000**
Tax Revenue ($)				
Northeast	415,000	225,000	138,000	778,000
Southeast	360,000	95,000	63,000	518,000
Interior Central	619,000	75,000	431,000	1,125,000
Interior South	843,000	227,000	121,000	1,191,000
Eastern Oregon	**2,237,000**	**622,000**	**753,000**	**3,612,000**

Source: Input/Output Models (Forest Econ Inc, 2012)

*Job, Output, and Income impacts include direct, indirect, and induced effects.

This study does not report the amount of economic 'leakage' resulting from trade and labor movement beyond the boundaries of the study area into the rest of the state or into domestic and foreign export markets. Leakage creates broader economic impacts than reported in this report and if taken into consideration, we estimate that there could be a 5-10 percent increase in the total economic impacts of forest restoration.

How much commercial product comes from the USFS's annual forest restoration program?

The USFS's commercial forest restoration activities produce an average 141 million board feet (MMBF) of sawlogs and 225,000 green tons (GT) of non-sawlogs and biomass annually (Table 2.2-3).

Eighty-three percent of the total sawlog volume is produced through timber sales. Stewardship contracts produce the remaining 17 percent. The Interior South and Interior Central Economic Regions produce 70 percent of the total sawlog volume - 47 percent and 23 percent, respectfully.

Sixty percent of the total non-sawlog/biomass production occurs through timber sales while the remaining percentage is attributed to stewardship contracts. Each economic region, except for the northeast, produces between 10,000 and 14,000 GT of non-sawlog/biomass annually. The Northeast Economic Region, on average, produces about 51,000 GT annually or 57 percent of the total production through stewardship contracts.

Table 2.2-3: USFS's average annual (2007-2011) commercial production volume

	Commercial		TOTAL
Product	Timber Sales	Stewardship Contracts	
Sawlog (MBF)			
Northeast	15,000	3,000	18,000
Southeast	20,000	5,000	25,000
Interior Central	30,000	2,000	32,000
Interior South	52,000	14,000	66,000
Eastern Oregon	**117,000**	**24,000**	**141,000**
Non-sawlog/Biomass (GT)			
Northeast	22,000	51,000	73,000
Southeast	24,000	14,000	38,000
Interior Central	44,000	13,000	57,000
Interior South	47,000	10,000	57,000
Eastern Oregon	**137,000**	**88,000**	**225,000**

Source: USFS TIM database, 2012.

What economic benefits result from the USFS spending $1 million on watershed restoration?
Watershed restoration activity results in economic impacts across eastern Oregon. Each economic region differs slightly from one another as show in Table 2.2-4, below.

Across the entire study area, $1 million spent on watershed restoration within eastern Oregon National Forests creates approximately 15 total jobs that generate about $502,000 in total income, $1.1 million in total industrial output, and $25,000 in state tax revenue.

Table 2.2-4: Economic impact of the USFS spending $1 million on watershed restoration[7] in each economic region

Summary	Northeast	Southeast	Interior Central	Interior South
Jobs (#)	17	24	7	20
Output ($1,000)	$1,500	$ 1,400	$ 470	$ 1,600
Income ($1,000)	$ 678	$ 615	$261	$644
State Tax Revenue ($1,000)	$ 34	$18	$ 39	$9

Source: Input/Output Models (Forest Econ Inc, 2012)

[7] Rows are not additive. Input/Output is based on linear modeling such that the impacts from the first million dollars can be reported with high confidence, but it would not be appropriate for the reader to assume that the second or third million spent on watershed restoration would yield similar economic impacts due to diminishing marginal returns.

Chapter 3: Costs and Benefits of Increased Forest Restoration

A discussion of restoration principles for ponderosa pine forests during workshop with staff from the Fremont-Winema National Forest.

Section 3.1: What does it mean to 'scale up' the pace of forest health restoration?

For the purposes of this study, 'scaling up' the pace of forest health restoration is defined as an increase in the number of acres treated annually to benefit and restore forest ecosystem health on Oregon's dry-side national forestlands over the next 20 years.

Across the entire study area, the USFS's average annual (2007-2011) forest restoration footprint is about 129,000 acres (Table 3.1-1).[8] The forest restoration footprint refers to the average number of unique acres that receive some form of restoration treatment per year. Once a treatment occurs on a particular acre, any other subsequent treatment on that particular acre is not included in the footprint calculation.[9]

The forest restoration footprint can be separated into two categories (Figure 3.1-1):

- Commercial Forest Restoration Footprint (31 percent of total restoration footprint)
  The average annual commercial restoration footprint in eastern Oregon is about 40,000 acres (timber sales and stewardship contracts combined). These acres are treated through traditional timber sales and stewardship contracts receiving some form of commercial activity resulting in a commercial product component (sawlogs, poles, biomass and fuel wood).

  In addition, these acres are also often treated through various activities such as pre-commercial thinning, piling and burning of fuels, and prescribed fire to realize the full restoration objectives for those acres.

- Non-commercial Forest Restoration Footprint (69 percent of total restoration footprint)
  The average annual non-commercial restoration footprint in eastern Oregon is about 89,000 acres. These acres are treated through service contracts that do not result in a commercial product.

  These acres receive a suite of restoration treatments such as pre-commercial thinning, piling and burning of fuels, prescribed fire, et cetera – occurring in one year or over multiple years.

We stress the distinction between total restoration accomplishments and the restoration footprint because we are interested in tracking unique treatment acres as opposed to tracking each activity within a particular treatment unit. Focusing on footprint acres allows us to gauge the relative impact of the agency's restoration activities across the eastern Oregon landscape.

[8] Footprint acres were calculated from the USFS TIM and FACTS databases as described in the Methodology Section.

[9] We recognize that a complete restoration program involves treating an individual acre multiple times, but for the purposes of this analysis, we focus on the footprint acre to avoid double counting treatment acres.

Table 3.1-1: USFS average annual (2007-2011) restoration footprint acres

	Commercial		Non-Commercial	
Economic Regions	Timber Sales	Stewardship Contracts	Service Contracts	**TOTAL**
Northeast	5,152	2,730	24,653	32,535
Southeast	6,464	1,867	13,688	22,019
Interior Central	10,613	1,477	25,262	37,352
Interior South	8,016	3,731	25,122	36,869
Eastern Oregon	**30,245**	**9,805**	**88,725**	**128,775**

Source: USFS TIM and FACTS database, 2012

For the purpose of this study, we assume that 'scaling up' would involve doubling the total footprint acres treated annually across the landscape.

There could be many other assumptions about how the mix of projects (commercial to non-commercial ratio) would occur across the eastern Oregon landscape, but we assume that the current level of activity reflects an acceptable mix defined by resource conditions, budget allocations, social agreement, processing infrastructure and the economies specific to each region.

In coordination with commercial and non-commercial forest restoration treatments, the USFS conducts watershed restoration work to improve aquatic and terrestrial wildlife habitat and ecosystem function. This is an essential component of forest restoration. These restoration activities include fish passage improvement, road drainage, road decommissioning, riparian restoration, and stream channel improvements. We do not define a total annual watershed restoration footprint due to the nature of the work – these treatments do not lend themselves to description by a single metric, such as acres treated.

The USFS also accomplishes certain forest and watershed restoration activities in-house through Force Account Crews as well as coordinated agreements with outside labor crews (e.g., youth corps, job corps, and prison crews). This study only includes restoration work being conducted through private sector interaction.

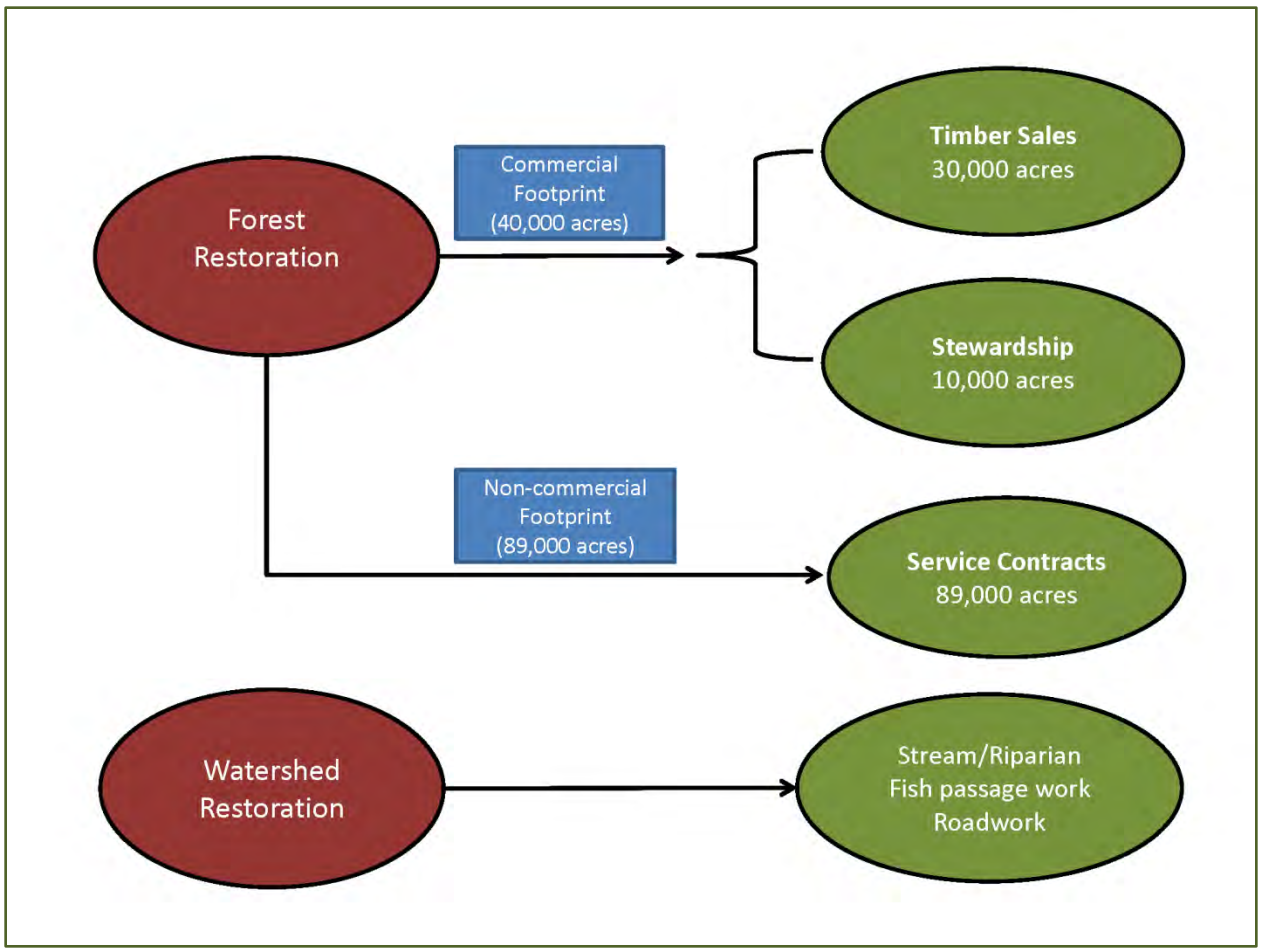

Figure 3.1-1: Diagram of eastern Oregon USFS forest health restoration activity

Note:

Timber sales = USFS contract forms: 6/6T, 4T/4P, and 3T/3S

Stewardship Projects = USFS contract forms: 13/13T (Integrated Resource Timber Contracts), 33/33T, 1449/1449T (Integrated Resource Service Contracts), and 21/21T (Stewardship Agreements)

Service Contracts = contracts for on the ground services requiring extensive hand labor including, but not limited to tree thinning, tree pruning, and other forest related services.

Watershed Restoration = contracts for watershed restoration work such as fish passage improvement, road drainage, decommissioning, and stream channel improvement.

Section 3.2: What will help to increase the scale and pace of forest health restoration?

Through interviews with stakeholders involved in forest restoration in eastern Oregon, we have identified three barriers that will need to be addressed before eastern Oregon National Forests are able to double the current pace of restoration: (1) capacity for social agreement, (2) USFS capacity for planning, and (3) market development, especially for forest restoration byproducts:

1. Capacity for social agreement

In recent years, collaboration has emerged as an effective way to rebuild trust and foster local agreements among stakeholders about how to sustainably manage public forests. Though not new, the collaborative model has experienced increasing success in Oregon and to date has been fairly successful in developing forest restoration projects with social and community support.

Currently, there are at least eight community-based collaboratives operating in eastern Oregon focused on improving the health of the forested landscapes and local communities by collaborating with the USFS to broaden stakeholder participation and increase the level of agreement on how to address forest health issues (Oregon Solutions 2012).[10]

The following forest collaboratives are currently established in eastern Oregon:

- Blue Mountain Forest Partners
- Deschutes Collaborative Forest Project
- Harney County Restoration Collaborative
- Lakeview Stewardship Group
- Ochoco Forest Restoration Collaborative
- Southern Oregon Forest Restoration Collaborative
- Umatilla Forest Collaborative
- Wallowa-Whitman Forest Collaborative

The USFS is committed to increasing the pace of landscape-scale forest restoration on national forests and is emphasizing collaboration as a necessary means to move beyond the legacy of conflict, and towards a program of work designed to restore the health and integrity of national forestlands. Across the entire USFS national forestland system, the agency is committed to increasing the number of acres being mechanically treated annually by 20 percent (USDA Forest Service 2012b).

In eastern Oregon, the USFS will invest about $7.1 million through the Collaborative Forest Landscape Restoration Program (CFLRP) during 2012. About $2.5 million will go to the Southern Blues Restoration Coalition Project[11] and another $3.5 million will be directed to the Lakeview Stewardship Project[12]. The Deschutes Collaborative Forest Project[13] was awarded $500,000 in 2010, $750,000 in 2011 and in 2012, the project was awarded $1.1 million giving Oregon three funded projects on eastside National Forests.

[10] See Davis et al. 2012 for further information on forest collaboratives.
[11] Includes Blue Mountain Forest Partners and Harney County Restoration Collaborative
[12] Coordinated by Lake County Resources Initiative
[13] Coordinated by Central Oregon Partnerships for Wildfire Risk Reduction

Congress established the Collaborative Forest Landscape Restoration Program with Title IV of the Omnibus Public Land Management Act of 2009. The purpose of the CFLRP is to encourage the collaborative, science-based ecosystem restoration of priority forest landscapes (USDA Forest Service 2012c).

The CFLRP provides a means to achieve the following goals:

- encourage ecological, economic, and social sustainability;
- leverage local resources with national and private resources;
- facilitate the reduction of wildfire management costs, including through re-establishing natural fire regimes and reducing the risk of uncharacteristic wildfire;
- demonstrate the degree to which various ecological restoration techniques achieve ecological and watershed health objectives; and,
- encourage utilization of forest restoration byproducts to offset treatment costs, to benefit local rural economies, to and improve forest health.

An increase in the pace of forest health restoration will challenge the ability of these collaborative groups to keep pace with and gain broad public consensus on the management of more forest area. In some instances, increased funding could enhance the capacity for collaboratives to maintain their effectiveness. However, current restoration activities are occurring in areas that have public support for one reason or another and once completed, fostering support for restoration will likely require additional investment at the local level to achieve social agreement. For instance, areas in need of restoration may be located on steeper slopes, in roadless areas or in areas where scientific justification for restoration is less clear. It is in these areas that gaining social agreement will challenge the capacity of collaborative groups to be successful.

Forest collaborative groups in eastern Oregon are primarily organized by volunteers and part-time employees that utilize limited resources to further their missions. Some of these organizations are reportedly experiencing burn out among their members and losing capacity due to natural organizational turn-over. An increased work load and commitment would accompany an increased pace of restoration, which may also be a challenge for some of these collaborative groups to overcome.

