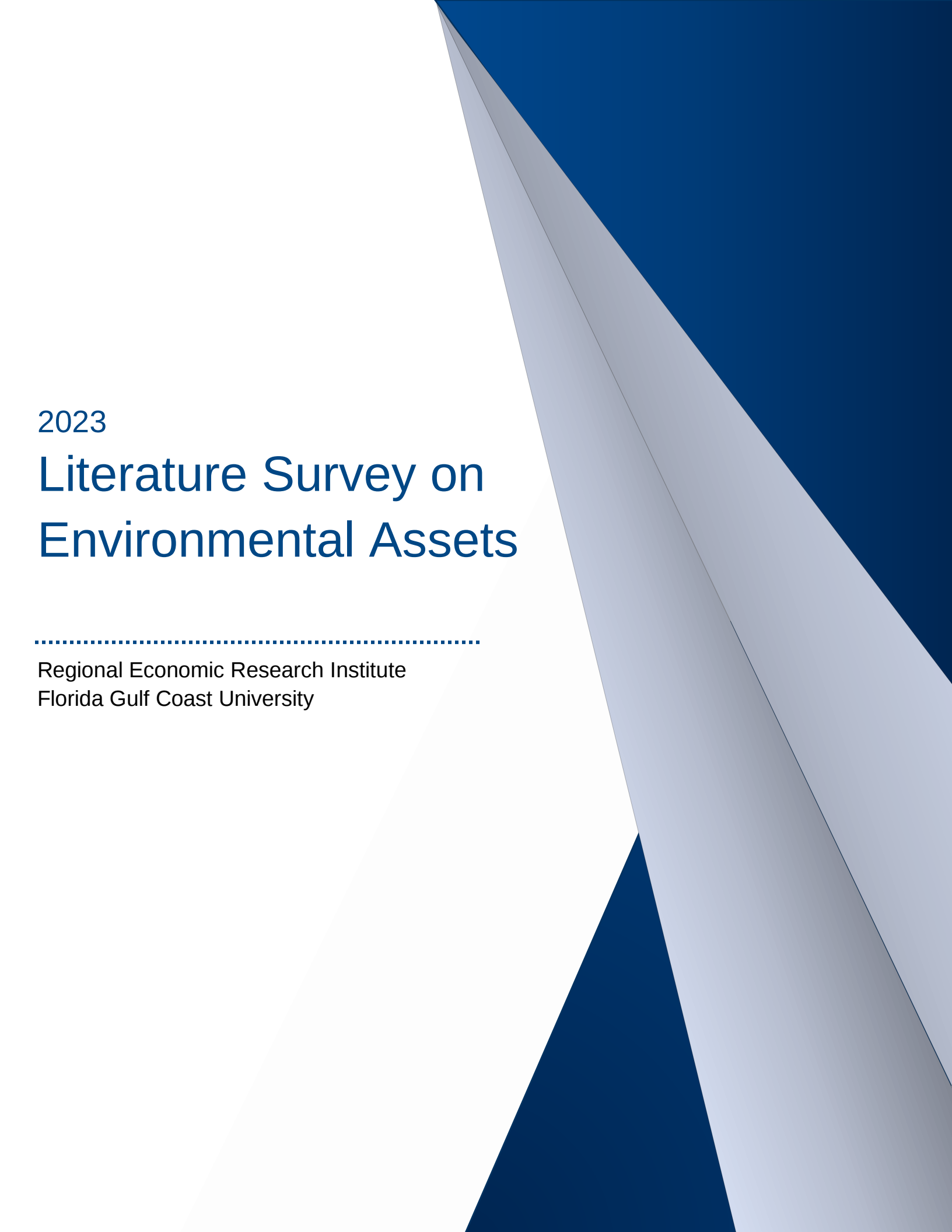




2023

Literature Survey on Environmental Assets

Regional Economic Research Institute
Florida Gulf Coast University

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About the Regional Economic Research Institute

The Regional Economic Research Institute studies, analyzes and reports on the regional economy encompassing Collier, Lee, Charlotte, Hendry and Glades counties. Established in 2005, it serves as a public service and economic development unit of the Lutgert College of Business' Dean's Office and strives to connect Southwest Florida to the resources of Florida Gulf Coast University.

In its many regular and occasional publications, and custom economic research, the RERI focuses on areas such as economic development and forecasting, economic impact analysis, secondary data analysis and surveys. The RERI often partner with different economic development organizations and chambers of commerce in our region, and works closely with the Lucas Institute for Real Estate Development and Finance, the Small Business Development Center and the Southwest Florida Leadership Institute, all of which are housed in the Lutgert College of Business at FGCU, as well as the Institute for Entrepreneurship.

Project Information

This report was created by Florida Gulf Coast University's Regional Economic Research Institute for the Collaboratory. This work would not have been possible without the RERI's student researchers.

