
ATTACHMENT 2



**NOAA SEA GRANT: ASSESSING THE MARKET AND NON-MARKET VALUE
AND ECONOMIC IMPACTS OF COASTAL ENGAGEMENT PROGRAMS**

LITERATURE REVIEW

SUBMITTED TO:
NOAA Sea Grant
Attn: Alison Krepp

SUBMITTED BY:
Eastern Research Group, Inc. (ERG)

DECEMBER 20, 2017

Table of Contents

1. Introduction	1
2. Literature Review	3
2.1 Previous Work Done by Sea Grant in this Area.....	3
2.2 Ecosystem Service Values	5
2.3 K-12 Environmental Educational Programs	6
2.4 Attribution	8
2.5 Long-term Benefits.....	8
2.6 Benefit-Cost Analysis of Resilience Planning	9

List of Appendices

Appendix A. Literature Review Tables.....	A-1
---	-----

List of Figures

Figure 1. Methodology for Performing Literature Review	1
--	---

1. Introduction

Each year, Sea Grant programs report on specific performance measures for each of the four focus areas outlined in NOAA’s Sea Grant 2014-2017 Strategic Plan—healthy coastal ecosystems, sustainable fisheries and aquaculture, resilient communities and economies, and environmental literacy and workforce development. Based on recent guidance, Sea Grant programs report on economic impacts that cross-cut these focus areas and includes:

- Number of new businesses and jobs created and associated wages
- Number of sustained businesses and jobs and associated wages
- Direct market impacts – Dollars saved, or revenue generated. Example benefits might include Resilient community insurance savings, efficiencies of fish catches
- Non-market impacts – Ecosystem service valuations from flood and storm protection, provision of fresh water, value of restored ecosystems, etc.

Over the past few years, several Sea Grant programs have explored the different methodologies used by individual Sea Grant programs to quantify economic benefits, including monetization approaches for non-market impacts. The purpose of this study is to continue exploring this challenging issue and recommend a set of monetization methodologies that:

- Produce reliable and consistent reporting of economic impacts across all Sea Grant programs
- Build on best management practices and tools that effectively quantify and communicate both market and non-market values of coastal engagement activities
- Can be implemented by non-economists.

To begin this analysis, we performed the following steps highlighted in Figure 1. We supplemented in-person listening sessions with several follow-up opportunities for feedback (webinars) to ensure we obtained feedback from Sea Grant Communication and Extension Leads, Educators, Research Coordinators, the Legal Network, and Economists.

Figure 1. Methodology for Performing Literature Review



We organized this report around the following sections:

- **Section 2** presents the findings from a literature review, which was targeted to issues raised during the listening sessions.

- **Appendix A** provides summary tables of the literature reviewed. A more extensive table with additional filterable, and sortable categories is found in the accompanying Excel file (“NOAA_SeaGrant_EconImpact_Lit.xlsx”).

2. Literature Review

The information collected from the listening sessions and the economist scoping session provided insight on the challenges and information gaps for developing monetization methodologies. Based on these insights, ERG targeted the literature review to identify key studies, databases, and tools in the areas of:

- Ecosystem service valuation
- K – 12 Educational Programs
- Attribution
- Long-term benefits
- Benefit-Cost analysis of resilience planning.

The targeted literature review shows that there are studies, methods, and databases available, which can be used to inform the development of similar methodologies. Ecosystem service valuation databases provide an avenue for valuing acres of land saved, some studies exist on K-12 environmental education that could be leveraged for Sea Grant, and there are some good resources for valuing the benefit-cost of resilience planning. Additionally, there are approaches out there for attributing benefits for partnership programs and for calculating long-term and recurring annual benefits.

The challenge going forward is not whether there are any methodologies or best practices we can build on. Rather, the key challenge is in balancing defensibility with simplicity and practicality. Can we develop approaches for attribution and long-term benefit reporting that are conservative enough that they do not raise eyebrows when presented to decision makers but can easily be calculated by non-economists?

2.1 Previous Work Done by Sea Grant in this Area

Since its inception, a goal of the National Sea Grant Network has been to manage and maximize economic impacts and benefits produced by fresh and salt water coastal ecosystems.¹ In the past 10 years, national reporting requirements have mandated return on investment (ROI) reporting for national programs, including the Sea Grant Network.² The mandated reporting has brought to light both positive and negative processes and results associated with reporting Sea Grant program benefits.³ Some existing studies, such as the Gulf of Mexico and Maine studies, have characterized the success of Sea Grant programs by monetizing program activity or “investments” and producing positive economic impacts and benefits data – or a positive return on investment. Such studies and attempts to collect program data have also helped identify gaps associated with monetizing Sea Grant program activities.