2. USFS Management Costs

The USFS spends significant resources on planning and implementing forest restoration projects. Much of the cost can be attributed to NEPA planning and analyses while sale and contract preparation represent additional costs. These costs are a barrier to increasing the pace of restoration because, in most cases, the USFS has reached its capacity to keep pace with ongoing planning efforts. If restoration activity were to increase, there could be a significant lag time from project planning to implementation.

There are instances in eastern Oregon where collaborative groups are out pacing the USFS's capacity to move projects through the planning process. Some forests are receiving an infusion of implementation funding through the CFLRP, but do not receive corresponding funding for the planning necessary for implementation; there is a budget imbalance.

Increasing the pace of restoration in eastern Oregon would depend on the USFS's ability to satisfy the NEPA planning requirements in a more cost effective manner – this can only be accomplished by increasing the agency's capacity to match the expected increase in restoration activities. This study estimates the USFS total annual forest restoration costs, which helps to determine what it would cost to 'scale up' forest restoration.

3. Market Development

Markets help drive on-the-ground implementation of forest health restoration because byproducts of treatments have economic value; more acres can be treated with less expenditure making a dollar of budget go further. Forest restoration treatments without byproduct recovery are expensive and will be limited by available funding.

Without a healthy market place to utilize forest restoration byproducts, restoration treatments cannot be sustained and supported across the landscape. Byproducts removed during restoration-based thinning operations must generate revenue and in order for this to occur, private industry must be able to convert non-sawlogs and woody biomass to economically viable products. The revenue generated from the merchantable value of this material helps to offset the treatment implementation costs.

In healthy market conditions, existing infrastructure in eastern Oregon has the capacity to utilize a higher volume of sawlogs. Investment is this existing infrastructure in necessary to retain capacity while investment in emerging markets, particularly for non-sawlogs and woody biomass material, must be a consideration in order to increase the current pace of restoration.

Section 3.3: Impacts of Increased Forest Health Restoration

How much national forestland (available for management) is currently being treated annually?
The current forest restoration footprint, across the entire study area, is impacting approximately 1.4 percent of USFS forestland that is not reserved from active forest management activities. In order to treat all the available acres at least one time during a 20 year time period, the USFS will need to reach an annual pace of 5 percent. The only economic region currently exceeding 2.5 percent is the Interior Central, which on average, accomplishes 2.6 percent of the region's available forestland each year (Table 3.3-1).

An accelerated forest restoration program with a goal of doubling the annual number of acres treated would increase the pace to 2.8 percent for the entire study area. At that rate, the USFS would treat about 258,000 acres per year – still 202,000 acres less than what is needed to achieve a 5 percent accomplishment rate of 460,000 acres a year.

Table 3.3-1: USFS forestland by economic region and impact of current restoration footprint

Economic Region	All USFS Acres	USFS – Available Acres	Current Annual Pace (%)	Current Annual Pace x 2 (%)
Northeast	2,646,000	1,878,000	1.7	3.4
Southeast	2,905,000	2,556,000	.86	1.7
Interior Central	2,016,000	1,452,000	2.6	5.2
Interior South	3,801,000	3,307,000	1.1	2.2
Eastern Oregon	**11,368,000**	**9,193,000**	**1.4**	**2.8**

Source: INR, 2012

What are the costs and economic impacts of doubling the current pace of restoration?
The costs and benefits of doubling the current pace of restoration are influenced by multiple factors ranging from current policies and budget constraints to forest specific objectives and goals.

Assuming that the USFS continued with the same mix or proportion of commercial (timber sales and stewardship contracts) and non-commercial forest restoration (service contracts) accomplishments, the cost of doubling the annual pace of forest restoration would increase from $41 to $82 million – assuming a linear relationship exists between the number of acres being treated and the associated costs.

By also assuming a linear relationship between the number of restoration acres and commercial production, doubling the current pace proportionate to the current distribution of commercial and non-commercial forest restoration would then double the volume of commercial production to 282 MBF of sawlogs and 450,000 GT of non-sawlog/biomass material annually.

Doubling the pace of restoration will allow businesses to invest, restoration contractors to hire more workers and help to maintain a vital infrastructure and workforce over a period of time. The total impact of increasing restoration activity on employment depends on existing use of capacity for restoration work. To the extent that workers are not currently full-time and other equipment is not being fully utilized, we will not see both workers and equipment double with the doubling of the pace of restoration. What can be said is that the doubling of restoration will undoubtedly save existing jobs and

increase working hours. While the total may not add to a doubling of workers and equipment, it will certainly move the numbers in that direction.

Most mills in the region currently operate one shift (8 hours per shift), but those mills generally need to operate at least at 60 percent capacity - requiring two 8-hour shifts - in order to be profitable. These mills have a total processing capacity of about 830 MMBF annually, but are currently operating at only 30 to 40 percent of that capacity (250 – 330 MMBF). An increase in timber volume resulting from more commercial forest restoration will help contribute towards maintaining the current level of operation. If sustained over a period of time it could help fill total capacity resulting in an additional shift that will create more jobs and total income. Keeping mills operational is a key consideration in realizing the full benefits of forest restoration.

Industrial output will also increase alongside commercial production expansion because more product sales will occur. State tax revenue is strongly linked to commercial production (income, corporate, fuels, and harvest tax), therefore, the total revenue generated from more forest restoration will also likely increase.

An additional 225,000 GT of non-sawlog/biomass material produced annually is more problematic. Currently, there is limited demand for green woody biomass and there is no indication that markets will improve in the near future. The only stand-alone bioenergy facility in the region is Biomass One in White City which, at full capacity, can consume about 300,000 bone dry tons (BDT) annually. Biomass One could capture a percentage of this material, a portion would enter the pulp chip market, and then there may be some remaining material that does not pay its way out of the woods. A program designed to produce more biomass should therefore include a program to develop more capacity for using more biomass.

At times, the Northeast Economic Region responds to chip demand driven by the pulp market. In good markets, the region is able to capture material from the Wallowa-Whitman, Umatilla, and the Malheur National Forests. This material is, however, exported out of the region through Columbia River ports.

If the USFS chose to adjust the proportion of acres being treated by each of the forest restoration categories, different economic impacts would result.

For instance, if the total forest restoration footprint was doubled with an even distribution of acres being treated by commercial and non-commercial activities, the USFS costs would increase by 11 percent from $82 million to $91 million. However, that additional cost would result in an increase in commercial product (more commercial forest restoration acres being treated) which would have greater secondary effects on the wood processing infrastructure likely generating more jobs, income, and state tax revenue.

On the other hand, if the majority of those additional acres were treated by non-commercial forest restoration and commercial forest restoration was decreased, the cost of doubling acres treated would fall by 9 percent from $82 million to $75 million. In this scenario, the USFS would decrease its total forest restoration cost, but there would likely be a decrease in the volume of commercial products (less commercial forest restoration acres being treated) which would then reduce the secondary effects on wood processing infrastructure leading to a decrease in industrial output, jobs, income, and state tax revenue.

What costs are avoided with forest restoration?

Accounting for all avoided costs associated with forest and watershed restoration is a complex task that is beyond the scope of this study. Nevertheless, we can discuss where some savings could be realized if a program of increased forest health restoration was implemented across the eastern Oregon landscape.

If successfully implemented, forest health restoration activities have the potential to return forested ecosystems to more normalized levels of resilience to fire, insects, and diseases and other disturbances. In the case of fire, a forest that is more resilient to fire is less likely to experience high intensity, large-scale crown fires that trigger massive emergency responses, which are extremely costly.

Predicting when a future fire might occur on a particular acre is speculative, but because present fuel loads are well outside of historic levels on many acres, fire ecologists believe that the unknown is not whether these forests burn but when (Mason et al. 2006). Based on the assumption that an acre treated would otherwise burn, we can estimate potential avoided fires suppression costs.

The federal government spends a significant amount of money each year on fire suppression. From 2007 to 2011, large fires annually burned an average of 56,000 acres of national forestland in eastern Oregon, which cost $43.6 million, on average (Table 3.3-2). Based on these five-year averages, the USFS spends an estimated $780 per acre on expenses related to fire suppression each year. These costs include the cost to suppress and contain the fire as well as any rehabilitation of fire suppression activities.

At current levels, the USFS's spends $40.8 million dollars each year to treat 129,000 acres. Based on the average fire suppression cost of $780 per acre, the USFS would incur approximately $100 million in fire suppression costs each year if 129,000 acres were left untreated and burned by wildfire. The difference between the cost of implementing restoration and incurring fire suppression costs represents a potential $59.2 million annual savings for the USFS. In other words, for every $1 the USFS spends on forest restoration, the agency avoids a potential loss of $1.45. This actual avoided cost could be higher because untreated acres are likely to be protected from crown fires by nearby acres that are treated, further reducing the potential for fire suppression expenditures.

Table 3.3-2: Acres and costs of eastern Oregon large fires (> 100 acres), 2007-2011.

Year	Total Acres Burned	Total Cost	Cost/Acre
2007	171,934	$ 61,137,556	$ 356
2008	35,552	$ 66,708,776	$ 1,876
2009	19,621	$ 17,843,480	$ 909
2010	22,020	$ 39,819,798	$1,808
2011	30,473	$32,505,420	$ 1,067
Total	**279,600**	**$ 218,015,030**	**$ 780**
5-year average	**55,920**	**$ 43,603,006**	**$780**

Source: USFS, 2012a

In addition to fire suppression costs, forest restoration would contribute to significant cost savings associated with avoiding facility losses, the loss of wildlife habitat, and timber value. Furthermore, post-fire reforestation is a necessary investment that is usually needed to avoid soil erosion, sedimentation, and water contamination (Mason et al. 2006).

Increased forest and watershed restoration will also have positive employment, income, and state tax revenue impacts in the rural communities of eastern Oregon. If more of the labor force is employed, increased levels of state tax revenue will be generated that will help fund current social service programs. As more people become employed and earn more income, communities are likely to see a decreased reliance on social services such as Temporary Assistance for Needy Families (TANF) and the Supplemental Nutrition Assistance Program (SNAP) – once known as the food stamp program. TANF provides cash assistance to low-income families for living expenses while the SNAP program provides cash assistance to low-income families to help purchase food.

Since 2006, total expenditures for TANF and SNAP have increased an average of 22 percent per year. In 2011, for instance, social service costs for the two programs totaled $298 million: $42 million for TANF, and $256 million for SNAP (Figure 3.3-1). During that year, TANF helped about 7,400 one- and two-parent families, providing about $465 per month in cash assistance while SNAP provided 77,000 households an estimated $278 per month.

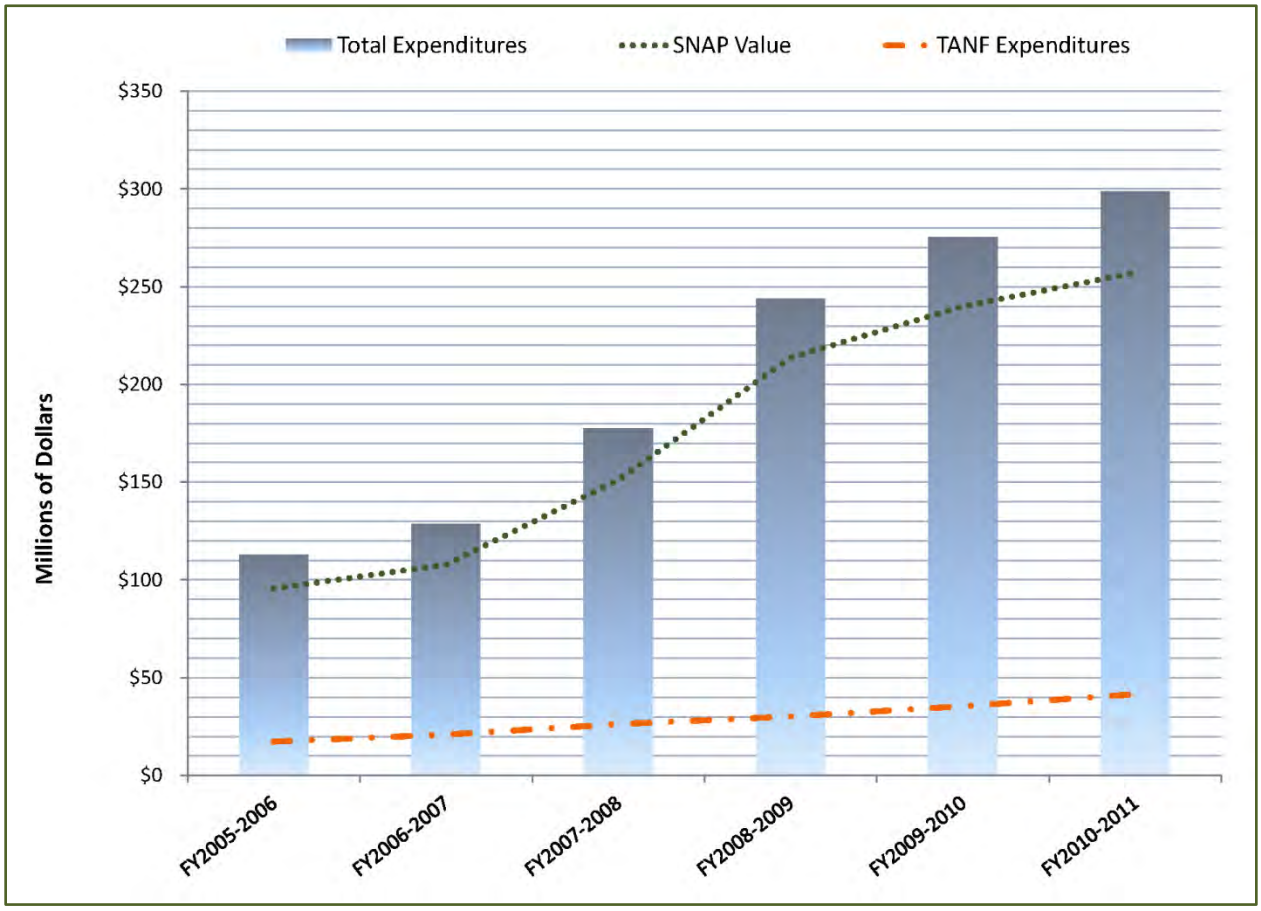

Figure 3.3-1: TANF and SNAP expenditures by fiscal year (FY) in eastern Oregon, 2005-2011
Source: Oregon Department of Human Services (DHS), 2012
DHS Districts 8-14

Unemployment and poverty rates are important measures of economic well-being that would also be influenced by a long-term program of forest health restoration. The unemployment rate shows the percent of an area's labor force that is not working but actively seeking employment. The poverty rate shows the percent of people in an area living below the poverty threshold.

As of September 2012, the average county unemployment rate is 10.8 percent within the study area, with ranges from 7.2 (Wheeler County) to 13.8 percent (Crook County). On a regional basis, the Southeast Economic Region has the highest unemployment rate at 12.8 percent followed by the Interior South's unemployment rate of 11.7 percent. The Northeast Economic Region has the lowest unemployment rate at 8.8 percent (Table 3.3-3).

The average poverty rate in 2010 for counties within the study area was 19.1 percent ranging from 15.5 percent (Umatilla County) to 39.5 percent (Malheur County). The Interior Central Economic Region had the highest poverty rate at 18.6 percent while the Northeast Economic Region had the lowest at 17.2 percent.[14]

Based on our assessment, forest restoration on USFS forestland in eastern Oregon employs a total of 2,310 people each year. If restoration activities were increased to a point where 2,310 new jobs were created, the region's unemployment rate would be reduced by 0.6 percent (10.8 to 10.1 percent). This reduction is relative to a baseline that assumes labor force and job growth proportionate to the region's population growth.

