The Economic Impacts of the US Ecological Restoration Sector

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Government-mandated restoration work provides jobs and economic growth, often in low-income and rural areas.

Debate continues over the economic impacts of environmental regulations that require environmental restoration. One question under discussion is what impact environmental restoration, restoration-related conservation, and mitigation actions—activities that are part of what we term the "restoration economy"—have on economic output and employment. The literature indicates that the restoration industry not only protects public environmental goods but also contributes to national economic growth and employment.[1] But the debate has lacked broad-scale empirical research to back up these findings.[2] To address this lack, we conducted a national survey of businesses that participate in restoration work to estimate the total sales and number of jobs directly associated with the restoration economy and to provide a profile of this nascent sector in terms of workforce needs and growth potential.[3]

What Is the Restoration Economy?

Restoration, for our purposes, is any combination of activities that are intended to improve ecosystem health and that result in a functioning ecosystem that provides a suite of ecosystem services (the beneficial functions of ecological systems).[4] A major challenge to quantifying the economic and employment impacts of the restoration industry is that it is spread across a diverse set of actors. The economic activities that contribute to restoration include project planning, engineering, legal services, intermediate supply of inputs, earthmoving, forestry, and landscaping.

Restoration is driven by complex legal requirements and public-sector investment arrangements. There are at least 25 federal statutes driving ecological restoration. Estimating conservatively, these statutes have guided at least 134 restoration programs, which have led to more than 1,118 restoration projects since 2000, ranging from $94,457 to $1.5 billion per year in restoration-budgeted spending.[5] There are restoration programs in every state, and these have led to at least 704 restoration projects since 2000.[6] (These figures omit restoration for which spending and activity statistics are not easily accessible; there is evidence of much higher levels of restoration work.)

There is ample evidence that public and private investments driven by federal regulations stimulate economic output and employment in restoration-related industries, contributing growth and jobs to the national economy in the short term, as well as long-term value and cost savings. In order to produce economic output, firms purchase input materials and services from other sectors of the economy (e.g., construction equipment, tools, computers, and specialized services). Thus, other sectors are stimulated indirectly from the direct sales of restoration firms (indirect impact). Finally, workers employed directly by restoration-related firms and indirectly in other sectors that sell inputs to restoration firms spend earnings on goods and services needed to support their households (induced impacts). Restoration is not limited to any single industry; it comprises a mixture of industries. Assessing the direct, indirect,

and induced effects requires constructing a custom input–output model. We did this by weighting multipliers from multiple industries by their relative contribution to the restoration program or project of interest.

What Our Model Revealed

We estimate that the US restoration economy as a whole produced $9.47 billion in economic output during 2014. This figure includes the value of all sales or revenue to firms engaged in all aspects of restoration work, from the environmental scientists and engineering companies that plan a wetland restoration project, to the construction firms hired to complete the work, to the greenhouses and nurseries that grow plants for the restoration. This activity directly generated 126,111 jobs and approximately $6.27 billion in labor income. The average labor income per direct job

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was $49,734 in 2014 dollars, which represents a figure close to the median annual US wage. This direct restoration activity results in $6.29 billion in value added to the US economy. Our analysis indicates that restoration activity generates approximately $75,170 in output per job. While this figure is lower than some highly capital-intensive industries like oil extraction and manufacturing, it is only slightly smaller than construction ($111,722) and is greater than retail ($58,836), which are some of the sectors most impacted by land development regulations. And the indirect effect represents an additional 26,444 jobs and $4.61 billion in output, while 68,843 jobs and $10.76 billion in output are generated through household spending.

All included, we estimate that the restoration economy generates approximately 221,000 jobs and $24.86 billion in economic output. The economic impact of $24.8 billion contributes approximately $1.02 billion to local and state coffers in tax revenues and an additional $2.13 billion to the federal government. These tax impacts measure revenue collected due to restoration work and are not net of any public procurements that pay for restoration.

The largest segments of restoration work involve planning, design, and engineering activities and physical restoration—the actual earth moving and site construction. Agriculture and forestry, architectural, engineering and related services, and environmental and other technical consulting services sectors represent nearly 90 percent of the direct employment and half of the total jobs supported by the restoration economy. This indicates that restoration job creation results in high-income and low-income employment opportunities without many in the middle. Although contractors and workers may experience seasonal and interannual fluctuations in income and employment, preliminary evidence indicates that restoration jobs are well compensated in comparison to average wages.[7]

The top 10 highest-employing occupations account for half of the jobs created directly. The top five occupations are in agriculture, and the next five are office and administrative jobs. These occupations range in typical education, work experience, on-the-job training, and compensation. (See "The 10 Highest-Employing Occupations with More Than 10 Employees.") The highest-paid occupations include chief executives, engineers, managers, and lawyers. (See "The 10 Highest-Paying Occupations with More Than

The 10 Highest-Employing Occupations with More Than 10 Employees

Occupation	Number Employed	Typical Education Required	Typical Work Experience Required	Typical On-the-Job Training Received	Mean Hourly Wage	Mean Annual Income
Farm workers and laborers, crop, nursery, and greenhouse	39,830	*	*	*	$10.01	$20,820.00
Graders and sorters, agricultural products	3,705	less than high school	none	short-term on-the-job training	$10.73	$22,320.00
Agricultural equipment operators	2,770	*	*	*	$13.70	$28,490.00
Farm workers, farm, ranch, and aquaculture	2,586	*	*	*	$12.10	$25,160.00
Packers and packagers, hand	2,468	less than high school	none	short-term, on-the-job training	$11.08	$23,040.00
Office clerks, general	2,293	high school diploma or equivalent	none	short-term, on-the-job training	$14.82	$30,820.00
Accountants and auditors	2,130	bachelor's degree	none	none	$35.42	$73,670.00
Lawyers	2,043	doctoral or professional degree	none	none	$64.17	$133,470.00
Bookkeeping, accounting, and auditing clerks	1,954	high school diploma or equivalent	none	moderate-term, on-the-job training	$18.30	$38,070.00
General and operations managers	1,822	associate's degree	1–5 years	none	$56.35	$117,200.00

* Indicates no data available for this occupation.
Source: Authors' analysis of survey data and US Bureau of Labor Statistics Current Employment Statistics Program (January 2014).