¹ Ropicki (TX Sea Grant), Andrew J., et al. “The Importance of Gulf of Mexico Marine Dependent Industries and Measuring Sea Grant Programming Benefits on those Industries.”

https://www.flseagrant.org/wp-content/uploads/GOMT16001_web.pdf

² Farrow, Kate, et al. “Report on the Economic Impact Assessment Methods Inventory for the Sea Grant Network – RFP: 2012 National Projects Competition, Maine Sea Grant.”

<http://nsgd.gso.uri.edu/meu/meus12003.pdf>

³ Farrow, Kate, et al. “Report on the Economic Impact Assessment Methods Inventory for the Sea Grant Network – RFP: 2012 National Projects Competition, Maine Sea Grant.”

<http://nsgd.gso.uri.edu/meu/meus12003.pdf>

Below are some of the key findings from the Gulf of Mexico and Maine studies that illustrate previous Sea Grant valuation work.

Maine Study

The Maine study is an inventory of Sea Grant impacts, both market and non-market, quantitative analyses of these impacts, and guidance recommendations to improve valuation strategies across the Sea Grant Network. Some of the key findings related to valuation of economic benefits were:

- Attribution is a key issue.
- Defines economic impact versus economic benefit.
- Non-market methodology used was value benefit transfer.
- Number of projects reporting dollar impacts businesses/jobs created and retained in 2010 and 2011.
- In both 2010 and 2011, 65% of Sea Grant projects reported dollar impacts. Thus approximately 1/3 of program impacts would need to be monetized in order to be captured. This necessitates [maybe] varying methodologies.
- Qualitative comments were among most useful feedback. Widespread agreement that there is a lack of social science expertise, especially in economics.
- Guidance is needed that promotes consistency in defining economic impacts and monetization methodologies.

GoM Study

The GoM study builds off two internal Sea Grant documents, the Maine Study and *2014-2017 National Performance Measures and Metrics*, by including “additional examples of Sea Grant programming and offering methodologies to qualitatively measure the economic value of marine dependent industries.”⁴ Some of the key findings related to valuation of economic benefits were:

- Benefits are calculated using IMPLAN or REMI and their associated multipliers.
- Qualitative Sea Grant impacts can be magnified by displaying the economic importance of the industry to local or regional economy (impact statements).
- Recreational fishing, commercial fishing, seafood processing, seafood wholesaling and retailing, and marine environmental recreation and tourism are key industries with huge economic impacts in the GoM.
- Sea Grant should be careful to not overstate total economic benefits of how they help these industries when attributing the Sea Grant portion of the benefit.
- Sea Grant should be cautious about using benefit transfer method as human preferences change over time and location.
- There is a large need to standardize methodologies and credit claimed by Sea Grant programs from economic impact assessments.

⁴ Ropicki (TX Sea Grant), Andrew J., et al. “The Importance of Gulf of Mexico Marine Dependent Industries and Measuring Sea Grant Programming Benefits on those Industries.”

https://www.flseagrant.org/wp-content/uploads/GOMT16001_web.pdf

2.2 Ecosystem Service Values

Through multiple listening sessions and analyzing existing Sea Grant economic benefits reporting data, monetizing ecosystem service values was consistently identified as a significant challenge for Sea Grant Offices across the Country. The challenges stemmed from 1) struggling to find existing studies suitable for benefits transfer, 2) the need for guidance about how many variables (e.g., geography, date of publication) can be different in an ecosystem service valuation study while still being defensible, 3) general concerns over the defensibility of the benefits transfer method, and 4) the extensive level of effort and expertise required to perform their own primary valuation study on ecosystem services.

GecoServe Database

This database provides a tool to help users find existing studies that demonstrate the value of the ecosystem, and preserving and restoring ecosystem is a core Sea Grant activity.⁵ The GecoServ database includes studies using a range of valuation methodologies, including willingness-to-pay, travel Cost, contingent valuation, random utility model, benefit transfer, and several others. The database includes valuation studies across 24 ecosystem services (habitats, water supply, recreation, science and education, etc.) and 10 different ecosystem types (freshwater wetlands, beaches, coral reefs, mangroves, etc.).

ESP – TEEB Database

The TEEB project, completed in 2010, houses over 300 studies of ecosystem service valuation, and like the GecoServ database, can be used as a tool by users to identify valuation methodologies that align with ecosystem restoration and conservation by Sea Grant.⁶ ERG identified studies and methodologies that differ from the GecoServ database, providing slight program and method selection diversity to Sea Grant Offices.