Table 3.3-3: Unemployment rates (September 2012) and poverty rates (2010) within study area

County	Unemployment Rate (%)*	Poverty Rate (%)
Baker County	9.9	20.0
Crook County	13.8	17.4
Deschutes County	11.4	14.8
Grant County	13.6	16.5
Harney County	12.6	19.1
Jackson County	10.8	15.7
Jefferson County	12.2	21.1
Klamath County	11.5	17.4
Lake County	12.9	20.4
Malheur County	9.9	39.5
Morrow County	8.9	16.7
Umatilla County	8.3	15.5
Union County	9.0	16.7
Wallowa County	10.2	16.6
Wheeler County	7.2	19.8
Average	**10.8**	**19.1**

Source: Oregon Labor Market Information System, 2012; U.S. Census Bureau Small Income and Poverty Estimates, 2012 (only 2010 data available)
*Seasonally adjusted rate

[14] Based on U.S. Census income thresholds that vary by family size and composition to determine who is in poverty. Poverty rate includes all ages.

Increased forest and watershed restoration will generate additional employment opportunities, which also increases the amount of payroll eligible for state and federal unemployment insurance tax. In 2010, Oregon Department of Employment distributed approximately $470 million in unemployment benefits through its Unemployment Insurance Program (Table 3.3-4) to individuals in the study area. These benefits were generated by an estimated 29,000 claims through state and federal payroll taxes to provide unemployed individuals in the study area assistance while actively seeking to become employed.

Table 3.3-4: Total unemployment benefits and number claims in eastern Oregon, 2010

County	Annual Benefits*	Number of Claims
Baker County	$6,248,585	450
Crook County	$23,014,056	1,226
Deschutes County	$162,027,228	9,506
Grant County	$4,661,743	288
Harney County	$6,178,635	358
Jackson County	$142,682,595	9,270
Jefferson County	$14,737,455	836
Klamath County	$44,103,975	2,865
Lake County	$3,676,512	258
Malheur County	$8,768,854	653
Morrow County	$3,960,819	270
Umatilla County	$30,389,119	2,131
Union County	$15,252,404	818
Wallowa County	$4,197,930	290
Wheeler County	$438,646	38
Total	**$470,338,556**	**29,257**

Source: State of Oregon Employment Department – Financial Services, 2012
*Includes payment for all types and claims in Oregon.

In areas of eastern Oregon, forest health restoration is also benefiting communities through an increase in property tax base. For example, restoration within the WUI is enabling the construction of high value homes for families wanting to live near the forest. This construction is adding to the local property tax base. One could also argue that restoration beyond the WUI is also contributing to increased property values because treatments are enhancing and protecting the recreational amenities that attract tourism-related business and new residents to the area.

What are the non-market benefits of forest health restoration?

National Forests on Oregon's eastside provide clean air, clean water, habitat for a variety of wildlife species, recreational opportunities, and other ecosystem services that are threatened by degraded forest health. A program to increase the pace of restoration presents an opportunity to improve the overall condition of this forested landscape and retain these invaluable services.

Forest health restoration will help protect, restore, and manage a full suite of sustainable non-timber resources and services (Table 3.3-5). These services can be categorized to highlight the values they provide to both people and ecosystem function: (1) supporting services; (2) provisioning services; (3) regulating services; and (4) cultural services (Deal et al. 2012).

Table 3.3-5: Categories of ecosystem services

Ecosystem Services			
Supporting Services	**Provisioning Services**	**Regulating Services**	**Cultural Services**
Nutrient cycling Soil productivity Primary production	Food Fiber Genetic resources Clean water	Air quality regulation Climate regulation (carbon sequestration) Water regulation Erosion regulation Water purification Disease regulation Pest regulation Pollination Natural hazard regulation	Aesthetic values Spiritual and religious values Recreation and tourism

Source: Adapted from Deal et al., 2012

The total economic value of ecosystem services flowing from eastern Oregon's national forestlands is unknown. There is an increasing interest in developing quantitative methods to calculate these values, but such analysis falls outside the scope of this study. We do, however, qualitatively highlight some of the more significant services to provide an understanding of their importance and connection to forest health restoration impacts.

Clean water

One of the most important ecosystem services from forests is a plentiful supply of clean water. In the Pacific Northwest, 38 percent of the total surface water runoff originates on national forestlands (USDA Forest Service 2000). Healthy forested watersheds reduce storm runoff, stabilize streambanks, shade surface water, cycle nutrients, and filter pollutants (USDA Forest Service 2010). In addition, National Forests house a number of municipal watersheds that provide clean water for domestic and industrial uses. Reducing the risk of high intensity wildfires through forest health restoration will help minimize sedimentation impacts by reducing soil erosion that can occur after a large, high intensity fire. There is also evidence that tree stress and mortality caused by fire, insects, and diseases may affect the depth and length of the winter snow pack which, in turn, reduces the duration and quantity of surface water during spring runoff.

A large supply of high-quality clean water from a healthy forested landscape is necessary to sustain human and ecological needs. Clean water is also essential to the economic well-being of our state as the cost of providing alternative sources of filtered water could be prohibitive.

Recreation

Recreation activities on eastern Oregon national forestlands have a significant economic impact on local and state economies. In 2009, recreational activities such as freshwater fishing and hunting in eastern Oregon produced $153 million in travel-related expenditures and $37.1 million in local recreational expenditures (Dean Runyan 2009) (Table 3.3-6).

Table 3.3-6: Expenditures for freshwater fishing and hunting in eastern Oregon, 2009

Activity	Travel-Generated Expenditures* ($Million)			Local Recreation Expenditures** ($Million)
	Overnight	Day	Total	Total
Freshwater Fishing	63.2	28.1	91.3	24.7
Hunting	51.5	10.6	62.1	12.4
Total	**114.7**	**37.8**	**153.4**	**37.1**

Source: Dean Runyan, 2009

*Travel-generated expenditures associated with overnight and day trips 50+ miles (one-way)

** Local recreation expenditures associated with trips under 50 miles.

In addition to these activities, other forms of recreation that are difficult to quantify have positive economic benefits locally and across the state. People visit National Forests to camp, backpack, mountain bike, operate recreational vehicles, and much more. All these activities hinge on the conservation and enhancement of user-friendly and aesthetically pleasing forested areas. As well, recreational users rely on conveniences such as gas stations, markets, motels, restaurants, etc., that likely would not be able to sustain year-round activities without a firm base of economic activity provided by forest management and restoration activities.

Air quality

The potential impacts of fire-induced degradation of air quality on public health and welfare range from exposure of smoke on firefighters to broader economic and social impacts (USDA Forest Service 2002). The components of smoke that are of most harm to humans are carbon monoxide and tiny particles of solid matter called particulate matter. Particulate matter is the main pollutant of concern to the public. Brief exposures to particulate matter may aggravate asthma and bronchitis and may sometimes cause heartbeat irregularities and heart attacks.

Forest restoration activities have the potential to reduce the risks of catastrophic wildfires, which in turn, will help reduce the public's long-term exposure to poor air quality resulting from wildfires. During the summer of 2012, wildfires caused unhealthy air conditions in most of the U.S. Interior Northwest. At times the general population was advised to stay indoors or wear masks.

Climate Change and Carbon Sequestration

Forest health restoration will help forested ecosystems adapt to the effects of a changing climate. Adaptation focuses on (1) increasing ecosystem resistance to climate-related stressors such as wildfire, insects and disease; (2) increasing ecosystem resilience to degradation by climate-related stressors; and (3) facilitating landscape-scale ecological transitions in response to changing conditions (Tidwell and Brown 2011). Management actions such as restoration treatments at the landscape scale will support ecosystems in adapting to changes in the climate and other large-scale drivers.

Working towards a healthy forested landscape through restoration activities will have a positive impact on the forest's ability to sequester carbon from the atmosphere, which helps regulate atmospheric greenhouse gases. Treatments designed to reduce fire and promote forest resiliency will reduce the scale of potential losses due to fires, insects and diseases that affect associated carbon emissions due to mortality (Malmsheimer, et al. 2011).

Section 3-4: Regional Economic Impacts of Forest Restoration

The USFS's current forest restoration program in eastern Oregon reflects the resource conditions, budget allocations, the level of social agreement, wood processing infrastructure capacity and the economies specific to each region. Subsequently, these factors influence the costs and benefits of regional forest restoration programs and can be compared to further understand the economic impacts of USFS forest restoration in eastern Oregon.

The following section provides a summary of economic impacts associated with the current level of restoration activity in each economic region. We graph the proportion of resource activity outputs and impacts in each region as a percent of the total. This provides a quick comparison between regions. Specific numbers for each region can be found in Appendix V.

Northeast Economic Region:

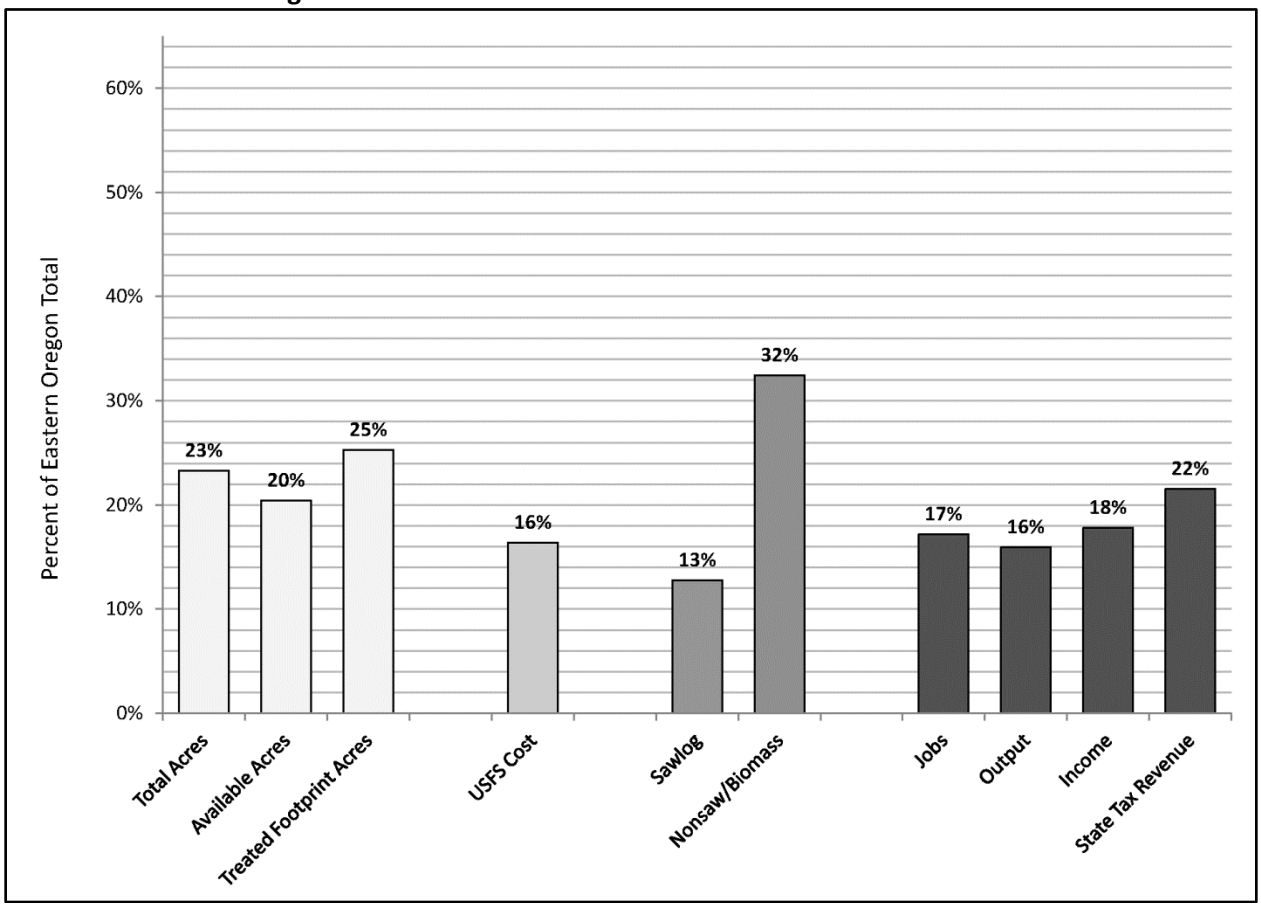

Figure 3.4-1: USFS's current level of forest restoration activity in the Northeast Economic Region
Sources: USFS TIM and FACTS database, 2012; USFS cost survey, 2012; Input/Output Models (Forest Econ Inc, 2012)

- The Northeast Economic Region accounts for a quarter of the forest restoration activity in the region.

- The USFS spends proportionately less in this region than the Interior Central and Interior South, producing proportionately less commercial sawlog material. However, the region produces the highest proportionate amount of non-sawlog/biomass material in eastern Oregon.

- The amount of non-sawlog and biomass material being produced is used by a wood products manufacturing infrastructure that is integrated and able to respond to available markets. Currently, there is a good market for fiber and the USFS should be able to sell all or most of the restoration sales that it develops. There has also been a good market for non-sawlogs in this region due to low Columbia-Snake River transportation costs. Labor intensive restoration projects that sell this material are generally more economically feasible in this region than in other parts of eastern Oregon. However, the market is cyclical and dependent upon remaining primary manufacturing infrastructure.

- The economic outputs related to commercial and non-commercial restoration are comparable to the total USFS costs and fairly similar with other regions, except for the Interior South.

- The Northeast Economic Region has a fairly robust contractor capacity that captures economic benefit from non-commercial forest restoration and watershed restoration work.

