

## **Creating Jobs and Stimulating the Economy through Investment in Green Water Infrastructure**



## **About American Rivers**

American Rivers is a leading national organization standing up for healthy rivers so our communities can thrive. Through national advocacy, innovative solutions and our growing network of strategic partners, we protect and promote our rivers as valuable assets that are vital to our health, safety and quality of life.

Founded in 1973, American Rivers has more than 65,000 members and supporters nationwide, with offices in Washington, DC and the Mid-Atlantic, Northeast, Midwest, Southeast, California and Northwest regions.

## **About the Alliance for Water Efficiency**

The Alliance for Water Efficiency is a broad-based non-profit organization located in Chicago and dedicated to the efficient and sustainable use of water in the United States and Canada. It brings together a diverse range of stakeholders to advocate for water use efficiency and conservation. Providing safe drinking water, maintaining economic competitiveness, and protecting ecosystems are all enhanced by improvements in water use efficiency. Reducing water demand and network water loss are often the lowest cost options for developing new supplies and meeting environmental needs.

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## Summary

The nation's economy faces its worst crisis since the 1930s. Home values have plummeted, credit markets are frozen and the stock market remains volatile. The economy shed 533,000 jobs in November 2008, the largest one-month loss of jobs in over three decades. At the same time, the nation's decaying infrastructure is threatening long-term economic competitiveness. In order to reverse these trends, Congress and the Obama Administration are considering an economic stimulus package that would put Americans to work and build a solid foundation for the future.

Investments in "green" water infrastructure projects must be a key part of this package, as they promise to provide both an immediate economic boost and adequate clean water to drive future economic growth. The stimulus package presents the nation with a unique opportunity to realize a new vision for water management that fully integrates green and grey water solutions everywhere, not in just some places or as a marginal component. By investing in green infrastructure, we can put Americans to work building sustainable, adaptable water infrastructure that will be our legacy to future generations.

While the environmental benefits of green infrastructure have been well documented, the short-term economic benefits have not been explored as extensively. This paper examines three categories of green water infrastructure projects and demonstrates that each would provide a significant stimulus to the national economy:

- **Green roofs:** Covering even 1% of large buildings in America's medium- to large-sized cities with vegetated roofs would create over 190,000 jobs and provide billions in revenue to suppliers and manufacturers that produce or distribute green roof-related materials.
- **Water Efficiency:** A \$10 billion investment in water efficiency projects would produce a total economic output of \$25-28 billion, create 150,000-220,000 jobs and save 6.5-10 trillion gallons of water.
- **Wetland Restoration:** According to a quick survey of water resource managers and advocates, there are approximately 37 wetland restoration projects totaling \$423 million in spending ready to start in the next 6-9 months if they receive funding. Past projects show significant economic stimulus potential such as the Cache River restoration, which directly employed 220 people and created over \$12.6 million in economic output.

Many communities are ready to begin these projects, waiting only for adequate funding. They will not only provide good, local jobs and stimulate the manufacturing sector but will also address the nation's long-neglected water infrastructure which is decaying to the point that decades of progress are being reversed. In addition, because green solutions are more cost effective than traditional water infrastructure, they will allow communities to meet their water needs for less and have more resources to hire teachers and police officers and meet other critical needs. Green infrastructure is the right investment for current economic woes and to ensure that we have the safe, clean water we need for future growth.

## **I. Introduction**

### ***Failing Infrastructure***

For years, the nation's infrastructure has been neglected. Federal funding has fallen from 10% of non-defense spending fifty years ago to under 4% today.<sup>1</sup> The American Society of Civil Engineers graded both wastewater and drinking water systems a D-, the lowest ratings of any infrastructure category.<sup>2</sup> Decades of rapid development and poorly planned sprawl replacing wetlands and natural landscapes have aggravated this neglect. If we are to reverse these trends, we will need to spend over \$650 billion on capital improvements for our drinking water and sewage infrastructure through 2019.<sup>3</sup>

On top of these challenges, global warming is beginning to cause more frequent and more severe floods and droughts, further taxing our aging infrastructure. One-third of the U.S. experienced moderate to severe drought last summer and 40 state water managers have forecast significant water shortages in the coming five years. Annual flood damages in the U.S. have increased from \$1 billion in the 1940's to \$5 billion in the 1990's.

