EARTH ECONOMICS

Return on Natural Capital Investments

Understanding Nature's Contribution to the Economy

Nature provides countless benefits to people, including many that are crucial to our survival, like breathable air, potable water, and nourishing food. In fact, our towns and cities are figuratively and literally embedded in nature and are reliant on functional ecosystems for long-term growth and resilience. Whether from shocks like floods and wildfire or ongoing stressors like chronic contamination and biodiversity decline, loss of nature's contributions come at a great cost to the economy and our communities. These benefits, often called ecosystem goods and services, represent real economic value.

Why is it Important to Put a Value on Nature's Contributions?

Until very recently, the benefits provided by natural systems have not been included in accounting or economic analysis; effectively, they have been valued at $0. Without associated dollar values for benefits, decision makers understandably minimize investment in natural systems to reduce project costs. Now, with better economic tools and improved understanding of ecological functions, reliable dollar values – often very high values - can be assigned to the benefits that flow from a floodplain, forest, or city park. With fully valued benefits, decision makers are far more likely to pursue projects that integrate natural systems with built infrastructure.

Nature is a Good Investment!

Projects that enhance natural systems begin to look much more like investment opportunities when benefit values are included. In fact, when the broad range of benefits is included in analyses, many natural capital projects provide a significant return on investment (ROI) for government or private investors. For example, an investment to protect and utilize natural floodplains to reduce destructive flooding can avoid millions of dollars of flooding damage to businesses and homes - true dollar savings. With a full understanding of benefits and costs, decision makers are far more likely to invest in projects that reconnect their economies and communities with nature – building resilience and ultimately reducing long-term costs.

Calculating the ROI

Economic tools and values needed to calculate nature's many contributions to our economy are now widely available and coming into more common use. Federal agencies, including FEMA and HUD, are actively incorporating ecosystem values in more and more of their analyses. Locally, ecosystem service values are now available in a 2015 report by Earth Economics, ***Open Space Valuation for Central Puget Sound***. These values can be used to calculate ROI for a wide variety of projects around Puget Sound.

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Return on Investment: Levee Setbacks

Natural Flood Control Offers Many Benefits

Increasing intensity of storms and flooding puts aging infrastructure such as levees at great risk and consumes many millions of maintenance and reconstruction dollars. An alternative is to restore the hydrological connection between rivers, adjacent wetlands, and floodplains. This connection provides robust flood protection as well as many co-benefits, most notably salmon and bird habitat, enhanced water filtration, and opportunities for recreation.

Neadham Road Case Study

The Puyallup River flows from Mount Rainier to sea level within a few dozen miles, and is prone to severe flooding as experienced during three large floods between 2006 and 2009. These floods affected more than 22,000 residents and many local businesses.

The Neadham Road project is located in the Puyallup River floodplain about four miles south of Orting, Washington. Repeated flooding has caused erosion well beyond the river channel, leaving only remnants of the costly historic levees.

The restoration project involved the removal of levee fragments, purchase and deconstruction of multiple homes, habitat restoration, and construction of a new setback levee.[1] The new levee allows for wetland creation, hydrological reconnection, and native plant restoration – returning the river to a more natural and resilient configuration.

Figure 1: Neadham Road Neighborhood 2006 Flooding

Financial and Environmental Returns

This project investment provides substantial financial and environmental returns, including not only avoided flood damages to residents and businesses, as envisioned for the the original levee, but also improved salmon habitat, reduced soil erosion, and enhanced recreation opportunities, among other benefits. If this project had not been completed, the county would continue to pour millions of dollars into the failing infrastructure and would miss the opportunity to rebuild critical habitat that will contribute to the economy for generations.

Total Project Cost	Calculated Benefit	Return on Investment
$8.1M	$165M	20.4x

*Calculated over 50 years with a discount rate of 3.5%

[1] Earth Economics. 2013. Return on Investment Analysis of Pierce County Flood Risk Management Solutions. Tacoma, WA.

Return on Investment: Habitat Restoration

Habitat Restoration Offers Many Benefits

Ecosystems are some of the most economically efficient production systems. Healthy rivers and riparian areas filter drinking water, move vast volumes of stormwater, channel floodwaters, recharge aquifers, and replenish surface waters. In an estuarine system that has suffered extensive degradation due to urban development, restoration provides important ecological and economic benefits. For example, salmon habitat restoration is beneficial not only to commercial, sport, and subsistence fishing but also supports local businesses such as motels, restaurants, sporting goods stores, gas stations, and fishing guide services.

North Winds Weir Restoration Case Study

The North Wind's Weir (NWW) estuarine habitat restoration project is located in the lower Duwamish River, a critical zone for salmon. The project helps protect juvenile salmon by providing a feeding area and transition zone in brackish estuarine water as they make their way out to Puget Sound.

Figure 2: North Winds Weir (Photo: Zac Christin)

Restoration of NWW removed hazardous material in the soils that contaminated the river and ultimately Puget Sound. The project installed native vegetation that provides a suite of ecosystem service benefits including flood protection, stormwater mitigation, water quality enhancements, recreation, air purification, and carbon sequestration. Investment in NWW restoration also provided jobs and economic contributions to the local economy.