- $1 million spent on watershed restoration in the Northeast Economic Region has an economic return of:

    - 17 jobs

    - $1.5 million in industrial output

    - $678,000 in total income

    - $34,000 in state tax revenue

Southeast Economic Region:

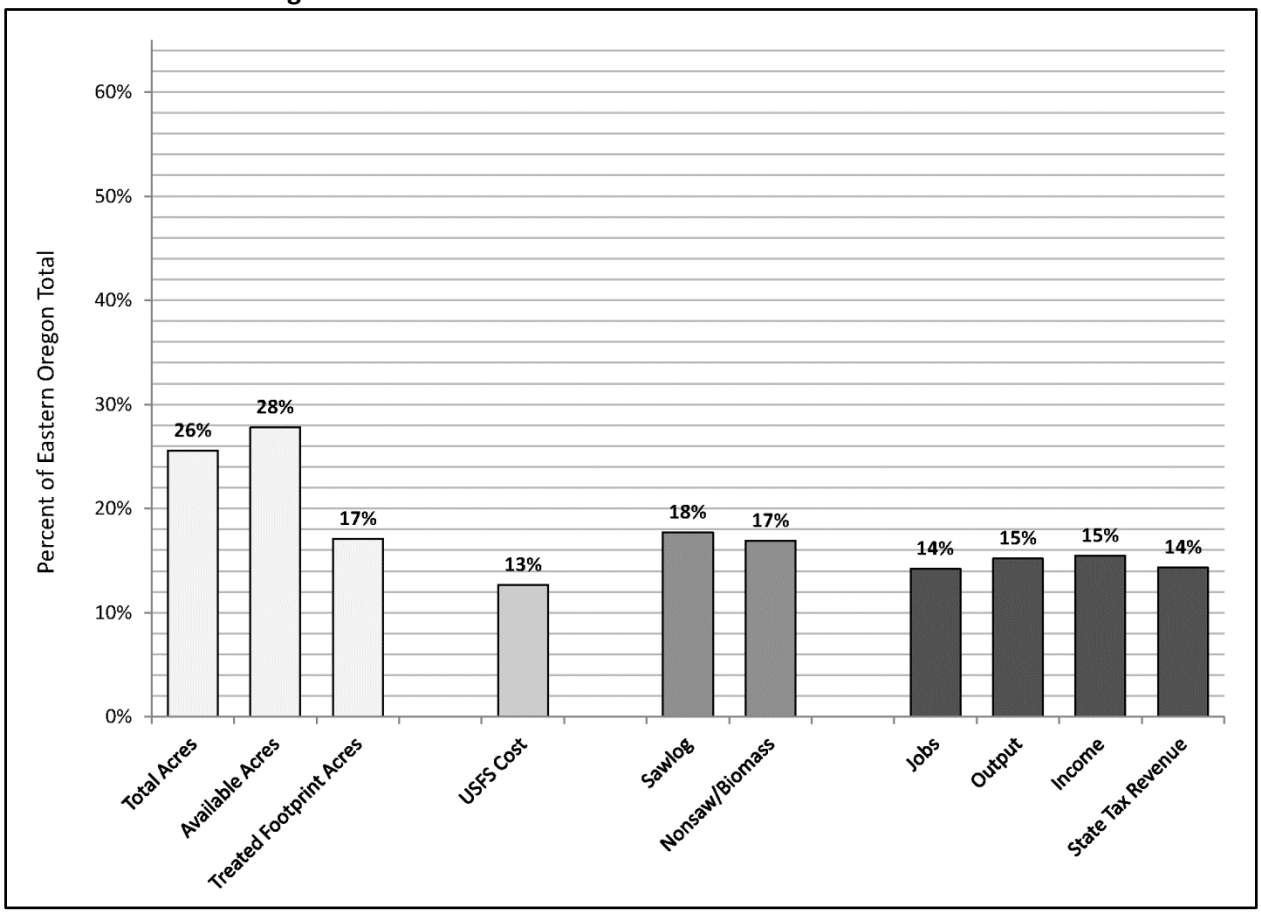

Figure 3.4-2: USFS's current level of forest restoration activity in the Southeast Economic Region
Sources: USFS TIM and FACTS database, 2012; USFS cost survey, 2012; Input/Output Models (Forest Econ Inc, 2012)

- The Southeast Economic Region treats proportionately fewer footprint acres than other regions.
- The USFS restoration costs are the lowest in this region, and as a result it has the lowest commercial production of any region – sawlog and nonsaw/biomass combined.
- Although the Southeast Economic Region has the lowest commercial production in eastern Oregon, the region is able to realize economic benefits comparable to the Interior Central Economic Region due to the existing Malheur Lumber Mill.
- This region has similar economic benefits as the Interior Central Economic Region, despite having proportionately less costs and lower commercial production.
- This region lacks the infrastructure to capture the full benefits of non-commercial forest restoration projects.
- This region lacks the infrastructure to capture watershed restoration projects. The watershed projects examined involve primarily traditional construction such as pulling culverts, and this region

does have construction contractors available. As more complex watershed restoration projects develop, the region will need to develop a pool of local contractors or work will go to other regions.

- $1 million spent on watershed restoration in the Southeast Economic Region has an economic return of:
    - 24 jobs
    - $1.4 million in industrial output
    - $615,000 in total income
    - $18,000 in state tax revenue

Interior Central Economic Region:

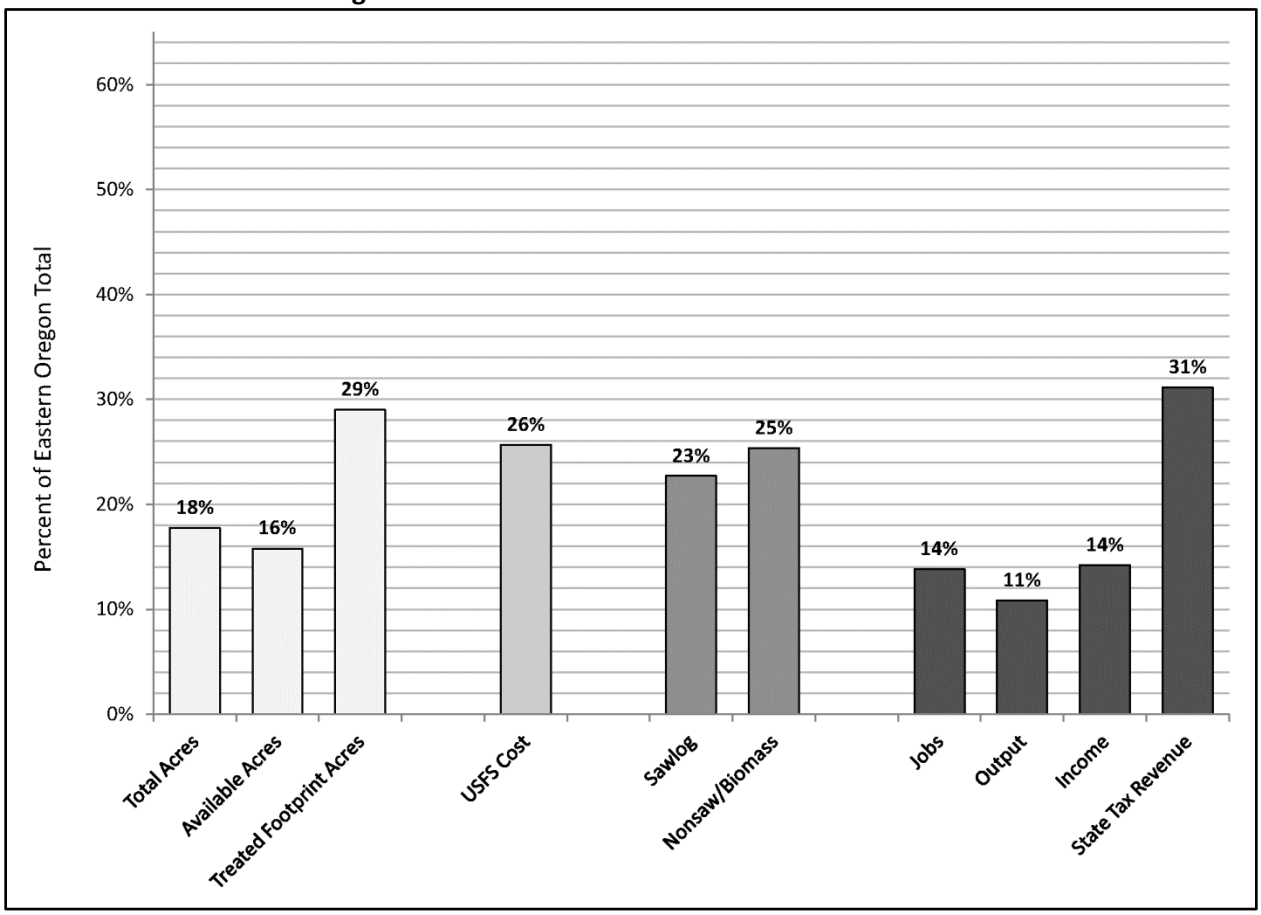

Figure 3.4-3: USFS's current level of forest restoration activity in the Interior Central Economic Region
Sources: USFS TIM and FACTS database, 2012; USFS cost survey, 2012; Input/Output Models (Forest Econ Inc, 2012)

- The Interior Central Economic Region has fewer available acres than other regions, but conducts forest restoration treatments on a higher proportion of those acres.

- The USFS spends more on restoration in this region than in the Interior Central and Northeast Economic Regions and produces about a quarter of eastern Oregon's sawlog and non-sawlog/biomass production.

- Although there is a large portion of commercial production occurring in the Interior Central Economic Region, most of the economic benefits are realized in other regions because the logs must be transported to other regions for processing. Most of the wood goes to the Interior South Economic Region.

- The region has a well developed restoration infrastructure that provides services to this region and surrounding areas. In the Bend-Redmond-Prineville area, there is a concentration of forest and watershed restoration contractors.

- The region captures both wage and salary and proprietor's income from non-commercial forest and watershed restoration.

- $1 million spent on watershed restoration in the Interior Central Economic Region has an economic return of:

    - 7 jobs

    - $470,000 in industrial output

    - $261,000 in total income

    - $39,000 in state tax revenue

Interior South Economic Region:

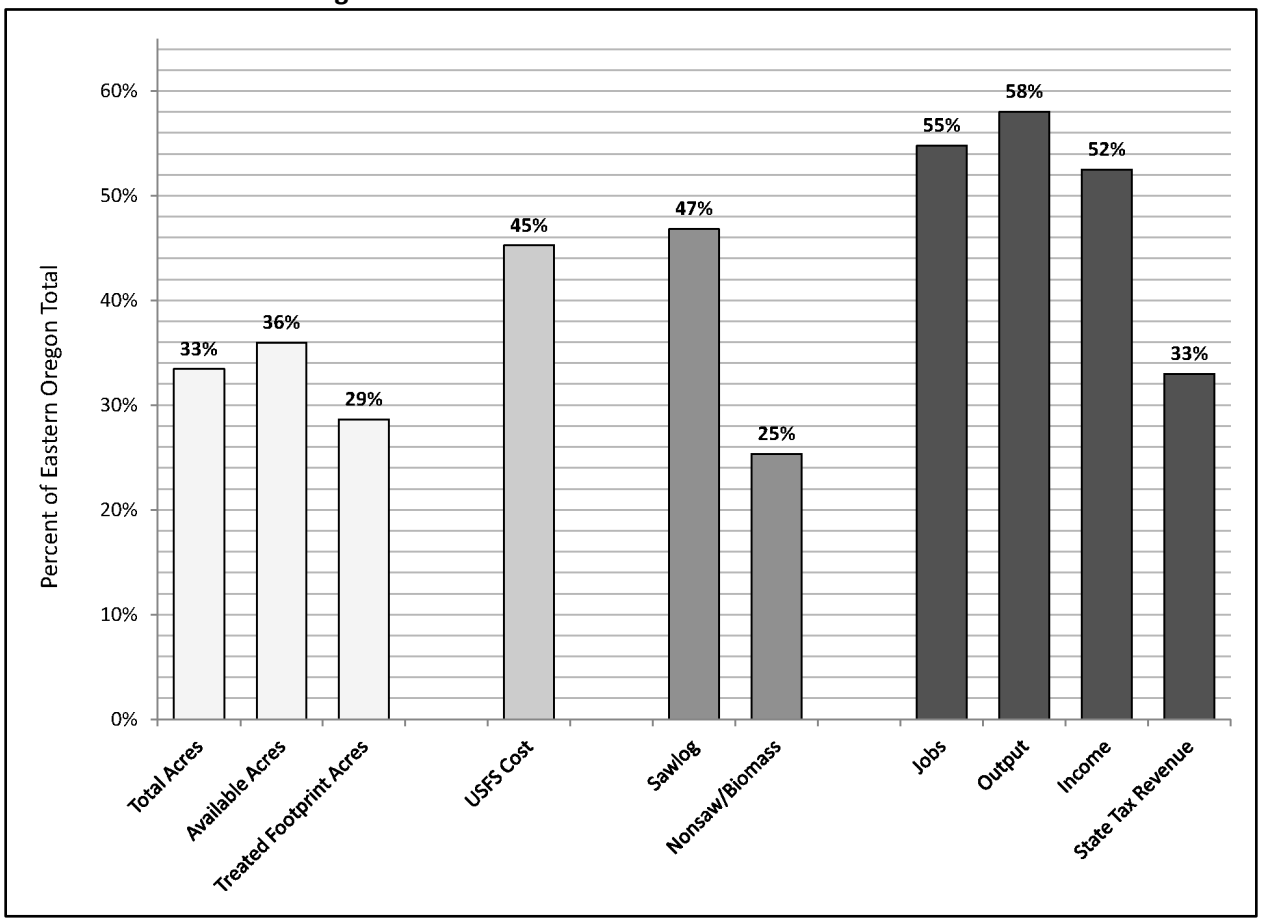

Figure 3.4-4: USFS's current level of forest restoration activity in the Interior South Economic Region
Sources: USFS TIM and FACTS database, 2012; USFS cost survey, 2012; Input/Output Models (Forest Econ Inc, 2012)

- The Interior South Economic Region conducts treatments roughly proportionate to the available acres.
- The USFS spends the most on forest restoration activities in this region and produces the most commercial sawlogs than other regions.
- The region produces about a quarter of eastern Oregon's non-sawlog/biomass material.
- The level of commercial production in the Interior South Economic Region combined with products from other economic regions provides this region with the largest economic benefits from current levels of forest restoration.
- The region has a nucleus of restoration contractors that allow it to capture most of the jobs and income benefits of all restoration projects.

- Sawmills in this region are the principal beneficiaries of USFS eastside Oregon timber harvest. As sawmills throughout the eastside have closed, the region's sawmills have captured an increasing share of USFS sawlog volume.
- Markets for biomass in this region help the region capture more of the benefits associated with restoration byproducts.

- $1 million spent on watershed restoration in the Interior South Economic Region an economic return of:

    - 20 jobs

    - $1.6 million in industrial output

    - $644,000 in total income

    - $9,000 in state tax revenue

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Chapter 4: Next Steps

Trucks roll through Ashland, Oregon, hauling commercial saw logs from a restoration thinning in the Ashland Forest Resiliency Project to the Murphy Plywood veneer mill in White City, Oregon.

Section 4.1: Next Steps

The risks involved in not addressing the forest health crisis, particularly on Oregon's eastside National Forests, have far-reaching implications that are already having an effect. The economic and ecological costs will continue to rise; an investment in active forest management focused on restoration represents a cost effective method to address the forest health concerns in eastern Oregon.

Achieving a substantial increase in forest restoration activity across the eastern Oregon landscape is a challenging endeavor and will take time to develop. We recognize that many of our elected leaders are undertaking laudable and ground-breaking efforts to increase the pace and scale of restoration. Instead of addressing individual legislative proposals, we offer several steps that can be taken at the local, regional, and state level to help advance landscape-scale forest health restoration.

1. **Any effort to 'scale up' the pace of forest restoration on Oregon's eastside National Forests will have to be accompanied by a large-scale planning effort led by the USFS.**

    - A planning effort will help determine the level at which forest restoration could be increased based on current social agreement, infrastructure base, available contractor workforce, and forest specific planning decisions.

    - The planning process could also address any policies that may be hindering the expansion or effectiveness of the agency's forest restoration goals.

2. **Improving the efficiency of the USFS' planning and implementation will reduce total management costs creating the potential to accomplish more forest restoration. There are many ideas and proposals for future analyses that should be pursued in order to have a meaningful impact on USFS costs.**

    - <u>Does collaboration help reduce USFS restoration costs</u>?
      Forest collaboratives in eastern Oregon report anecdotal evidence that the collaborative process reduces the frequency of litigation and helps streamline the overall NEPA process, thus reducing USFS planning costs.

      A focused study that quantifies the costs of litigation and associated planning costs between collaborative and non-collaborative projects is necessary to help gauge the degree to which the collaborative process helps reduce USFS restoration costs.

    - <u>What efficiencies can the USFS target to help reduce time and costs</u>?
      The USFS is working to improve the efficiency of the NEPA process by increasing the use of landscape-scale NEPA, proposing the use of new Categorical Exclusions for restoration activities, and the use of an adaptive Environmental Impact Statement (EIS) process that would cover a large planning area with individual projects being evaluated through focused assessments allowing for a quicker time to decision and faster implementation rate.

      These efforts have the potential to significantly reduce restoration costs and should be supported.

- What is the fiscal impact of extending Stewardship Contracting authority?
  The expanded use of stewardship contracting has the potential to reduce restoration costs, and this integrated approach should be extended through congressional approval. Current approval expires September 30, 2013.

  State level support for extending stewardship contracting authority permanently should be a priority.

3. Forest collaboratives in eastern Oregon have a wealth of local, project-based knowledge.

- Forest collaboratives have years of project documentation and experience, which should be analyzed in order to inform how to support their efforts in future years. The analysis should be based on specific projects that have been implemented through the collaborative process.

- Individual case studies of collaborative effectiveness should include an economic and fiscal impact analysis to determine the economic impact of site specific restoration.