However, simply repairing last century's infrastructure will not work. We need to learn from past mistakes and employ innovative solutions that will be flexible enough to control stormwater runoff, buffer against worsening floods and droughts and secure a safe and consistent supply of water for all Americans. We will need to invest in new pipes and treatment plants, but we must also focus resources on more cost-effective and flexible strategies such as water efficiency, water reuse and green infrastructure.

### ***Economic Stimulus through Green Infrastructure***

It is time for a new public works program that can support economic growth, create new jobs and protect our most vital resource: water. Retrofitting homes and businesses with efficient plumbing fixtures has been shown to significantly lower water consumption, add effective capacity to sewage treatment systems, reduce energy costs associated with treatment and transportation of water and improve ecosystem health by leaving more water in rivers. New York City replaced 1.3 million inefficient toilets through a rebate program in the 1990s, reducing per capita water consumption 34% and saving \$200 million in water infrastructure costs.<sup>4</sup> Green roofs, rain gardens and other green infrastructure techniques can reduce wastewater flowing into overtaxed sewer systems, minimize flooding and recharge groundwater supplies. By integrating green infrastructure into their sewer overflow reduction plan, the City of Indianapolis will be able to reduce the size of sewage pipes and save over \$300 million.<sup>5</sup> Protecting and restoring wetlands and other natural areas near rivers can reduce and slow flood peaks, reducing damages

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<sup>1</sup> Building America's Future (January 19, 2008). "[Gov. Rendell Joins Gov. Schwarzenegger, Mayor Bloomberg to Create Non-Partisan Coalition for Federal Infrastructure Investment](#)". Press Release.

<sup>2</sup> American Society of Civil Engineers. "Report Card for America's Infrastructure." 2005.

<sup>3</sup> Environmental Protection Agency. "The Clean Water and Drinking Water Infrastructure Gap Analysis." Washington, DC: EPA, 2002.

<sup>4</sup> New York City Department of Environmental Protection. "Water Conservation Program" Flushing, NY: New York City Department of Environmental Protection, 2006.

<sup>5</sup> *Sewer Overhaul Mean More Green*, Indystar.com Oct. 14, 2008, <http://www.indystar.com/apps/pbcs.dll/article?AID=/20081014/LOCAL18/810140384>.

downstream. They also absorb sediment and other pollutants and prevent them from contaminating waterways, cutting water treatment costs.

Most importantly, given present circumstances, green infrastructure creates jobs and increases revenue for the manufacturing sector. Below we demonstrate the proven job creation potential for three categories of green infrastructure: green roofs, efficiency retrofits and wetland restoration. For the first two categories we are able to estimate the job creation and other economic benefits from implementing these techniques on a national scale. The results demonstrate that green infrastructure can have far-reaching economic impacts on multiple sectors of the American economy while also beginning to build the water infrastructure that will be key to maintaining competitiveness in the 21<sup>st</sup> century.

## **II. Green Infrastructure Programs**

### ***Green roofs***

Green roofs have long been recognized as an effective strategy to control stormwater, improve air quality and lower energy bills. Green roofs consist of a layer of soil and vegetation installed on top of a building. Widely used throughout Europe, they are rapidly gaining acceptance in the U.S. as well. A number of cities have undertaken demonstration projects, and cities such as Portland, Oregon and New York have recently begun to offer financial incentives to install green roofs. EPA has recognized green infrastructure as an important tool in meeting water quality objectives and is encouraging its use in Clean Water Act permits.<sup>6</sup>

Less attention has been paid to the near-term economic stimulus effect of green roof construction. Our analysis demonstrates that covering even 1% of large roof surfaces in all medium to large American cities would generate over 190,000 jobs. Billions of dollars would go to American workers and the manufacturers that supply green roof materials. Indirect economic effects would spread the stimulus effect across a broader section of the economy. Green roof programs have the added advantage that they can be implemented more rapidly than large-scale water infrastructure projects and can thus provide an immediate boost to the economy. In addition, controlling stormwater and reducing energy use in buildings will help build the new water and energy infrastructure that will be needed to keep communities economically competitive in the future. The combination of an immediate economic boost and long-term energy and water benefits makes investing in green roofs one of the soundest investments in any upcoming economic stimulus effort.