10 Employees.") Executives and engineers earn higher incomes than any of the 10 highest-employing occupations. Interestingly, lawyers appear on both the most-common and the highest-paid tables. The highest-paying jobs and jobs with fewer than 10 employees account for just over 3 percent of the total jobs analyzed.

The longevity of firms responding to our survey indicates a strong presence of mature companies that are looking to restoration work to expand their business. Their labor demand is multidimensional: they need workers with limited post-secondary education (e.g., in construction and landscaping industries), with a bachelor's degree, and also those with an advanced degree in engineering.

Restoration tends to occur in rural, low-income areas, where job creation is especially beneficial.

Previous and repeated assessments of biodiversity markets[8] and watershed investments and payments[9] suggest a global trend of increasing investments in ecological restoration. Restoration investments appear to have particularly localized benefits, which can be attributed to the tendency for projects to employ local labor and materials. However, the different compensation standards across states affect labor costs, and the different rules governing collective bargaining and public procurement affect the shares of labor and equipment that are locally supplied.

Another benefit of restoration is that it tends to occur in rural and largely low-income areas, meaning job creation tends to benefit low-income populations. Many firms transitioning to restoration are moving away from industries that are declining in the United States, such as logging, so restoration may represent welcome and needed job alternatives in low-income areas. While more research is needed, overall these trends provide useful insight into a growing restoration economy that creates a wide range of jobs.

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Endnotes

1 For a small sampling of articles, see. A. Ghermandi et al., "Values of Natural and Human-made Wetlands: A Meta-analysis," *Water Resources Research* 46, no. 12 (December 2010); R.H. Bark et al., "Habitat Preservation and Restoration: Do Homebuyers Have Preferences for Quality Habitat," *Ecological Economics* 68, no. 5 (2009): 1465–75; and P.E.T. Edwards, A.E. Sutton-Grier, and G.E. Coyle, "Investing in Nature: Restoring Coastal Habitat: Blue Infrastructure and Green Job Creation," *Marine Policy* no. 38 (2013): 65–7.

2 Todd K. BenDor et al., "Defining and Evaluating the Ecological Restoration Economy," *Restoration Ecology* 23, no. 3 (2015): 209–19.

3 Todd K. BenDor et al., "Estimating the Size and Impact of the Ecological Restoration Economy," *PLoS ONE* 10, no. 6 (2015): http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0128339.

4 "Ecosystems and Human Well-being: Biodiversity Synthesis," (report, Millennium Ecosystem Assessment, 2005), http://www.unep.org/maweb/documents/document.354.aspx.pdf.

5 BenDor et al., "Defining and Evaluating the Ecological Restoration Economy."

6 Ibid.

7 R. Shropshire and B. Wagner, "An Estimation of Montana's Restoration Economy" (report, Montana Research and Analysis Bureau, September 2009), http://ourfactsyourfuture.mt.gov/media/9321/restoration.pdf.

8 See, for example, B. Madsen, N. Carroll, and K. Moore Brands, "State of Biodiversity Markets Report: Offset and Compensation Programs Worldwide" (report, Ecosystem Marketplace, July 2010), http://www.ecosystemmarketplace.com/documents/acrobat/sbdmr.pdf.

9 For example, G. Bennett, N. Carroll, and K. Hamilton, "Charting New Waters: State of Watershed Payments 2012" (report, Ecosystems Marketplace, 2013), http://www.forest-trends.org/documents/files/.doc_3308.pdf.

The 10 Highest-Paying Occupations with More Than 10 Employees

Occupation	Numbers Employed	Typical Education	Typical Work Experience	Typical On-the-Job Training	Mean Hourly Wage	Mean Annual Income
Chief executives	216	bachelor's degree	more than 5 years	none	$86.88	$180,700.00
Petroleum engineers	22	bachelor's degree	none	none	$70.92	$147,520.00
Architectural and engineering managers	331	bachelor's degree	more than 5 years	none	$66.69	$138,720.00
Marketing managers	183	bachelor's degree	1–5 years	none	$66.06	$137,400.00
Natural sciences managers	96	bachelor's degree	more than 5 years	none	$65.60	$136,450.00
Computer and information systems managers	462	bachelor's degree	more than 5 years	none	$65.52	$136,280.00
Lawyers	2,043	doctoral or profes-	none	none	$64.17	$133,470.00
Financial managers	324	bachelor's degree	more than 5 years	none	$62.61	$130,230.00
Sales managers	188	bachelor's degree	1–5 years	none	$60.60	$126,040.00
Compensation and benefits managers	16	bachelor's degree	1–5 years	none	$57.05	$118,670.00

* Indicates no data available for this occupation
Source: Authors' analysis of survey data and US Bureau of Labor Statistics Current Employment Statistics Program (January 2014).