- A fiscal analysis to describe federal government costs tied to collaboratives and forest restoration activity would help policymakers determine the highest leverage points for taxpayer investment.

- The studies should also assess the challenges and opportunities for collaboratives if the pace of landscape-scale restoration were to increase – what is needed to foster social agreement as implementation increases across the landscape?

4. Retaining eastern Oregon's wood product manufacturing infrastructure is critical to the success of a landscape-scale forest restoration program.

- Priority should be given to existing infrastructure that supports forest restoration work.

- Economic regions with a robust, integrated infrastructure are able to capture more value and result in more jobs than regions with limited manufacturing capacity. There are few remaining mills in eastern Oregon and haul distances are considerable. If mills continue to close in the region, it will not be economical to conduct restoration work. Haul costs will be too high and National Forest sales will no longer be attractive to bidding contractors.

5. **Pursuing markets and public investments to utilize forest restoration products and byproducts is an important component of landscape-scale implementation of forest health restoration.**

   - An integrated wood products infrastructure in eastern Oregon is dependent upon the markets that drive long-term product demand, but also on well designed restoration projects. Projects should be designed with current market conditions in mind to make the removal of material economical will benefit both the USFS and local economies.

   - Oregon's Forest Biomass Working Group[15] has identified four market development initiatives that should be pursued and supported at the state level. They are biomass thermal (on-site heat at commercial and institutional facilities), distributed generation (heat and electricity at existing wood product facilities), existing markets (landscape bark, shavings, bedding, etc.), and emerging markets (biofuels, biochar, cellulosic ethanol, etc.).

[15] The Oregon Forest Biomass Working Group has proposed these initiatives through its recent document, "Growing Oregon's Biomass Industry: Oregon's Forest Biomass Strategy".

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Appendices

A resilient ponderosa pine forest following restoration thinning and prescribed fire at Sycan Marsh in Lake County, Oregon.

Appendix I: Acknowledgements

In addition to the Project Steering Committee, The Federal Forestlands Advisory Committee-*ad hoc* Implementation Working Group gratefully acknowledges the support, participation, counsel and expert advice of the following people who contributed to this report:

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Appendix II: Definition of Available Acres

The Institute for Natural Resources (INR) at Oregon State University provided the analysis to estimate the acres of national forestland within the study area that are available for forest restoration. The following description provides INR's methodology.

The Ownership-Allocation and Management Layer is a GIS database created by combining the ownership-allocation data (primarily compiled by Oregon Department of Forestry) and a management layer (compiled by Oregon State University, Institute for Natural Resources).

Ownership-Allocation is the primary land ownership with the major management allocation for the owner. This is derived from the public land ownership data combined with some additional data from the Northwest Forest Plan (NWFP), Wilderness areas and roadless areas. This approach, used in the Integrated Mapping and Assessment Project (IMAP) was developed by Andy Herstrom at Oregon Department of Forestry. The primary data are outlined below used for Public Ownership and Management:

Public Ownership

The public ownership layer is the land ownership/management for public entities - Federal, Tribal, State, and Local. This is a seamless, statewide Oregon Public Ownership vector layer composed of fee ownership of lands by Federal, State, Tribal, County, and City agencies. The layer is comprised of the best available data compiled at 1:24,000 scale or better and line work matching GCDB boundary locations and ORMAP standards where possible. This is a draft landownership theme. Corrections should be sent to the Oregon Department of Forestry. FGDC compliant metadata was created by the Oregon Geospatial Data Clearinghouse using source materials provided by the Oregon Department of Forestry.

The following are the Ownership categories:

- F = USFS ownership
- B = BLM ownership
- S = General State
- O = Other Public (National Park, National Monument and other federal)
- T = Tribal
- P = Private

Management Data

Management data was compiled by Melissa Whitman from Oregon State University and feedback from the modeling team. The process consisted of manually reviewing data from local land managers (including data from the regional and local management plans) to determine a general management category. Numerous data sets were all combined in this dataset include the Northwest Forest Plan (NWFP), local management data, ownership, WUI, stewardship data (from GAP) and numerous other sources.

The six management categories were created primarily for the VDDT modeling purposes. The initial concept behind the codes was based on the definitions associated with Bureau of Land Management's Four Visual Resource Classes (VRM). Two additional classes (more restrictive than VRM Code 1 and less restrictive than VRM Code 4) were added to better represent the range of management practices.

Six categories were determined based on a review of the data which is outlined below:

- Code 1 = Protected & Preservation
- Code 3 = Retention
- Code 4 = Partial Retention
- Code 5 = Modification
- Code 6 = Modification Private

Code 1 is used to encompass areas that are legally dedicated to protection and preservation of the characteristic of natural landscape (wilderness, congressional reserve, national parks). Additionally it contains slightly less restrictive management and may allow for more adjustments in management practices (regional conservation reserves/preserves, late successional reserves, wilderness study areas, VRM Class 1).

Code 3 has more of an emphasis on retention of forested areas or native vegetation for a variety of reasons such as the conservation of endangered species or for maintaining forested corridors along areas of visual or biological importance (municipal watersheds, corridors for visual/riparian/biodiversity, endangered/threatened species management, other values of importance, private conservation areas, wildlife refuges, VRM Class 2).

Code 4 is based mainly on partial-retention with the potential for longer rotations or more experimental management strategies (partial retention, adaptive management areas, experimental forests, other wildlife areas, primitive recreation usage, VRM Class 3).

Code 5 is associated with major modification of the landscape and includes general forestry, developed recreation (off road vehicle use, ski areas), mining, or grazing on public land (general forestry w/ habitat modification, NWFP Matrix, developed recreation, VRM Class 4).

Code 6 is specific to privately owned lands which may be less restrictive than public lands may or may not remain committed towards natural resource management over time.

Available acres in this study were determined by calculating the number of acres, within the study area, that are under USFS ownership (F) with Management Category Codes 3, 4 and 5.

Appendix III: Input/Output Modeling Assumptions

Log and Residuals Flows:
We used survey data wherever possible to specify USFS timber consumption and log flows. We assumed that small purchasers of miscellaneous wood products (log home builders, post and pole, timber frame and firewood) were more dependent upon National Forest timber. Industrial private timber does not tend to be available for these sources and non-industrial private landowners log flows have diminished greatly due to low stumpage prices.

Most of the pulp logs from the Umatilla and Wallowa National Forests were assumed to go into chips which supply paper mills along the Columbia River. A portion of these chips also may go into the Asian chip export market, but for modeling purposes that has no bearing on local value added: they are still exported from the region.

During the time of our analysis, there was an unusually high volume of ton wood going into the chip market. When chip prices go down some of these ton wood timber sales (particularly those distant from mills) will not sell. Biomass facilities were assumed to be dependent upon local supplies of material. Interviews indicated that biomass material rarely moved over fifty miles.

The Southeast Economic Region (Baker, Grant, Harney, and Malheur Counties) was assumed to capture most of the flows of the Malheur National Forest and a portion of the Ochoco National Forest. The Northeast Economic Region (Morrow, Umatilla, Union, Wallowa, and Wheeler Counties) was assumed to capture most of the harvest of the Wallowa-Whitman and Umatilla National Forests. The Interior Central Economic Region (Crook, Deschutes, Jefferson Counties) currently has no large operating mills that use National Forest timber (one small mill in Prineville is an exception to this). Most of the National Forest timber from this region is exported to other regions of Oregon or to Longview, Washington (chips). The Interior South Economic Region (Jackson, Klamath, and Lake Counties) was assumed to capture most of the flows of the Fremont-Winema and Rogue National Forests.

Log exports:
It is not important to specify the destination of log exports for modeling purposes. Log exports (leakage) are log exports regardless of destination. They leave the region's economy and no value added or multiplier effect from their processing is realized in the region. If statewide models were developed they would capture this leakage and show stronger multiplier effects and fiscal recovery from these projects. The absence of a pulp mill in eastern Oregon results in a significant loss of value added from chips and residuals.

A significant portion of the logs from the Northeast Economic Region are exported to Idaho or downriver along the Columbia. All log exports are treated the same and the destination is not important for modeling purposes (they are all log exports). Log exports from the Interior South Economic Region to the Willamette are offset by log imports from California and the Interior Central Economic Region. The Interior Central Economic Region does not have a large sawmill that uses Forest Service timber, so virtually all of the saw logs are exported from this region (primarily to the Interior South Economic Region which has four mills). The Southeast Economic Region has only one mill and haul distances are considerable to mills outside the area.

Proprietors Income (Profit):
Proprietor's income was scaled to changes in earnings. This assumes that proprietors' income goes up proportionately with increases in income. Effective tax rates were applied uniformly. Most wood products firms are operating at a loss and may not be reporting profit at this time. Consequently, this assumption may produce more revenue than actual conditions. Eastern Oregon mills have been operating at a loss or very close to their margin for several years. As log supply and housing markets improves, they will be much more profitable and will return more revenue.

We modeled the past five years which is a period in which mills have generally not been very profitable. The industry is very cyclical and profits go up and down sharply with housing and other material markets.

Wage and Salary Earnings:
Wage rates were assumed to be constant for the study period. This has been a period of very stable wage rates—no significant increases in wage rates. Wage rates in some aspects of the industry where there are shortages of skilled labor could go up significantly as the housing market recovers. This is particularly true of logging contractors and skilled mill workers.

Trade leakage for Restoration and Watershed Projects:
The models assume that local contracting capacity is absorbed before outside contractors are hired. We did not have information about in-commuting for labor intensive forest restoration and watershed projects. Because this analysis is focused on the impact on the entire eastern Oregon economy it was not critical if local or out-of-area contractors were hired for a project. Parts of eastern Oregon do not have enough local contractors specializing in watershed and forest restoration. This represents a potential local economic development opportunity. In the Southeast Economic Region, the region where this is most apparent, the only watershed restoration project examined entailed conventional construction (culvert removal and similar conventional construction).

The area in which contractor specialization is most apparent is in fire-scaping services for homes. These services tend to be most concentrated in the Interior Central Economic Region and around Medford. As we were examining only Forest Service contracting most of these services do not come into play (the Forest Service typically uses its own crews for maintaining defensible space around their facilities). A broader analysis that examines private spending for restoration might show more concentrated spending for defensible space in areas where homes are more concentrated in high risk areas.

Forest Service Administrative Costs:
For watershed projects Forest Service internal administrative cost for project development, environmental, contracting and environmental were assumed to be forty percent administrative costs.

Non-commercial watershed restoration projects are easier to develop and administer and have administrative costs in the range of 15-20 percent.

Administrative costs for mechanical restoration and labor intensive forest restoration are both very high (typically higher than forty percent). This is due to the extensive project planning, environmental review, appeals and monitoring associated with these projects.

Data Sources:

- Data for the I/O models was derived from IMPLAN (Minnesota IMPLAN Group), augmented with field work performed for a previous study for the Oregon Forest Resources Institute (Oregon Forest Resources Institute, 2012). IMPLAN data was 2010 data and it was updated in the spring of 2012 with current data for all components of the forest industry.

- Phone interviews were conducted in the summer of 2012 to ascertain log flows and material usage.

- USFS TIM and FACTS database information and costs surveys were used to determine commercial product volumes and implementation costs.

- Effective tax rates for personnel income tax, corporate profits, fuels, and harvest tax were obtained from the Oregon Department of Revenue. These tax rates were applied to wage and salary earning generated by National Forest stewardship sales, conventional timber harvest, and downstream impacts on sawmills plywood mills and other facilities.

- An effective tax rate of 6% was assumed for all corporate profits (proprietor's income).

- A timber harvest tax of $3.70 per thousand board feet of harvest was applied to all stumpage and ton wood harvested from national forestlands. This was the harvest tax for eastern Oregon in 2011.

Changes in property taxes were not estimated. Property taxes are viewed as being somewhat independent from National Forest timber harvest. Over the long term property values have been affected in some areas of the state by major reductions in National Forest timber harvest. For the period examined National Forest sales are small and fairly stable so no property tax effects were expected. In any case the major changes in the housing market in 2006 over-shadow any expected effects from National Forest actions.

Table A-III.1: Production Functions*

Selected Industries	Timber Sales	Stewardship Contracts	Watershed Restoration
Accounting and bookkeeping services	-	0.02900	0.00040
Advertising and related services	0.01100	0.00022	0.00017
Architectural and engineering services	-	-	0.00687
Banking	0.00100	0.00088	0.00441
Civic, social, professional and similar organizations	-	-	0.00083
Construction	0.00180	0.05000	0.00001
Construction machinery manufacturing	-	0.00002	0.03031
Environmental and other technical consulting services	-	0.00151	0.00022
Fabricated structural metal	-	-	0.00247
Food services and drinking places	-	0.00100	0.00410
Forest nurseries, forest products, and timber tracts	0.00190	0.01400	-
Forestry support	-	0.01000	-
Insurance	-	0.02900	0.00002
Labor	0.36800	0.62300	0.36500
Legal services	-	0.00033	0.00631
Machine shops	-	0.00006	0.00188
Machinery and equipment rental and leasing	-	0.10100	0.00907
Management consulting services	0.00100	-	0.00202
Management of companies and enterprises	-	-	0.03327
Plastics plumbing fixtures	-	-	0.00413
Ready-mix concrete	-	0.00500	0.00176
Real estate	-	0.00038	0.01098
Retail trade	0.17000	0.14100	0.00282
Sand, gravel, clay, and refractory mining	-	-	0.01800
Scientific research and development services	-	-	0.00169
Stone mining and quarrying	-	-	0.04282
Truck transportation	0.01289	0.00800	0.00100
Wholesale trade	-	0.10160	0.02624

Source: Forest Econ Inc., 2012 (Input/Output Models)

*Production functions for each economic region differ slightly from one another. This table serves as an example of the general production function developed for this study.

Appendix IV: Economic Impact: Detailed Tables

The following summary tables show the economic impact of forest and watershed restoration for each type of restoration on major economic sectors within each economic region.

Each table displays the total output, jobs, and income (direct, indirect, and induced effects) in the entire region ('Total' column) for each sector and then the economic contribution to those sectors for each restoration category ('Contribution' column).

For example, Table A-IV.1 shows that the Northeast Economic Region has a total industrial output of $5.9 billion and timber sale contracts on USFS forestland account for $21 million, or 0.36 percent, of that total output.

Please note that the forest restoration impacts are based on the USFS's average annual restoration activity while the watershed restoration impacts are based on estimated expenditures over several years.