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<sup>6</sup> U.S. Environmental Protection Agency. Green Infrastructure Initiative. Announced April 19, 2007 in "Green Infrastructure Statement of Intent" Agreement between U.S. EPA, National Association of Clean Water Agencies, Natural Resources Defense Council, Low Impact Development Center and Association of State and Interstate Water Pollution Control Administrators.  
[http://www.epa.gov/npdes/pubs/gi\\_intentstatement.pdf](http://www.epa.gov/npdes/pubs/gi_intentstatement.pdf). Accessed December 3, 2008.

### Methodology

Our analysis of the economic stimulus effect of a nationwide green roof initiative is based on draft data from a forthcoming report on the job creation potential of green roof construction in Washington, DC.<sup>7</sup> We adopt the estimates used in this study (Table 1) of the cost per square foot of green roof installed and the number of jobs created per million dollars of direct investment. Based on these ratios, we can extrapolate the job creation potential to larger investments in green roofs across the country.

**Table 1 – Washington, DC Green roof Analysis<sup>8</sup>**

<b>Number of Jobs Created</b>	<b>Cost</b>	<b>Total Green Roof Area (ft<sup>2</sup>)</b>
5,895	\$299,900,000	14,994,000
11,791	\$599,800,000	29,988,000
17,686	\$899,600,000	44,982,000

In order to estimate the cost of a nationwide green roof initiative, we first need to determine the total area to be covered. Based on our calculations, the total green roof-ready area in U.S. cities over 50,000 people is 48.5 billion square feet.<sup>9</sup> Based on this area we can create a range of cost estimates for a national green roof initiative depending on the percentage of green roof-ready area covered. From this cost estimate we can in turn generate a range of job creation numbers based on the Washington, DC data.

### Results

Table 2 demonstrates that a nationwide green roof initiative has immense potential to create jobs and stimulate the economy. An initiative covering just 1% of the nation's green roof-ready building area would create over 190,000 jobs. The cost of this initiative would total about \$10 billion, making the job creation benefits comparable to other types of public infrastructure investments. In addition, billions of dollars of this total would go to U.S. manufacturers and suppliers related to the green roof industry.

**Table 2 – Job Creation Benefits of a National Green roof Initiative**

<b>Percent of greenroof-ready area covered</b>	<b>Cost<sup>10</sup></b>	<b>Number of jobs created<sup>11</sup></b>
1% coverage	\$9,694,674,570	190,580
2.5% coverage	\$24,236,686,425	476,450
5% coverage	\$48,473,372,851	952,900
7.5% coverage	\$72,710,059,276	1,429,349
10% coverage	\$96,946,745,701	1,905,799

<sup>7</sup> Washington, DC Office of Planning. Draft data from forthcoming report, Green Jobs from Green Roofs, 2009.

<sup>8</sup> *Ibid.*

<sup>9</sup> Green roof-ready area is defined as 75% (the amount of a roof surface typically covered by a green roof) of all roof area on buildings over 10,000 square feet in U.S. cities with a population greater than 50,000. Total area of the 601 U.S. cities with population over 50,000 comes from U.S. Census Bureau data. Estimates of the area in U.S. cities covered by roofs and the percentage of buildings over 10,000 feet are derived from a number of sources and studies. For a complete description of the methodology used in this projection, please contact [Whewes@americanrivers.org](mailto:Whewes@americanrivers.org).

<sup>10</sup> Washington, DC Office of Planning. Draft data from forthcoming report, Green Jobs from Green Roofs, 2009.

<sup>11</sup> *Ibid.*

Analyzing green roof implementation on such a large scale can be difficult to grasp given the large investment of resources it necessitates. Table 3 demonstrates the job creation benefits of green roof programs in one city. For example, covering 5% of Chicago’s green roof-ready rooftop area would create nearly 8,000 jobs.