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Executive Summary

The ongoing loss of biological diversity and the negative impact this has on environmental, human health and well-being has sparked interest in policies that protect, preserve and restore ecosystem services. This has led to a growing body of scientific research on ecosystem services. Ecosystem services valuation is one of the key areas of research undertaken in the broader ecosystem services research.

The purpose of this report is to systematically analyze available studies on the economic values of environmental goods and services provided by ecosystems around the world, with emphasis on state of Florida, particularly in Southwest Florida. To this end, we analyzed 10 papers, classifying them and identifying the relevance to Southwest Florida.

This survey analysis was conducted in two phases. First, we searched for academic research publications that had evaluated ecosystem services across the world using Google Scholar using certain keywords. From each paper, we focused on the Total Economic Value (TEV) which accounts for the sum of all use and non-use values of such ecosystems. Using population and area associated with each study we reconcile the different studies by relying on intensive measures: TEV by person and TEV by hectare.

Key Definitions

- **Ecosystem services valuation:** process of assessing the contributions of ecosystem services to sustainable human wellbeing.
- **Total Economic Value (TEV):** measure that accounts for the sum of all use and non-use values of ecosystems.

Main Findings

- The average TEV across the selected studies is \$9,709 billion dollars.
- The average TEV per person across the selected studies is \$2,026 dollars.
- The average TEV per hectare across the selected studies is \$18,599.
- For studies focusing on a global scale, the TEV ranged from \$29.1 to \$35 trillion dollars.
- For studies focusing on Florida, excluding South Florida and Southwest Florida, the TEV ranged from \$0.192 to \$3.2 billion dollars.
- For studies focusing on Southwest Florida and the Everglades, the TEV ranged from \$0.145 to \$2.7 billion dollars.

Introduction

The ongoing loss of biological diversity and the negative impact this has on environmental, human health and well-being has sparked interest in policies that protect, preserve and restore ecosystem services. This has led to a growing body of scientific research on ecosystem services. Ecosystem services valuation is one of the key areas of research undertaken in the broader ecosystem services research. According to Costanza and Liu (2004), ecosystem services valuation (ESV) refers to the process of assessing the contributions of ecosystem services to sustainable human wellbeing. Lara-Pulido, Guevara-Sangines and Martelo (2018) argue that placing an economic value on nature is potentially a powerful policy instrument since it makes invisible non-traded life-sustaining benefits we receive from nature to society visible. When these benefits are invisible (i.e., due to missing values), there is a risk that policy decisions are made by assuming they have a value of zero or with a complete unawareness of their real value.

According to TEEB (2009), placing values on environmental non-traded asserts and making these values visible makes it possible to: (i) compensate those who provide benefits, (ii) modify subsidies that affect natural capital, (iii) internalize environmental losses by establishing rates and prices or enforcing regulations, (iv) create economic value through protected areas, and (v) invest in ecological infrastructure. In every case, more information on the value of nature enhances the policy making process. While economic valuation of ecosystem services¹ is not the only way to inform policy makers, it is a simple way to communicate the value of nature.

In July 2011, the President's Council of Advisors on Science and Technology (PCAST) called upon the federal government to assess quadrennially the condition of the United States' ecosystems and the social and economic value of services they provide to the nation. The objective was to improve methods for evaluating those services and to establish an ecoinformatics initiative to pull together existing knowledge and gather new information in a format that interested parties can easily use. In 1997 Robert Costanza, Distinguished University Professor of Sustainability at Portland State University, Oregon, and colleagues first estimated that ecosystem services worldwide are worth an average \$33 trillion annually (\$44 trillion in 2012's dollars), nearly twice the global GNP of around \$18 trillion (\$24 trillion in today's dollars). Although the \$33 trillion has been hard to substantiate, their research was widely praised for drawing attention to the value of ecosystem services, according to Rick Linthurst, national program director of the Ecosystem Services Research Program at the U.S. Environmental Protection Agency (EPA) (Holzman, 2012).

In this context, the purpose of this report is to systematically analyze available studies on the economic values of environmental goods and services provided by ecosystems around the world, with emphasis on state of Florida, particularly in Southwest Florida. To this end, we analyzed 10 papers, classifying them and identifying the relevance to Southwest Florida.

¹ <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/economic-valuation-of-ecosystem-services>

Methodology

This survey analysis was conducted in two phases. First, we searched for academic research publications that had evaluated ecosystem services across the world using Google Scholar. For this search the following key words were used:

- ecosystem services
- economic value
- total economic value
- valuation of ecosystem services
- valuing resources
- economic value of natural resources.

We validated the selected papers for consistency in the measurement of “environmental valuation” and retained 10 papers for this survey. Given the interest in understanding the environmental valuation in Lee County, FL we broke the papers by regions: Southwest Florida/South Florida, Florida, and Global. Southwest Florida is defined as the five-county region of Charlotte, Collier, Glades, Hendry and Lee Counties. South Florida is defined in this paper as the area of Florida that houses the Florida Everglades. The papers discussed in this report that examine South Florida focus on the Everglades National Forest. The Everglades National Forest falls within the borders of Miami-Dade, Monroe, and Collier Counties.