Table A-IV.1: Northeast Economic Region – Timber Sales

Economic Sector	Output ($1000)	Contribution ($1000)	%	Jobs	Contribution	%	Income* ($1000)	Contribution ($1000)	%
Agriculture and Forestry Services	577,839	2,795	0.48%	11,186	6	0.05%	148,693	868	0.58%
Mining, Sand and Gravel	6,504	4	0.07%	80	0	0.06%	2,230	1	0.06%
Construction	168,866	233	0.14%	2,703	4	0.14%	74,225	102	0.14%
Food Processing	1,190,700	10,389	0.87%	4,543	49	1.08%	198,805	2,280	1.15%
Wood and Paper Processing	99,365	106	0.11%	496	1	0.11%	23,004	23	0.10%
Misc. Manufacturing	21,704	7	0.03%	92	0	0.03%	9,113	3	0.03%
Transportation	175,268	33	0.02%	1,037	0	0.02%	44,369	8	0.02%
Publishing & Communications	420,262	93	0.02%	3,207	1	0.03%	174,964	38	0.02%
Public Utilities	304,128	233	0.08%	373	0	0.08%	44,845	35	0.08%
Trade	65,062	39	0.06%	489	0	0.09%	15,235	12	0.08%
Motels, Eating and Drinking	463,072	1,306	0.28%	7,854	27	0.34%	204,862	605	0.30%
Finance, Insurance, and Real Estate	235,532	197	0.08%	3,588	3	0.08%	68,450	89	0.13%
Amusement and Recreation	160,097	288	0.18%	4,498	8	0.18%	54,852	98	0.18%
Consumer Services	205,022	217	0.11%	2,417	6	0.24%	65,061	92	0.14%
Business Services	269,980	521	0.19%	4,343	15	0.35%	106,723	253	0.24%
Medical, Education, and Social Services	447,302	717	0.16%	8,465	13	0.15%	249,157	402	0.16%
Federal Government	222,198	1,875	0.84%	1,468	12	0.80%	107,157	857	0.80%
State and Local Government	919,438	2,086	0.23%	9,916	23	0.23%	491,440	1,115	0.23%
Total	**5,952,340**	**21,139**	**0.36%**	**66,755**	**167**	**0.25%**	**2,083,185**	**6,882**	**0.33%**

Source: Forest Econ Inc., 2012 (Input/Output Models)
*Wage and salary income only – no proprietor's income

Table A-IV.2: Northeast Economic Region – Stewardship Contracts

Economic Sector	Output ($1000)	Contribution ($1000)	%	Jobs	Contribution	%	Income* ($1000)	Contribution ($1000)	%
Agriculture and Forestry Services	577,839	3,718	0.64%	11,186	52	0.47%	148,693	1,998	1.34%
Mining, Sand and Gravel	6,504	3	0.05%	80	0	0.04%	2,230	1	0.04%
Construction	168,866	266	0.16%	2,703	4	0.16%	74,225	117	0.16%
Food Processing	1,190,700	1,363	0.11%	4,543	6	0.14%	198,805	262	0.13%
Wood and Paper Processing	99,365	15	0.01%	496	0	0.02%	23,004	3	0.01%
Misc. Manufacturing	21,704	3	0.02%	92	0	0.02%	9,113	1	0.01%
Transportation	175,268	22	0.01%	1,037	0	0.01%	44,369	5	0.01%
Publishing & Communications	420,262	61	0.01%	3,207	1	0.02%	174,964	24	0.01%
Public Utilities	304,128	113	0.04%	373	0	0.04%	44,845	17	0.04%
Trade	65,062	22	0.03%	489	0	0.05%	15,235	7	0.04%
Motels, Eating and Drinking	463,072	504	0.11%	7,854	10	0.13%	204,862	233	0.11%
Finance, Insurance, and Real Estate	235,532	90	0.04%	3,588	1	0.03%	68,450	39	0.06%
Amusement and Recreation	160,097	175	0.11%	4,498	5	0.11%	54,852	60	0.11%
Consumer Services	205,022	140	0.07%	2,417	3	0.14%	65,061	51	0.08%
Business Services	269,980	222	0.08%	4,343	6	0.13%	106,723	100	0.09%
Medical, Education, and Social Services	447,302	425	0.10%	8,465	7	0.09%	249,157	238	0.10%
Federal Government	222,198	1,037	0.47%	1,468	7	0.44%	107,157	474	0.44%
State and Local Government	919,438	1,212	0.13%	9,916	14	0.14%	491,440	648	0.13%
Total	**5,952,340**	**9,390**	**0.16%**	**66,755**	**117**	**0.18%**	**2,083,185**	**4,279**	**0.21%**

Source: Forest Econ Inc., 2012 (Input/Output Models)
*Wage and salary income only – no proprietor's income

Table A-IV.3: Northeast Economic Region – Service Contracts

Economic Sector	Output Contribution ($1000)		%	Jobs Contribution		%	Income* Contribution ($1000)		%
Agriculture and Forestry Services	577,839	3,318	0.58%	11,186	72	0.65%	146,693	1,875	1.28%
Mining, Sand and Gravel	6,504	2	0.03%	80	0	0.03%	2,230	1	0.03%
Construction	168,866	232	0.14%	2,703	4	0.14%	74,225	102	0.14%
Food Processing	1,190,700	96	0.01%	4,543	0	0.01%	198,805	17	0.01%
Wood and Paper Processing	99,365	8	0.01%	496	0	0.01%	23,004	2	0.01%
Misc. Manufacturing	21,704	2	0.01%	92	0	0.01%	9,113	1	0.01%
Transportation	175,268	14	0.01%	1,037	0	0.01%	44,369	3	0.01%
Publishing & Communications	420,262	46	0.01%	3,207	0	0.01%	174,964	18	0.01%
Public Utilities	304,128	78	0.03%	373	0	0.03%	44,845	12	0.03%
Trade	65,062	16	0.02%	489	0	0.04%	15,235	5	0.03%
Motels, Eating and Drinking	463,072	314	0.07%	7,854	6	0.08%	204,862	145	0.07%
Finance, Insurance, and Real Estate	235,532	61	0.03%	3,588	1	0.02%	68,450	26	0.04%
Amusement and Recreation	160,097	132	0.08%	4,498	4	0.08%	54,852	45	0.08%
Consumer Services	205,022	107	0.05%	2,417	2	0.10%	65,061	38	0.06%
Business Services	269,980	140	0.05%	4,343	3	0.08%	106,723	59	0.06%
Medical, Education, and Social Services	447,302	320	0.07%	8,465	6	0.07%	249,157	179	0.07%
Federal Government	222,198	572	0.26%	1,468	4	0.24%	107,157	262	0.24%
State and Local Government	919,438	912	0.10%	9,916	10	0.10%	491,440	487	0.10%
Total	**5,952,340**	**6,369**	**0.11%**	**66,755**	**113**	**0.17%**	**2,081,185**	**3,276**	**0.16%**

Source: Forest Econ Inc., 2012 (Input/Output Models)
*Wage and salary income only – no proprietor's income

Table A-IV.4: Northeast Economic Region – Watershed Restoration

Economic Sector	Output ($1000)	Contribution ($1000)	%	Jobs	Contribution	%	Income* ($1000)	Contribution ($1000)	%
Agriculture and Forestry Services	577,839	940	0.16%	11,186	7	0.06%	148,693	240	0.16%
Mining, Sand and Gravel	6,504	56	0.87%	80	1	0.74%	2,230	18	0.81%
Construction	168,866	2,350	1.39%	2,703	38	1.39%	74,225	1,033	1.39%
Food Processing	1,190,700	81	0.01%	4,543	0	0.01%	198,805	14	0.01%
Wood and Paper Processing	99,365	19	0.02%	496	0	0.02%	23,004	4	0.02%
Misc. Manufacturing	21,704	7	0.03%	92	0	0.03%	9,113	3	0.03%
Transportation	175,268	24	0.01%	1,037	0	0.01%	44,369	5	0.01%
Publishing & Communications	420,262	75	0.02%	3,207	1	0.02%	174,964	30	0.02%
Public Utilities	304,128	107	0.04%	373	0	0.04%	44,845	16	0.04%
Trade	65,062	17	0.03%	489	0	0.04%	15,235	5	0.03%
Motels, Eating and Drinking	463,072	192	0.04%	7,854	4	0.05%	204,862	88	0.04%
Finance, Insurance, and Real Estate	235,532	29	0.01%	3,588	0	0.01%	68,450	8	0.01%
Amusement and Recreation	160,097	130	0.08%	4,498	4	0.08%	54,852	44	0.08%
Consumer Services	205,022	87	0.04%	2,417	2	0.09%	65,061	37	0.06%
Business Services	269,980	175	0.07%	4,343	5	0.11%	106,723	92	0.09%
Medical, Education, and Social Services	447,302	323	0.07%	8,465	6	0.07%	249,157	181	0.07%
Federal Government	222,198	2,081	0.94%	1,468	13	0.89%	107,157	949	0.89%
State and Local Government	919,438	922	0.10%	9,916	10	0.10%	491,440	493	0.10%
Total	**5,952,340**	**7,616**	**0.13%**	**66,755**	**90**	**0.14%**	**2,083,185**	**3,260**	**0.16%**

Source: Forest Econ Inc., 2012 (Input/Output Models)
*Wage and salary income only – no proprietor's income

Table A-IV.5: Southeast Economic Region – Timber Sales

Economic Sector	Output ($1000)	Contribution ($1000)	%	Jobs	Contribution	%	Income* ($1000)	Contribution ($1000)	%
Agriculture and Forestry Services	317,842	5,151	1.62%	6,356	9	0.14%	79,976	1,420	1.78%
Mining, Sand and Gravel	13,256	7	0.05%	170	0	0.08%	4,326	2	0.05%
Construction	46,258	132	0.29%	1,210	3	0.29%	20,333	58	0.29%
Food Processing	290,223	12,117	4.18%	1,320	52	3.95%	51,895	2,584	4.98%
Wood and Paper Processing	94,542	57	0.06%	347	0	0.07%	17,914	10	0.06%
Misc. Manufacturing	3,125	5	0.17%	28	0	0.17%	832	1	0.17%
Transportation	15,976	46	0.29%	140	0	0.33%	4,842	12	0.24%
Publishing & Communications	54,383	83	0.15%	705	1	0.17%	22,015	33	0.15%
Public Utilities	68,458	285	0.42%	115	0	0.40%	10,484	44	0.42%
Trade	45,330	63	0.14%	295	1	0.27%	9,632	20	0.21%
Motels, Eating and Drinking	270,911	2,558	0.94%	4,976	52	1.05%	120,752	1,182	0.98%
Finance, Insurance, and Real Estate	113,831	396	0.35%	1,714	6	0.37%	34,294	177	0.52%
Amusement and Recreation	101,155	479	0.47%	2,609	12	0.48%	34,811	164	0.47%
Consumer Services	48,427	373	0.77%	1,338	10	0.77%	18,067	163	0.90%
Business Services	77,382	668	0.86%	1,550	13	0.87%	36,691	325	0.89%
Medical, Education, and Social Services	231,014	899	0.39%	4,660	16	0.35%	128,640	503	0.39%
Federal Government	144,357	2,451	1.70%	1,005	16	1.60%	69,141	1,122	1.62%
State and Local Government	517,780	1,612	0.31%	5,635	20	0.35%	276,753	862	0.31%
Total	**2,454,249**	**27,381**	**1.12%**	**34,172**	**215**	**0.63%**	**941,399**	**8,682**	**0.92%**

Source: Forest Econ Inc., 2012 (Input/Output Models)
*Wage and salary income only – no proprietor's income

Table A-IV.6: Southeast Economic Region – Stewardship Contracts

Economic Sector	Output Contribution ($1000)		%	Jobs Contribution		%	Income* Contribution ($1000)		%
Agriculture and Forestry Services	317,842	1,245	0.39%	6,356	20	0.32%	79,976	551	0.69%
Mining, Sand and Gravel	13,256	1	0.01%	170	0	0.01%	4,326	0	0.01%
Construction	46,258	36	0.08%	1,210	1	0.08%	20,333	16	0.08%
Food Processing	290,223	1,179	0.41%	1,320	5	0.36%	51,895	229	0.44%
Wood and Paper Processing	94,542	6	0.01%	347	0	0.01%	17,914	1	0.01%
Misc. Manufacturing	3,125	1	0.03%	28	0	0.03%	832	0	0.03%
Transportation	15,976	8	0.05%	140	0	0.06%	4,842	2	0.04%
Publishing & Communications	54,383	17	0.03%	705	0	0.03%	22,015	7	0.03%
Public Utilities	68,458	44	0.06%	115	0	0.06%	10,484	7	0.06%
Trade	45,330	11	0.02%	295	0	0.05%	9,632	4	0.04%
Motels, Eating and Drinking	270,911	357	0.13%	4,976	7	0.15%	120,752	165	0.14%
Finance, Insurance, and Real Estate	113,831	61	0.05%	1,714	1	0.06%	34,294	27	0.08%
Amusement and Recreation	101,155	85	0.08%	2,609	2	0.09%	34,811	29	0.08%
Consumer Services	48,427	67	0.14%	1,338	2	0.13%	18,067	27	0.15%
Business Services	77,382	106	0.14%	1,550	2	0.14%	36,691	49	0.13%
Medical, Education, and Social Services	231,014	156	0.07%	4,660	3	0.06%	128,640	87	0.07%
Federal Government	144,357	423	0.29%	1,005	3	0.28%	69,141	194	0.28%
State and Local Government	517,780	271	0.05%	5,635	3	0.06%	276,753	145	0.05%
Total	**2,454,249**	**4,075**	**0.17%**	**34,172**	**50**	**0.15%**	**941,399**	**1,541**	**0.16%**

Source: Forest Econ Inc., 2012 (Input/Output Models)
*Wage and salary income only – no proprietor's income

Table A-IV.7: Southeast Economic Region – Service Contracts

Economic Sector	Output Contribution ($1000)		%	Jobs Contribution		%	Income* Contribution ($1000)		%
Agriculture and Forestry Services	317,842	2,020	0.64%	6,356	37	0.58%	79,976	1,138	1.42%
Mining, Sand and Gravel	13,256	1	0.01%	170	0	0.02%	4,326	0	0.01%
Construction	46,258	66	0.14%	1,210	2	0.14%	20,333	29	0.14%
Food Processing	290,223	52	0.02%	1,320	0	0.02%	51,895	9	0.02%
Wood and Paper Processing	94,542	5	0.01%	347	0	0.01%	17,914	1	0.01%
Misc. Manufacturing	3,125	1	0.02%	28	0	0.02%	832	0	0.02%
Transportation	15,976	7	0.05%	140	0	0.05%	4,842	2	0.04%
Publishing & Communications	54,383	22	0.04%	705	0	0.04%	22,015	8	0.04%
Public Utilities	68,458	45	0.07%	115	0	0.06%	10,484	7	0.07%
Trade	45,330	12	0.03%	295	0	0.05%	9,632	4	0.04%
Motels, Eating and Drinking	270,911	294	0.11%	4,976	6	0.12%	120,752	135	0.11%
Finance, Insurance, and Real Estate	113,831	58	0.05%	1,714	1	0.05%	34,294	25	0.07%
Amusement and Recreation	101,155	107	0.11%	2,609	3	0.11%	34,811	37	0.10%
Consumer Services	48,427	81	0.17%	1,338	2	0.16%	18,067	30	0.16%
Business Services	77,382	95	0.12%	1,550	2	0.14%	36,691	40	0.11%
Medical, Education, and Social Services	231,014	192	0.08%	4,660	4	0.08%	128,640	107	0.08%
Federal Government	144,357	351	0.24%	1,005	2	0.23%	69,141	161	0.23%
State and Local Government	517,780	319	0.06%	5,635	4	0.07%	276,753	171	0.06%
Total	**2,454,249**	**3,729**	**0.15%**	**34,172**	**63**	**0.19%**	**941,399**	**1,902**	**0.20%**

Source: Forest Econ Inc., 2012 (Input/Output Models)
*Wage and salary income only – no proprietor's income

Table A-IV.8: Southeast Economic Region – Watershed Restoration

Economic Sector	Output Contribution ($1000)		%	Jobs Contribution		%	Income* Contribution ($1000)		%
Agriculture and Forestry Services	317,842	103	0.03%	6,356	1	0.02%	79,976	26	0.03%
Mining, Sand and Gravel	13,256	8	0.06%	170	0	0.24%	4,326	3	0.06%
Construction	46,258	918	1.98%	1,210	24	1.98%	20,333	403	1.98%
Food Processing	290,223	13	0.00%	1,320	0	0.00%	51,895	2	0.00%
Wood and Paper Processing	94,542	6	0.01%	347	0	0.01%	17,914	1	0.01%
Misc. Manufacturing	3,125	1	0.04%	28	0	0.04%	832	0	0.04%
Transportation	15,976	8	0.05%	140	0	0.06%	4,842	2	0.04%
Publishing & Communications	54,383	16	0.03%	705	0	0.03%	22,015	6	0.03%
Public Utilities	68,458	30	0.04%	115	0	0.04%	10,484	5	0.04%
Trade	45,330	6	0.01%	295	0	0.03%	9,632	2	0.02%
Motels, Eating and Drinking	270,911	100	0.04%	4,976	2	0.04%	120,752	46	0.04%
Finance, Insurance, and Real Estate	113,831	16	0.01%	1,714	0	0.01%	34,294	4	0.01%
Amusement and Recreation	101,155	54	0.05%	2,609	1	0.05%	34,811	19	0.05%
Consumer Services	48,427	31	0.06%	1,338	1	0.07%	18,067	13	0.07%
Business Services	77,382	45	0.06%	1,550	1	0.07%	36,691	22	0.06%
Medical, Education, and Social Services	231,014	102	0.04%	4,660	2	0.04%	128,640	57	0.04%
Federal Government	144,357	661	0.46%	1,005	4	0.43%	69,141	302	0.44%
State and Local Government	517,780	166	0.03%	5,635	2	0.04%	276,753	89	0.03%
Total	**2,454,249**	**2,285**	**0.09%**	**34,172**	**40**	**0.12%**	**941,399**	**1,002**	**0.11%**