**Table 3 – Chicago, IL**

Percent coverage	Cost	Jobs created
1%	\$80,722,604	1,587
5%	\$403,613,021	7,934
20%	\$1,614,452,083	31,737
40%	\$3,228,904,166	63,474
60%	\$4,843,356,249	95,212

While a national green roof initiative would have a large stimulative effect on the economy, the greatest benefit would come from the reduced stormwater runoff, energy savings, lower air pollution levels and cooler temperatures. Table 4 demonstrates the stormwater runoff benefits from installing green roofs in Washington, DC. Even the most moderate scenario reduces runoff by nearly 300 million gallons. This means that 300 million gallons of stormwater runoff containing pathogens, heavy metals, nutrients and other pollutants would not flow into the Anacostia or Potomac rivers or enter the city’s sewer system and cause combined sewer overflows (CSO). This reduction in runoff and sewer overflows improves public health, eases pressure on aging sewer infrastructure, enhances recreational use of local waterways and improves habitat for aquatic species. By reducing energy costs associated with heating and cooling buildings (on hot summer days, green roofs can be as much as 90° cooler than conventional roofs), green roofs also lower greenhouse gas emissions and combat global warming.

**Table 4 – Washington, DC Stormwater Benefits<sup>12</sup>**

Percent Green roof Coverage	Total Green roof Area (ft <sup>2</sup> )	Annual Stormwater Storage by Green roofs (gal)	Reduction in Annual Citywide Runoff	CSO Volume Reduction (gal)
20%	14,944,000	297,000,000	1.2%	75,000,000
40%	29,988,000	594,000,000	2.3%	150,000,000
60%	44,982,000	891,000,000	3.5%	210,000,000
80%	59,976,000	1,188,000,000	4.6%	273,000,000
100%	74,970,000	1,485,000,000	5.8%	334,000,000

***Water Efficiency***

Water efficiency programs offer the opportunity to stimulate the economy and create jobs in the near-term while strengthening communities, ecosystems and economic competitiveness in the long run. There is a great potential to increase water efficiency throughout the U.S., where EPA estimates there are 100 million antiquated toilets that use 2-3 times more water per flush than modern alternatives.<sup>13</sup> As more parts of the country face extended droughts, communities will need to make the most of every drop. An army

<sup>12</sup> Deutsch et al. “Re-greening Washington, DC: A Green Roof Vision Based on Quantifying Storm Water and Air Quality Benefits.” Casey Trees Endowment Fund and Limno-Tech, Inc, 2002.

<sup>13</sup> Plumbing Fixtures market Overview: Water Savings Potential for Residential and Commercial Toilet and Urinals. D&R International. September 30, 2005.

of workers will be needed to replace inefficient appliances and fixtures, improve outdoor irrigation and reduce water use in industrial and commercial applications. A recent analysis by the Alliance for Water Efficiency (AWE) – considered in depth below - found that a \$10 billion investment in water efficiency programs would create a total economic output of \$25-28 billion and create 150,000 to 220,000 jobs.<sup>14</sup>

Water efficiency programs have numerous additional benefits that will help ensure a competitive economy and healthy communities for future generations. First, a large amount of energy is needed to pump, transport and treat drinking water and collect and treat wastewater. Water-related energy use consumes 19% of California’s electricity.<sup>15</sup> Nationally, the figure is conservatively estimated to be 3-6% though most water and energy experts believe it is much higher. Lowering demand can reduce greenhouse gas emissions and help communities lower costs. Reducing domestic water consumption can also lower bills and help households balance their finances. This is especially important in low-income communities which have a disproportionate share of inefficient appliances and fixtures. Reducing demand on a city-wide scale can stretch existing water supplies further and preclude the need to construct expensive and energy-intensive new water supply projects. The City of New York, for example, replaced 1.3 million antiquated toilets in the 1990s. Through this and several other initiatives, the city reduced per capita water consumption 34% and saved the city nearly \$200 million by allowing it to defer water supply and wastewater treatment projects for 10 years.<sup>16</sup> Finally, reducing water consumption allows more water to remain in rivers and streams, leading to healthier ecosystems that can support recreation, tourism and other downstream water needs.