From each paper, we focused on the Total Economic Value (TEV). Schuster and Doerr (2015) define ecosystem service valuation as the process quantifying the value that a landscape or habitat type in a defined location benefits people. Thus, the TEV accounts for the sum of all use and non-use values of such ecosystems. This definition was consistency throughout the selected papers. However, as pointed out by Barbier (2013) there are gaps and inconsistencies in the literature in terms of use areas studied, key values and used methods. Therefore, to reconcile these different studies we rely on intensive measures: TEV by person and TEV by hectare.

Population of specific regions were collected using the US Census, Population Reference Bureau, and Datacommons. The population was reported for the year that the paper was written. If not stated in the paper, the land area was collected from various different websites including the World Bank and the US Forest Service.

Survey of Papers

Globally, the TEV ranged from \$29.1 to \$35 trillion dollars. The TEV per person ranged from \$3,984.25 to \$5,936.23 with an average of \$5,195.19. On the other hand, the TEV per hectare ranged from \$2,236.79 to \$2,691.69 with an average of \$2,488.78. Numbers are consistent across studies suggesting. Given the scope of the research and methodology these seem appropriate initial estimates.

For Florida (excluding South Florida and Southwest Florida), the TEV ranged from \$0.192 to \$3.2 billion dollars. The TEV per person ranged from \$9.50 to \$2,596.42 with an average of \$671.57. On the other hand, the TEV per hectare ranged from \$11.27 to \$9,043.94 with an average of \$2,283.97. One concern with these estimates is that given the lack of a well-defined region the TEV/Population and TEV/Land estimates are underestimations of the true value.

For Southwest Florida and the Everglades, the TEV ranged from \$0.145 to \$2.7 billion dollars. The TEV per person ranged from \$427.53 to 975.82 with an average of \$662.11. On the other hand, the TEV per hectare ranged from \$18,691.98 to \$88,359.02 with an average of \$56,462.97. Overall, the average TEV per person is estimated at \$2,026 dollars and the average TEV per hectare is estimated at \$18,599.

Author	Method	TEV Average (in \$ Billions)	TEV/POP Average	TEV/Land Average
<i>Global</i>				
Groot et al. (2012) ^{P, H}	Meta-regression analysis	\$35,000	\$5,936.23	\$2,691.69
Balasubramanian (2019) ^{P, H}	Meta-regression analysis	\$29,085	\$3,984.25	\$2,236.79
Costanza, et al. (1997) ^{P, H}	Meta-analysis of willingness-to-pay studies	\$33,000	\$5,665.09	\$2,537.88
<i>Florida</i>				
Kroeger (2005) ^P	Benefit transfer	\$3.2	\$2,596.42	\$9,043.94
Kreye et al. (2016) ^{P, H}	Willingness-to-pay survey	\$0.192	\$9.50	\$11.27
Condon et al. (2007) ^{P, H}	Willingness-to-pay survey	\$0.827	\$51.98	\$48.53
Harrison (2014) ^P	Benefit Transfer	\$0.548	\$28.37	\$32.15
<i>SWFL/SF</i>				
Beever III (2013) ^P	ECOSERVE method	\$0.629	\$975.82	\$62,337.93
Beever III & Walker (2016) ^P	ECOSERVE method	\$0.145	\$427.53	\$88,359.02
Jerath et al. (2016) ^P	Cost benefit analysis	\$2.7	\$582.98	\$18,691.98

Note: ^P Population has been obtained at source other than the paper. ^H Land area has been obtained at source other than the paper.

There is a voluminous literature on economic and ecosystem services valuations of nature. For purposes of this report, we focused on the idea of total economic value in Southwest Florida. While this survey is not comprehensive of the whole literature, it does provide a good starting point to better understand the measurement of “environmental valuation” of areas and ecosystems, especially those located in Florida and Southwest Florida.

TEV provides an all-encompassing measure of the economic value of any environmental asset by capturing both use and non-use (i.e., passive use) values. This report concentrates on this indicator as it is so important for capturing and reflecting changes in well-being due to a project or policy that has environmental impacts. Overall, the review of existing studies illustrates the high value placed on natural resources in Florida.

Despite the challenges, considerable progress has been made over the last decades toward improved techniques for linking changes in ecosystem services to changes in human welfare. Part of that improvement is due to continuous improvements in modeling methods and better-quality data. Improvements in the data and continuous enhancement in analytical tools, as well as evaluation of geographic information system (GIS) means that there is scope to expand the current knowledge about the valuation of ecosystem services in Florida. Investment on the valuation of ecosystem services could improve stewardships, yielding a flow of vital goods and services to the benefits residents.

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