Source: Forest Econ Inc., 2012 (Input/Output Models)
*Wage and salary income only – no proprietor's income

Table A-IV.9: Interior Central Economic Region – Timber Sales

Economic Sector	Output ($1000)	Contribution ($1000)	%	Jobs	Contribution	%	Income* ($1000)	Contribution ($1000)	%
Agriculture and Forestry Services	284,139	396	0.14%	4,671	2	0.05%	63,121	115	0.18%
Mining, Sand and Gravel	13,436	3	0.02%	298	0	0.03%	4,470	1	0.02%
Construction	391,882	105	0.03%	7,945	2	0.03%	172,252	46	0.03%
Food Processing	759,945	4,999	0.66%	3,563	52	1.45%	172,217	1,675	0.97%
Wood and Paper Processing	210,724	38	0.02%	924	0	0.02%	51,983	10	0.02%
Misc. Manufacturing	144,995	41	0.03%	392	0	0.04%	37,413	13	0.04%
Transportation	430,521	150	0.03%	2,908	1	0.03%	135,738	43	0.03%
Publishing & Communications	175,058	35	0.02%	1,698	0	0.02%	70,521	14	0.02%
Public Utilities	252,741	150	0.06%	368	0	0.05%	39,867	23	0.06%
Trade	313,530	54	0.02%	1,990	0	0.02%	91,665	18	0.02%
Motels, Eating and Drinking	921,940	429	0.05%	13,852	7	0.05%	413,251	194	0.05%
Finance, Insurance, and Real Estate	740,400	117	0.02%	12,051	2	0.02%	221,267	34	0.02%
Amusement and Recreation	574,437	356	0.06%	11,926	7	0.06%	197,128	123	0.06%
Consumer Services	253,799	162	0.06%	6,198	4	0.06%	101,909	67	0.07%
Business Services	518,927	463	0.09%	10,805	9	0.08%	273,622	250	0.09%
Medical, Education, and Social Services	1,128,210	677	0.06%	15,491	9	0.06%	639,423	383	0.06%
Federal Government	318,390	3,739	1.17%	2,411	27	1.14%	154,287	1,704	1.10%
State and Local Government	1,090,483	485	0.04%	10,773	5	0.05%	582,863	259	0.04%
Total	**8,523,556**	**12,400**	**0.15%**	**108,263**	**129**	**0.12%**	**3,422,999**	**4,972**	**0.15%**

Source: Forest Econ Inc., 2012 (Input/Output Models)
*Wage and salary income only – no proprietor's income

Table A-IV.10: Interior Central Economic Region – Stewardship Contracts

Economic Sector	Output Contribution ($1000)		%	Jobs Contribution		%	Income* Contribution ($1000)		%
Agriculture and Forestry Services	284,139	736	0.26%	4,671	12	0.26%	63,121	411	0.65%
Mining, Sand and Gravel	13,436	0	0.00%	298	0	0.00%	4,470	0	0.00%
Construction	391,882	36	0.01%	7,945	1	0.01%	172,252	16	0.01%
Food Processing	759,945	348	0.05%	3,563	3	0.09%	172,217	113	0.07%
Wood and Paper Processing	210,724	5	0.00%	924	0	0.00%	51,983	1	0.00%
Misc. Manufacturing	144,995	5	0.00%	392	0	0.01%	37,413	1	0.00%
Transportation	430,521	21	0.00%	2,908	0	0.01%	135,738	6	0.00%
Publishing & Communications	175,058	10	0.01%	1,698	0	0.01%	70,521	4	0.01%
Public Utilities	252,741	24	0.01%	368	0	0.01%	39,867	4	0.01%
Trade	313,530	10	0.00%	1,990	0	0.00%	91,665	3	0.00%
Motels, Eating and Drinking	921,940	98	0.01%	13,852	2	0.01%	413,251	45	0.01%
Finance, Insurance, and Real Estate	740,400	27	0.00%	12,051	1	0.00%	221,267	9	0.00%
Amusement and Recreation	574,437	68	0.01%	11,926	1	0.01%	197,128	23	0.01%
Consumer Services	253,799	65	0.03%	6,198	1	0.02%	101,909	21	0.02%
Business Services	518,927	98	0.02%	10,805	2	0.02%	273,622	42	0.02%
Medical, Education, and Social Services	1,128,210	117	0.01%	15,491	2	0.01%	639,423	66	0.01%
Federal Government	318,390	321	0.10%	2,411	2	0.10%	154,287	147	0.10%
State and Local Government	1,090,483	90	0.01%	10,773	1	0.01%	582,863	48	0.01%
Total	**8,523,556**	**2,079**	**0.02%**	**108,263**	**28**	**0.03%**	**3,422,999**	**961**	**0.03%**

Source: Forest Econ Inc., 2012 (Input/Output Models)
*Wage and salary income only – no proprietor's income

Table A-IV.11: Interior Central Economic Region – Service Contracts

Economic Sector	Output ($1000)	Contribution ($1000)	%	Jobs	Contribution	%	Income* ($1000)	Contribution ($1000)	%
Agriculture and Forestry Services	284,139	5,609	1.97%	4,671	93	2.00%	63,121	3,166	5.02%
Mining, Sand and Gravel	13,436	3	0.02%	298	0	0.02%	4,470	1	0.02%
Construction	391,882	241	0.06%	7,945	5	0.06%	172,252	106	0.06%
Food Processing	759,945	112	0.01%	3,563	1	0.02%	172,217	23	0.01%
Wood and Paper Processing	210,724	20	0.01%	924	0	0.01%	51,983	5	0.01%
Misc. Manufacturing	144,995	11	0.01%	392	0	0.01%	37,413	4	0.01%
Transportation	430,521	59	0.01%	2,908	0	0.01%	135,738	16	0.01%
Publishing & Communications	175,058	48	0.03%	1,698	0	0.03%	70,521	19	0.03%
Public Utilities	252,741	117	0.05%	368	0	0.04%	39,867	18	0.04%
Trade	313,530	53	0.02%	1,990	0	0.02%	91,665	17	0.02%
Motels, Eating and Drinking	921,940	636	0.07%	13,852	11	0.08%	413,251	294	0.07%
Finance, Insurance, and Real Estate	740,400	166	0.02%	12,051	3	0.03%	221,267	59	0.03%
Amusement and Recreation	574,437	387	0.07%	11,926	8	0.07%	197,128	134	0.07%
Consumer Services	253,799	445	0.18%	6,198	8	0.13%	101,909	134	0.13%
Business Services	518,927	576	0.11%	10,805	10	0.09%	273,622	221	0.08%
Medical, Education, and Social Services	1,128,210	661	0.06%	15,491	9	0.06%	639,423	375	0.06%
Federal Government	318,390	969	0.30%	2,411	7	0.30%	154,287	443	0.29%
State and Local Government	1,090,483	514	0.05%	10,773	5	0.05%	582,863	275	0.05%
Total	**8,523,556**	**10,627**	**0.12%**	**108,263**	**162**	**0.15%**	**3,422,999**	**5,309**	**0.16%**

Source: Forest Econ Inc., 2012 (Input/Output Models)
*Wage and salary income only – no proprietor's income

Table A-IV.12: Interior Central Economic Region – Watershed Restoration

Economic Sector	Output Contribution ($1000)		%	Jobs Contribution		%	Income* Contribution ($1000)		%
Agriculture and Forestry Services	284,139	3,488	1.23%	4,671	58	1.24%	63,121	1,969	3.12%
Mining, Sand and Gravel	13,436	2	0.01%	298	0	0.01%	4,470	1	0.01%
Construction	391,882	150	0.04%	7,945	3	0.04%	172,252	66	0.04%
Food Processing	759,945	69	0.01%	3,563	0	0.01%	172,217	14	0.01%
Wood and Paper Processing	210,724	12	0.01%	924	0	0.01%	51,983	3	0.01%
Misc. Manufacturing	144,995	7	0.00%	392	0	0.01%	37,413	2	0.01%
Transportation	430,521	37	0.01%	2,908	0	0.01%	135,738	10	0.01%
Publishing & Communications	175,058	30	0.02%	1,698	0	0.02%	70,521	12	0.02%
Public Utilities	252,741	73	0.03%	368	0	0.03%	39,867	11	0.03%
Trade	313,530	33	0.01%	1,990	0	0.01%	91,665	11	0.01%
Motels, Eating and Drinking	921,940	396	0.04%	13,852	7	0.05%	413,251	183	0.04%
Finance, Insurance, and Real Estate	740,400	103	0.01%	12,051	2	0.02%	221,267	37	0.02%
Amusement and Recreation	574,437	241	0.04%	11,926	5	0.04%	197,128	84	0.04%
Consumer Services	253,799	277	0.11%	6,198	5	0.08%	101,909	83	0.08%
Business Services	518,927	358	0.07%	10,805	6	0.06%	273,622	137	0.05%
Medical, Education, and Social Services	1,128,210	411	0.04%	15,491	5	0.03%	639,423	233	0.04%
Federal Government	318,390	602	0.19%	2,411	4	0.18%	154,287	275	0.18%
State and Local Government	1,090,483	320	0.03%	10,773	3	0.03%	582,863	171	0.03%
Total	**8,523,556**	**6,609**	**0.08%**	**108,263**	**101**	**0.09%**	**3,422,999**	**3,301**	**0.10%**

Source: Forest Econ Inc., 2012 (Input/Output Models)
*Wage and salary income only – no proprietor's income

Table A-IV.13: Interior South Economic Region – Timber Sales

Economic Sector	Output ($1000)	Contribution ($1000)	%	Jobs	Contribution	%	Income* ($1000)	Contribution ($1000)	%
Agriculture and Forestry Services	659,990	11,450	1.73%	8,696	22	0.25%	158,000	3,231	2.05%
Mining, Sand and Gravel	18,978	20	0.10%	322	0	0.09%	5,820	6	0.10%
Construction	485,141	601	0.12%	10,254	13	0.12%	213,244	264	0.12%
Food Processing	1,343,324	38,466	2.86%	6,180	149	2.41%	270,134	7,829	2.90%
Wood and Paper Processing	435,226	322	0.07%	2,149	2	0.08%	105,685	74	0.07%
Misc. Manufacturing	97,782	114	0.12%	403	0	0.11%	26,117	28	0.11%
Transportation	515,744	423	0.08%	3,231	3	0.11%	141,231	125	0.09%
Publishing & Communications	412,014	363	0.09%	5,283	6	0.10%	166,741	147	0.09%
Public Utilities	336,439	1,016	0.30%	630	2	0.31%	51,304	157	0.31%
Trade	439,116	342	0.08%	2,736	3	0.12%	104,441	107	0.10%
Motels, Eating and Drinking	1,815,141	8,854	0.49%	31,526	159	0.51%	812,461	4,095	0.50%
Finance, Insurance, and Real Estate	974,659	1,374	0.14%	16,576	25	0.15%	299,142	537	0.18%
Amusement and Recreation	741,090	1,643	0.22%	17,841	38	0.21%	258,634	566	0.22%
Consumer Services	393,168	1,469	0.37%	9,472	41	0.44%	143,940	592	0.41%
Business Services	847,035	4,320	0.51%	15,898	90	0.57%	435,551	2,146	0.49%
Medical, Education, and Social Services	1,981,975	3,811	0.19%	30,567	55	0.18%	1,123,096	2,158	0.19%
Federal Government	557,099	6,028	1.08%	3,936	41	1.04%	274,721	2,768	1.01%
State and Local Government	1,691,260	6,043	0.36%	17,655	67	0.38%	903,978	3,230	0.36%
Total	**13,745,182**	**86,659**	**0.63%**	**183,356**	**717**	**0.39%**	**5,494,241**	**28,060**	**0.51%**

Source: Forest Econ Inc., 2012 (Input/Output Models)
*Wage and salary income only – no proprietor's income

Table A-IV.14: Interior South Economic Region – Stewardship Contracts

Economic Sector	Output Contribution ($1000)		%	Jobs Contribution		%	Income* Contribution ($1000)		%
Agriculture and Forestry Services	659,990	4,581	0.69%	8,696	21	0.24%	158,000	1,531	0.97%
Mining, Sand and Gravel	18,978	6	0.03%	322	0	0.03%	5,820	2	0.03%
Construction	485,141	211	0.04%	10,254	4	0.04%	213,244	93	0.04%
Food Processing	1,343,324	11,390	0.85%	6,180	39	0.63%	270,134	2,085	0.77%
Wood and Paper Processing	435,226	91	0.02%	2,149	1	0.02%	105,685	21	0.02%
Misc. Manufacturing	97,782	31	0.03%	403	0	0.03%	26,117	8	0.03%
Transportation	515,744	124	0.02%	3,231	1	0.03%	141,231	37	0.03%
Publishing & Communications	412,014	117	0.03%	5,283	2	0.03%	166,741	48	0.03%
Public Utilities	336,439	313	0.09%	630	1	0.10%	51,304	48	0.09%
Trade	439,116	111	0.03%	2,736	1	0.04%	104,441	35	0.03%
Motels, Eating and Drinking	1,815,141	2,973	0.16%	31,526	54	0.17%	812,461	1,378	0.17%
Finance, Insurance, and Real Estate	974,659	460	0.05%	16,576	8	0.05%	299,142	183	0.06%
Amusement and Recreation	741,090	517	0.07%	17,841	12	0.07%	258,634	178	0.07%
Consumer Services	393,168	508	0.13%	9,472	14	0.15%	143,940	201	0.14%
Business Services	847,035	1,464	0.17%	15,898	30	0.19%	435,551	721	0.17%
Medical, Education, and Social Services	1,981,975	1,187	0.06%	30,567	17	0.06%	1,123,096	672	0.06%
Federal Government	557,099	1,476	0.26%	3,936	10	0.26%	274,721	680	0.25%
State and Local Government	1,691,260	1,919	0.11%	17,655	21	0.12%	903,978	1,026	0.11%
Total	**13,745,182**	**27,480**	**0.20%**	**183,356**	**236**	**0.13%**	**5,494,241**	**8,946**	**0.16%**

Source: Forest Econ Inc., 2012 (Input/Output Models)
*Wage and salary income only – no proprietor's income