### *Methodology*

The Alliance for Water Efficiency’s recently-completed study provides an indication of the job creation and economic stimulus potential of water efficiency programs.<sup>17</sup> The report examines a variety of water efficiency investments, including:

- Indoor water efficiency: Replacing toilets, clothes washers, dishwashers, showerheads and faucets with more efficient models.
- Outdoor water efficiency: Installing smart irrigation controllers, efficient irrigation equipment and real-time monitoring.
- Commercial/industrial efficiency: Cooling tower upgrades, process water improvements, plumbing retrofits.
- Water utility efficiency: Municipal water utility leak detection and system water loss reduction programs.

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<sup>14</sup> Alliance for Water Efficiency. “Transforming Water: Water Efficiency as Stimulus and Long-Term Investment.” December 4, 2008.

<sup>15</sup> Klein, Gary. “California’s Water-Energy Relationship.” Sacramento: California Energy Commission, 2005.

<sup>16</sup> New York City Department of Environmental Protection. “Water Conservation Program” Flushing, NY: New York City Department of Environmental Protection, 2006.

<sup>17</sup> Alliance for Water Efficiency. “Transforming Water: Water Efficiency as Stimulus and Long-Term Investment.” December 4, 2008. For the complete study visit:

<http://www.allianceforwaterefficiency.org/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=2638>

The study uses an input-output model of the U.S. economy to measure the near-term creation of jobs and labor income, growth in GDP and total economic output resulting from a \$10 billion investment in water efficiency. They derive water efficiency program expenditures and cost estimates from actual water and energy efficiency programs already developed for municipal water utilities. They include the economic impacts for all sectors of the economy impacted by a given program including manufacturing, warehousing, transportation and distribution.

*Results*

Total economic output per million dollars of investment is between \$2.5 and \$2.8 million. The gross domestic product (GDP) increases \$1.3-1.5 million per million dollars of direct investment. Furthermore, every million dollars of direct investment in water efficiency programs creates 15-22 jobs. Table 5 lists a number of efficiency projects and details the economic and job creation benefits for each one. Based on these results, the Alliance for Water Efficiency’s report concludes that a \$10 billion investment in water/energy efficiency programs would raise the U.S. GDP \$13-15 billion and create 150,000-220,000 jobs. It would also save 6.5-10 trillion gallons of water with a significant reduction in energy use as a result.

**Table 5 – Economic Stimulus Benefits, Per Million Dollars of Investment<sup>18</sup>**

<b>Program Option</b>	<b>Output (million \$)</b>	<b>GDP (million \$)</b>	<b>Labor Income (million \$)</b>	<b>Employment (jobs)</b>
Water System Loss Control	\$2.82	\$1.44	\$1.05	21.6
Irrigation Controller Rebate/Direct Install Programs	\$2.55	\$1.31	\$0.85	20.4
High Efficiency Toilet Rebate Program	\$2.54	\$1.47	\$0.96	18.0
High Efficiency Toilet Direct Install Program	\$2.46	\$1.38	\$0.87	17.2
Industrial Water/Energy Survey & Retrofit Program	\$2.78	\$1.31	\$0.89	15.6

The direct and indirect economic benefits from a \$10 billion water/energy efficiency program would be spread broadly throughout the economy. Table 6 details the economic benefits by economic sector.<sup>19</sup>

**Table 6 – Distribution of Benefits from \$10 Billion Direct Investment in Water Efficiency Programs<sup>20</sup>**

<b>Economic Sector</b>	<b>GDP (Million \$)</b>	<b>Employment (Jobs)</b>
Ag, Forestry, Fish & Hunting	\$89	1,706
Mining	\$181	591
Utilities	\$232	438

<sup>18</sup> Alliance for Water Efficiency. “Transforming Water: Water Efficiency as Stimulus and Long-Term Investment.” December 4, 2008.