Financial and Environmental Returns

King County purchased this property (2.5 acres) in an industrial region along the Duwamish River in 2001. After 10 years, contaminated soils were removed and native upland and emergent vegetation was planted, completing restoration in 2011. Earth Economics conducted a return-on-investment analysis in 2015.[2] Results show that the project provides a positive return-on-investment of about $1.16 for each dollar invested.

Total Project Cost	Calculated Benefit	Return on Investment
$4.6M	$5.3M	1.16x

*Calculated over 50 years with a discount rate of 2%

[2] Christin, Z. 2014. Return on Investment of North Wind's Weir. Earth Economics. Tacoma, WA.

Return on Investment: Managed Aquifer Recharge

Using Nature to Invest in Tomorrow's Water Supply

Natural areas with suitable topography and soils act as large water collectors that funnel rainwater into underground aquifers. Some communities augment this natural process by creating managed aquifer recharge projects (MARs) that manipulate the landscape and water flow to enhance recharge. During times of drought, these underground water reservoirs may be the only viable water source for farmers and communities.

Bokariza Managed Aquifer Recharge Project

The Pajaro Valley Aquifer located in Santa Cruz County, California is critical to the region, providing more than 90 percent of the water used by the Counties' $600 million agriculture industry.[3] Today, water is being withdrawn more quickly than it is recharged. This imbalance poses a significant threat to the surrounding communities and the local economy and has demanded that the County find ways to enhance recharge.

Figure 3: Bokariza Drainage Area

To demonstrate technical and financial feasibility, Santa Cruz County has implemented the Bokariza MAR project. Runoff from a 100-acre drainage area comprised primarily of commercial berry farms flows into a 2-acre recharge basin that feeds the aquifer. The MAR is expected to collect between 80 to 100 acre-feet of water per year. Though the Bokariza MAR provides only a fraction of the volume needed to make up the overdraft, this approach may be applied in other areas feeding the aquifer.

Return on Investment

An economic study by Earth Economics reviewed the ecological and hydrological functions performed by the Bokariza MAR project and produced a return on investment (ROI) analysis. [4] The MAR's benefits go well beyond water recharge and include important co-benefits such as flood mitigation and wetland habitat creation. The project offers a cumulative return of 467% over 25 years or $4.67 for each dollar invested. This translates to an annual return of 6.4% over the period, comparable to returns from public market investments.

Total Project Cost	Calculated Benefit	Return on Investment
$575,600	$3.3M	4.67x

*Calculated cumulative ROI over 25 years with a discount rate of 3.5%

[3] BAE Urban Economics, 2013. Draft Phase 1: Trends Report for the Santa Cruz County Economic Vitality Strategy.
[4] Schmidt, R., Lozano, S., Robins, J., Schwartz, A., Batker, D., 2015. Nature's Value in Santa Cruz County. Earth Economics, Tacoma, WA & the Resource Conservation District of Santa Cruz County, Capitola, CA.

Return on Investment: Open Space Conservation

Investments that Sustain Recreation, Water Supply, and Habitat

Governments and private landowners invest in landholding, conservation easements, and stewardship activities that protect natural landscapes and provide many market and non-market benefits. Natural capital investments often present a low financial risk while providing a high level of benefits and a productive life that is often significantly longer than that of built capital investments. Private or public, demonstrating the positive returns from these investments will help to bring more investors and dollars to these important projects.

The Coyote Valley Open Space Preserve

Acquired by the Santa Clara Valley, California Open Space Authority in 2010, the Coyote Valley Open Space Preserve (CVOSP) supports a mixture of oak woodland and grassland habitat. The Preserve provides a network of multi-use trails, grazing opportunities, and wildlife habitat.

If the CVOSP had not been protected in perpetuity, it is likely that at least 50 acres of the land would have been developed per zoning proposed in the City of San Jose's Coyote Valley Specific Plan.[5]

Figure 4: Coyote Valley Open Space Preserve

Return on Investment

Earth Economics conducted a return on investment (ROI) analysis of the CVOSP.[6] Multiple categories of benefits were considered in the analysis, including recreation (hiking, wildlife viewing), ecosystem services (flood protection, water quality, among others), and grazing revenue from leases to ranchers.

Though many of the project investments represent one-time costs, the benefits accrue year after year for decades, yielding a positive ROI. The investment in acquisition, capital improvements, and ongoing stewardship of the CVOSP yield at least $6 in public and private benefits for each $1 invested after 20 years.

Total Project Cost	Calculated Benefit	Return on Investment
$352,000	$2.5M	6.23x

*Calculated over 20 years with a discount rate of 3.5%

[5] City of San Jose, 2008. Coyote Valley Plan: A Vision for Sustainable Development.
[6] Batker, D., Schwartz, A., Schmidt, R., Mackenzie, A., Smith, J., Robins, J. 2014. Nature's Value in Santa Clara County. Earth Economics, Tacoma, WA & the Santa Clara Valley Open Space Authority, San Jose, CA