Table A-IV.15: Interior South Economic Region – Service Contracts

Economic Sector	Output Contribution ($1000)		%	Jobs Contribution		%	Income* Contribution ($1000)		%
Agriculture and Forestry Services	659,990	9,790	1.48%	8,696	166	1.91%	158,000	5,490	3.47%
Mining, Sand and Gravel	18,978	6	0.03%	322	0	0.03%	5,820	2	0.03%
Construction	485,141	463	0.10%	10,254	10	0.10%	213,244	203	0.10%
Food Processing	1,343,324	239	0.02%	6,180	1	0.02%	270,134	39	0.01%
Wood and Paper Processing	435,226	63	0.01%	2,149	0	0.02%	105,685	16	0.01%
Misc. Manufacturing	97,782	31	0.03%	403	0	0.03%	26,117	8	0.03%
Transportation	515,744	130	0.03%	3,231	1	0.03%	141,231	38	0.03%
Publishing & Communications	412,014	144	0.04%	5,283	2	0.04%	166,741	57	0.03%
Public Utilities	336,439	258	0.08%	630	0	0.08%	51,304	39	0.08%
Trade	439,116	102	0.02%	2,736	1	0.03%	104,441	31	0.03%
Motels, Eating and Drinking	1,815,141	1,589	0.09%	31,526	28	0.09%	812,461	728	0.09%
Finance, Insurance, and Real Estate	974,659	347	0.04%	16,576	6	0.04%	299,142	127	0.04%
Amusement and Recreation	741,090	589	0.08%	17,841	13	0.08%	258,634	203	0.08%
Consumer Services	393,168	579	0.15%	9,472	13	0.14%	143,940	191	0.13%
Business Services	847,035	839	0.10%	15,898	17	0.10%	435,551	364	0.08%
Medical, Education, and Social Services	1,981,975	1,339	0.07%	30,567	19	0.06%	1,123,096	758	0.07%
Federal Government	557,099	1,677	0.30%	3,936	11	0.29%	274,721	771	0.28%
State and Local Government	1,691,260	1,997	0.12%	17,655	22	0.13%	903,978	1,067	0.12%
Total	**13,745,182**	**20,183**	**0.15%**	**183,356**	**313**	**0.17%**	**5,494,241**	**10,131**	**0.18%**

Source: Forest Econ Inc., 2012 (Input/Output Models)
*Wage and salary income only – no proprietor's income

Table A-IV.16: Interior South Economic Region – Watershed Restoration

Economic Sector	Output ($1000)	Contribution ($1000)	%	Jobs	Contribution	%	Income* ($1000)	Contribution ($1000)	%
Agriculture and Forestry Services	659,990	4,674	0.71%	8,696	36	0.41%	158,000	1,191	0.75%
Mining, Sand and Gravel	18,978	206	1.09%	322	4	1.26%	5,820	63	1.08%
Construction	485,141	5,532	1.14%	10,254	117	1.14%	213,244	2,431	1.14%
Food Processing	1,343,324	238	0.02%	6,180	1	0.02%	270,134	39	0.01%
Wood and Paper Processing	435,226	128	0.03%	2,149	1	0.04%	105,685	34	0.03%
Misc. Manufacturing	97,782	109	0.11%	403	0	0.11%	26,117	26	0.10%
Transportation	515,744	302	0.06%	3,231	2	0.08%	141,231	88	0.06%
Publishing & Communications	412,014	229	0.06%	5,283	3	0.06%	166,741	89	0.05%
Public Utilities	336,439	373	0.11%	630	1	0.11%	51,304	56	0.11%
Trade	439,116	111	0.03%	2,736	1	0.04%	104,441	33	0.03%
Motels, Eating and Drinking	1,815,141	998	0.05%	31,526	18	0.06%	812,461	452	0.06%
Finance, Insurance, and Real Estate	974,659	292	0.03%	16,576	6	0.03%	299,142	83	0.03%
Amusement and Recreation	741,090	600	0.08%	17,841	15	0.08%	258,634	209	0.08%
Consumer Services	393,168	433	0.11%	9,472	10	0.11%	143,940	168	0.12%
Business Services	847,035	963	0.11%	15,898	19	0.12%	435,551	505	0.12%
Medical, Education, and Social Services	1,981,975	1,386	0.07%	30,567	20	0.07%	1,123,096	784	0.07%
Federal Government	557,099	6,493	1.17%	3,936	44	1.12%	274,721	2,964	1.08%
State and Local Government	1,691,260	2,097	0.12%	17,655	23	0.13%	903,978	1,121	0.12%
Total	**13,745,182**	**25,163**	**0.18%**	**183,356**	**320**	**0.17%**	**5,494,241**	**10,338**	**0.19%**

Source: Forest Econ Inc., 2012 (Input/Output Models)
*Wage and salary income only – no proprietor's income

Appendix V: Detailed Summary Data

Table A-V.1: Northeast Economic Region Summary Data

Summary Data	Commercial Timber Sales	Commercial Stewardship Contracts	Non-commercial Service Contracts	Total
USFS Costs				
Planning/NEPA	$ 717,000	$ 396,000	-	**$ 1,113,000**
Pre-sale/Preparation	$ 781,000	$ 431,000	-	**$ 1,212,000**
Administrative	$ 369,000	$ 203,000	$ 566,000	**$ 1,138,000**
Implementation	-	-	$3,218,000	**$3,218,000**
Total USFS Costs	$ 1,867,000	$ 1,030,000	$ 3,784,000	**$ 6,681,000**
Product Volume (Volume)				
Sawlogs (MBF)	15,009	2,886	-	**17,895**
Non-saw/Biomass (GT)	21,650	51,285	-	**72,935**
Total Industrial Output	$ 21,138,751	$ 9,389,886	$ 6,368,561	**$ 36,897,198**
Total Jobs (#)	167	117	113	**397**
Income				
Wage and Salary	$ 6,882,124	$ 4,278,852	$ 3,275,988	**$ 14,436,964**
Proprietor's Income	$ 1,168,895	$ 316,705	$ 180,022	**$ 1,665,622**
Total Income	$ 8,051,019	$ 4,595,558	$ 3,456,010	**$ 16,102,586**
Tax Revenue				
Income	$ 234,190	$ 150,859	$ 117,090	**$ 502,139**
Corporate	$ 70,134	$ 19,002	$ 10,801	**$ 99,937**
Fuels	$ 43,986	$ 16,669	$ 10,186	**$ 70,842**
Harvest	$ 66,211	$ 38,551	-	**$ 104,762**
Total Tax Revenue	$ 414,520	$ 225,082	$ 138,078	**$ 777,680**

Source: USFS TIM & FACTS database, 2012; USFS Cost Survey, 2012; Forest Econ Inc., 2012 (Input/Output Models)
Note: USFS costs for non-commercial (service contracting) includes administration and implementation costs. Implementation costs for commercial treatments are paid by contractors or through returned receipts.

Table A-V.2: Southeast Economic Region Summary Data

Summary Data	Commercial		Non-commercial	Total
	Timber Sales	Stewardship Contracts	Service Contracts	
USFS Costs				
Planning/NEPA	$ 934,000	$ 161,000	-	**$ 1,095,000**
Pre-sale/Preparation	$ 1,017,000	$ 176,000	-	**$ 1,193,000**
Administrative	$ 480,000	$ 83,000	$ 348,000	**$ 911,000**
Implementation	-	-	$ 1,970,000	**$ 1,970,000**
Total USFS Costs ($)	$ 2,431,000	$ 420,000	$ 2,318,000	**$ 5,169,000**
Product Volume (Volume)				
Sawlogs (MBF)	20,300	4,664	24,964	**24,964**
Non-saw/Biomass (GT)	23,723	13,903	37,627	**37,627**
Total Industrial Output	$ 27,381,274	$ 4,074,976	$ 35,184,922	**$ 35,184,922**
Total Jobs (#)	215	50	329	**329**
Income				
Wage and Salary	$ 8,682,208	$ 1,540,619	$ 12,125,240	**$ 12,125,240**
Proprietor's Income	$ 1,588,824	$ 266,061	$ 1,893,536	**$ 1,893,536**
Total Income	$ 10,271,032	$ 1,806,680	$ 14,018,775	**$ 14,018,775**
Tax Revenue				
Income	$ 87,984	$ 47,006	$ 181,026	**$ 181,026**
Corporate	$ 95,329	$ 15,964	$ 119,119	**$ 119,119**
Fuels	$ 84,499	$ 11,759	$ 105,500	**$ 105,500**
Harvest	$ 92,366	$ 19,889	$ 112,255	**$ 112,255**
Total Tax Revenue	$ 360,179	$ 94,618	$ 517,900	**$ 517,900**

Source: USFS TIM & FACTS database, 2012; USFS Cost Survey, 2012; Forest Econ Inc., 2012 (Input/Output Models)
Note: USFS costs for non-commercial (service contracting) includes administration and implementation costs. Implementation costs for commercial treatments are paid by contractors or through returned receipts.

Table A-V.3: Interior Central Economic Region Summary Data

Summary Data	Commercial		Non-commercial	Total
	Timber Sales	Stewardship Contracts	Service Contracts	
USFS Costs				
Planning/NEPA	$ 1,435,000	$ 123,000	-	**$ 1,558,000**
Pre-sale/Preparation	$ 1,562,000	$ 134,000	-	**$ 1,696,000**
Administrative	$ 737,000	$ 63,000	$ 963,000	**$ 1,763,000**
Implementation	-	-	$ 5,459,000	**$ 5,459,000**
Total USFS Costs ($)	$ 3,734,000	$ 320,000	$ 6,422,000	**$ 10,476,000**
Product Volume (Volume)				
Sawlogs (MBF)	29,904	2,243	-	**32,147**
Non-saw/Biomass (GT)	44,083	13,141	-	**57,224**
Total Industrial Output	$ 12,400,048	$ 2,079,158	$ 10,627,298	**$ 25,106,504**
Total Jobs (#)	129	28	162	**319**
Income				
Wage and Salary	$ 4,972,125	$ 961,478	$ 5,308,532	**$ 11,242,134**
Proprietor's Income	$ 929,866	$ 104,103	$ 599,541	**$ 1,633,510**
Total Income	$ 5,901,991	$ 1,065,580	$ 5,908,073	**$ 12,875,644**
Tax Revenue				
Income	$ 376,326	$ 34,984	$ 374,462	**$ 785,772**
Corporate	$ 111,584	$ 6,246	$ 35,972	**$ 153,803**
Fuels	$ 12,407	$ 3,125	$ 20,954	**$ 36,486**
Harvest	$ 118,943	$ 30,247	-	**$ 149,190**
Total Tax Revenue	$ 619,260	$ 74,601	$ 431,388	**$ 1,125,250**

Source: USFS TIM & FACTS database, 2012; USFS Cost Survey, 2012; Forest Econ Inc., 2012 (Input/Output Models)
Note: USFS costs for non-commercial (service contracting) includes administration and implementation costs. Implementation costs for commercial treatments are paid by contractors or through returned receipts.

Table A-V.4: Interior South Economic Region Summary Data

Summary Data	Commercial		Non-commercial	Total
	Timber Sales	Stewardship Contracts	Service Contracts	
USFS Costs				
Planning/NEPA	$ 2,290,000	$ 558,000	-	**$ 2,848,000**
Pre-sale/Preparation	$ 2,493,000	$ 608,000	-	**$ 3,101,000**
Administrative	$ 1,176,000	$ 287,000	$ 1,656,000	**$ 3,119,000**
Implementation	-	-	$ 9,381,000	**$ 9,381,000**
Total USFS Costs ($)	$ 5,959,000	$ 1,453,000	$ 11,037,000	**$ 18,449,000**
Product Volume (Volume)				
Sawlogs (MBF)	51,618	14,004	-	**65,622**
Non-saw/Biomass (GT)	47,034	10,356	-	**57,390**
Total Industrial Output	$ 86,659,462	$ 27,479,529	$ 20,183,322	**$ 134,322,313**
Total Jobs (#)	717	236	313	**1,265**
Income				
Wage and Salary	$ 28,059,745	$ 8,946,070	$ 10,131,042	**$ 47,136,857**
Proprietor's Income	$ 69,574	$ 37,501	$ 277,571	**$ 384,646**
Total Income	$ 28,129,319	$ 8,983,571	$ 10,408,612	**$ 47,521,503**
Tax Revenue				
Income	$ 300,658	$ 93,322	$ 54,655	**$ 448,635**
Corporate	$ 4,174	$ 2,250	$ 16,654	**$ 23,079**
Fuels	$ 95,026	$ 100,618	$ 49,612	**$ 445,255**
Harvest	$ 242,802	$ 30,335	-	**$ 273,137**
Total Tax Revenue	$ 842,660	$ 226,525	$ 120,921	**$ 1,190,106**

Source: USFS TIM & FACTS database, 2012; USFS Cost Survey, 2012; Forest Econ Inc., 2012 (Input/Output Models)
Note: USFS costs for non-commercial (service contracting) includes administration and implementation costs. Implementation costs for commercial treatments are paid by contractors or through returned receipts.

Table A-V.5: Eastern Oregon – Summary Data

Summary Data	Commercial		Non-commercial	Total
	Timber Sales	Stewardship Contracts	Service Contracts	
USFS Costs				
Planning/NEPA	$ 5,376,000	$ 1,238,000	-	**$ 6,614,000**
Pre-sale/Preparation	$ 5,853,000	$ 1,349,000	-	**$ 7,202,000**
Administrative	$ 2,762,000	$ 636,000	$3,534,000	**$ 6,932,000**
Implementation	-	-	$20,029,000	**$ 20,029,000**
Total USFS Costs ($)	$ 13,991,000	$ 3,223,000	$ 23,563,000	**$ 40,777,000**
Product Volume (Volume)				
Sawlogs (MBF)	116,831	23,797	-	**140,627**
Non-saw/Biomass (GT)	136,491	88,685	-	**225,176**
Total Industrial Output	$ 147,579,535	$ 43,023,549	$ 40,907,853	**$ 231,510,937**
Total Jobs (#)	1,228	430	651	**2,310**
Income				
Wage and Salary	$ 3,757,160	$ 724,370	$ 1,095,784	**$ 5,577,314**
Proprietor's Income	$ 52,353,361	$ 16,451,390	$ 21,713,757	**$ 90,518,509**
Total Income	$ 48,596,202	$ 15,727,020	$ 20,617,973	**$ 84,941,195**
Tax Revenue				
Income	$ 999,159	$ 326,170	$ 592,243	**$ 1,917,572**
Corporate	$ 281,222	$ 43,462	$ 71,254	**$ 395,938**
Fuels	$ 435,918	$ 132,171	$ 89,994	**$ 658,083**
Harvest	$ 520,321	$ 119,022	-	**$ 639,343**
Total Tax Revenue	$ 2,236,620	$ 620,825	$ 753,491	**3,610,936**

Source: USFS TIM & FACTS database, 2012; USFS Cost Survey, 2012; Forest Econ Inc., 2012 (Input/Output Models)
Note: USFS costs for non-commercial (service contracting) includes administration and implementation costs. Implementation costs for commercial treatments are paid by contractors or through returned receipts.

Table A-V.6: Economic impact of the USFS spending $1 million on forest and watershed restoration.

Economic Impact	Commercial		Non-commercial Service Contracts	Watershed Restoration
	Timber Sales	Stewardship Contracts		
Jobs (#)	88	133	28	15
Output ($)	$ 10,548,000	$ 13,349,000	$ 1,736,000	$ 1,124,000
Income ($)	$ 3,742,000	$ 5,104,000	$ 922,,000	$ 502,000
State Tax Revenue ($)	$ 160,000	$ 193,000	$ 32,000	$ 25,000

Source: USFS TIM & FACTS database, 2012; USFS Cost Survey, 2012; Forest Econ Inc., 2012 (Input/Output Models)

Table A-V.6: Economic impact from forest restoration for every 1,000 acres treated on eastern Oregon federal forestlands.

Economic Impact	Commercial		Non-commercial Service Contracts
	Timber Sales	Stewardship Contracts	
Jobs (#)	41	44	4
Output ($)	$ 4,879,000	$ 4,388,000	$ 461,000
Income ($)	$ 1,731,000	$ 1,678,000	$ 245,000
State Tax Revenue ($)	$ 74,000	$ 63,000	$ 8,000

Source: USFS TIM & FACTS database, 2012; USFS Cost Survey, 2012; Forest Econ Inc., 2012 (Input/Output Models)