<sup>19</sup> Economic sectors are classified according to the North American Industry Classification System (NAICS).

<sup>20</sup> Alliance for Water Efficiency. “Transforming Water: Water Efficiency as Stimulus and Long-Term Investment.” December 4, 2008.

Construction	\$1,112	16,917
Manufacturing	\$2,313	24,315
Wholesale Trade	\$1,016	8,353
Retail Trade	\$1,398	24,768
Transportation & Warehousing	\$357	5,235
Information	\$431	2,459
Finance & Insurance	\$753	5,594
Real Estate & Rental	\$1,054	5,500
Professional - Scientific & Tech Services	\$818	9,123
Management of Companies	\$305	2,242
Administrative & Waste Services	\$682	18,191
Educational Services	\$57	1,651
Health & Social Services	\$437	8,328
Arts - Entertainment & Recreation	\$78	2,059
Accommodation & Food Services	\$220	7,077
Other Services	\$1,113	17,548
Government & Non-NAICS	\$857	13,409
<b>Total</b>	<b>\$13,501</b>	<b>175,504</b>

This analysis clearly demonstrates that water efficiency programs have the potential to create jobs and stimulate manufacturing and many other sectors of the economy. The economic stimulus potential of these efficiency projects is similar to other types of public infrastructure investments. However, efficiency programs have the added advantage that they can be implemented relatively quickly and scaled according to need. They will be able to provide a more rapid economic stimulus than other type of infrastructure projects for which planning has not yet been completed.

### ***Wetland Restoration***

Wetlands are a vital part of the nation’s water infrastructure. They provide untold benefits, from controlling floods and buffering communities from droughts to filtering pollutants and improving water quality. After centuries of neglect during which half of the nation’s wetlands were lost,<sup>21</sup> communities are beginning to realize that healthy wetlands are essential to ensuring a clean and consistent supply of water for future generations. Undoing centuries of damage will take significant time and resources, but it can also create jobs and stimulate local economies. While it is difficult to estimate the economic benefits of wetland restoration on a national scale, we examine one restoration project in Illinois which created over \$12 million in economic output and directly employed 220 workers.<sup>22</sup>

Wetland restoration could provide an immediate boost to the economy. In a quick survey in November 2008, American Rivers compiled a list of 37 wetland restoration projects totaling \$423 million in spending that are “ready to go,” meaning that design and

<sup>21</sup> Dahl, Thomas and Gregory Allord. “Technical Aspects of Wetlands: History of Wetlands in the Conterminous United States.” United States Geological Survey Water Supply Paper 2425. <http://water.usgs.gov/nwsum/WSP2425/history.html>. Accessed November 19, 2008.

<sup>22</sup> Caudill, James. “The Economic Impacts of Restoration and Conservation-Related Expenditures: The Cache River Watershed in Southern Illinois.” May 2008.

planning has been completed but additional funds are needed to begin work.<sup>23</sup> By funding these and other wetland restoration projects, we can inject millions into local economies and help ensure the financial stability of communities by protecting and restoring natural water supply and flood control infrastructure.

*Case Study: Cache River Wetlands Project*

The Cache River Wetlands are located in a watershed in southern Illinois. It is one of only 22 designated Wetlands of International Significance in the United States under the Ramsar Convention on Wetlands. Since 1991 a public-private partnership known as the Joint Venture Partnership has worked to protect a 60,000-acre wetland corridor along the Cache River. The group has undertaken significant efforts to restore the ecosystem through forest and wetland habitat restoration, reduction of sedimentation and stream bank/bed erosion and a partial reconnection of the upper and lower segments of the Cache River. With over \$10 million in funding from county, state and federal agencies, the Partnership completed an extensive list of restoration projects between 1996 and 2005. In May 2008 the U.S. Fish and Wildlife Service released a report examining the economic impact of this investment, which outlines the extensive benefits to the local and state economies.<sup>24</sup> The project directly employed hundreds and provided an economic boost to local businesses, but it also indirectly spurred economic growth as a result of the restored ecosystem.

Over the course of the ten year restoration project, nearly \$10 million was spent on salaries, equipment and materials within the state.<sup>25</sup> Table 7 shows how the expenditures were divided between salary and non-salary expenses and whether the money was spent locally.<sup>26</sup> Salary expenses are income earned by workers, while non-salary expenses are used for the purchase of equipment, supplies, building materials, bulldozers or other needs. Millions of dollars in wages were paid to workers throughout the local area and the state. Overall, 220 workers were employed to carry out the restoration and construction work. Local businesses and suppliers also benefited from millions in income as a result of the restoration project.

**Table 7 – Restoration and Construction Expenditure Summary**

<b>Expenditure Type</b>	<b>Local Expenditures</b>	<b>Non-Local Expenditures</b>	<b>Total</b>
<b>Salary</b>	\$3,157,192	\$2,781,035	\$5,938,227
<b>Non-salary</b>	\$1,408,448	\$2,405,208	\$3,813,656
<b>Total</b>	\$4,565,640	\$5,186,243	\$9,751,883

The economic benefit of the Cache River Wetland restoration goes beyond the direct wages paid and equipment purchased. There is a significant secondary economic stimulus

<sup>23</sup> American Rivers, NRDC, Environmental Law and Policy Center and the Ferguson Group. “Ready to Go Green Infrastructure Projects.” December 11, 2008. [www.americanrivers.org](http://www.americanrivers.org).

<sup>24</sup> Caudill, James. “The Economic Impacts of Restoration and Conservation-Related Expenditures: The Cache River Watershed in Southern Illinois.” May 2008.

<sup>25</sup> Total construction costs totaled over \$10.6 million, but the author of the economic impacts study only examines expenditures made in-state. A small amount, \$871,179 or 8% of overall project costs, left the state. The remaining 92% of expenditures totals over \$9.7 million.

<sup>26</sup> The local area is defined as Alexander, Pulaski, Johnson and Union counties.

and job creation effect for the region and the state. The total economic output for the restoration project totals more than \$12.6 million dollars (Table 8). This includes the salaries and equipment expenses from Table 7 and also indirect and induced effects. Indirect effects are the purchases by a retailer from a wholesaler or manufacturer that result from the direct expenditure. For example, if the agencies carrying out the restoration project purchase equipment from a retailer who subsequently purchases additional equipment from a manufacturer, the latter purchase would be counted as an indirect effect. Induced effects in this context refer to the increased spending by people employed in the restoration project. Together, the wetlands restoration project created total economic output of over \$4 million for the local area and an additional \$8.5 million for the state. In addition, over the ten year period, 130 jobs were created indirectly as a result of the restoration initiative which added additional income and additional tax revenue for the local area and the state.

**Table 8 – Summary of Restoration Economic Impacts**

	<b>Local Spending</b>	<b>Non-Local Spending</b>	<b>Total</b>
<b>Total Expenditures</b>	\$4,565,640	\$5,186,243	\$9,751,883
<b>Total Economic Output</b>	\$4,157,221	\$8,475,142	\$12,632,363
<b>Indirect Jobs Created</b>	60	70	130
<b>Indirect Employment Income</b>	\$1,259,571	\$2,830,850	\$4,090,421
<b>Tax Revenue</b>	\$642,103	\$736,793	\$1,378,896

While we cannot extrapolate the economic benefit from this case study because of the particularity of the project, it demonstrates that wetland restoration can have a significant benefit to local communities and the region. The Cache River Wetland project directly created hundreds of jobs and provided an even greater stimulus indirectly through restoration spending. It also protected and revitalized a unique ecosystem that provides immense benefits to local communities in the form of wildlife habitat, flood control and water quality improvement.

### **III. Conclusion**

The above analysis proves that green infrastructure and water efficiency retrofit projects have a significant stimulus effect on local, regional and national economies. These projects are typically carried out for their important clean water benefits, but they can be an important part of an economic recovery plan as well. The many benefits green infrastructure provides will furthermore help communities secure sufficient clean water to support new manufacturing plants, power generation, recreational industries or other economic growth. Investing in green infrastructure now will provide jobs in the near term and will ensure the clean water supplies essential to long-term economic growth.