Benefit Transfer and Use Model Toolkit

The Benefit Transfer and Use Estimating Model Toolkit (sponsored by Colorado State University) is another database from which users could identify fish and wildlife benefit transfer valuation studies that could be implemented on a program by program basis. This database provides secondary data for both use values and passive values for hunting, fishing, viewing, per acres of habitat, and per household of threatened and endangered species.⁷ Additionally, the studies provided in this database are another way for Sea Grant offices to monetize similar benefits.

Other Publications

ERG also identified several non-database publications which Sea Grant Offices could use to inform valuation methodologies for ecosystem services not found in the above databases. For example, there is a valuation paper of New Jersey's ecosystem services and natural capital, the National Parks Service

⁵ "GecoServ.org (Gulf of Mexico Ecosystem Services Valuation Database)," Harte Research Institute for Gulf of Mexico Studies, Texas A&M University.

<http://www.gecoserv.org/>

⁶ Van der Ploeg, S. and R.S. de Groot (2010) The TEEB Valuation Database – a searchable database of 1310 estimates of monetary values of ecosystem services. Foundation for Sustainable Development, Wageningen, the Netherlands.

<https://www.es-partnership.org/services/data-knowledge-sharing/ecosystem-service-valuation-database/>

⁷ "College of Agricultural Sciences: Agricultural & Resource Economics," Colorado State University,

<http://dare.agsci.colostate.edu/outreach/tools/>

Lands and Programs, as well as Environmental Protection Agency (EPA) National Estuary Program (NEP) valuation strategies. The valuation of New Jersey's ecosystem services and natural capital publication uses benefits transfer (among eight other methodologies) to determine dollar-per-year values of New Jersey's wetlands, marine ecosystems, forests, urban green space, beaches, agricultural land, and open freshwater and riparian buffers.⁸ This publication briefly serves as a cross-over between ecosystem services and long-term benefits, as there is present value analysis conducted to determine ecosystem service benefits through time.

The Total Economic Valuation of the National Parks Service Lands and Programs uses survey data and choice experiment methodology to determine values of the National Parks Service (NPS) and Programs as a whole, as well as valuing more granular marginal and per-household values of NPS programs. This publication concludes that survey respondents marginal value of natural landmark protection each year is \$3.05 per landmark, \$54.94 per year to avoid cuts to these protective services, and \$347.98 for all protective services for all sites per year. This report describes similar analyses for educational program, historic sites, community acreage, nature/ water focused national parks, and many more ecosystem services.

Finally, U.S. EPA has published valuation profiles of their NEPs which provide insight into the valuation methodologies implemented by other federal agencies.⁹ These NEP valuations align with potential Sea Grant valuation needs, especially for ecosystem-level valuations, like estuaries, fisheries and sounds. One example of the data the NEP valuations produce can be observed in the Peconic Estuary ecosystem services, specifically of eelgrass beds (\$7,680/acre/year), saltmarshes (\$6,144/acre/year), and shellfish beds (\$4,760/acre/year).¹⁰

2.3 K-12 Environmental Educational Programs

Like ecosystem service values, multiple listening sessions identified monetizing educational programs as a significant challenge, as there were very few methodologies implemented across Sea Grant Offices. UMN Sea Grant has developed a methodology based on a peer-reviewed paper on the increased earning potential of students based on teacher effectiveness—in short, Sea Grant generates an economic value by teaching the teachers who in turn teach the students better. The prescribed literature review returned few publications, within the scope of the project, that presented methodologies for valuing educational programs. The literature review identified several publications, of which only a few implemented or suggested valuation methodologies.

A key publication is titled, *Ocean Guardian – Parents' Values and Opinions of an Ocean Conservation and Stewardship Educational Program*, a NOAA Office of National Marine Sanctuaries publication describing a monetization methodology for Federally funded educational programs. The Ocean Guardian program is an environmental stewardship project in which public, private, and charter schools can engage students in educational programs spanning across five ocean conservation topics: composting, marine

⁸ Costanza, Robert, et al. "The Value of New Jersey's Ecosystem Services and Natural Capital., *Gund Institute for Ecological Economics and the Rubenstein School of Environment and Natural Resources – University of Vermont*. Project supported by: Contract #SR04-075 William J. Mates, Project Officer New Jersey Department of Environmental Protection. <http://www.state.nj.us/dep/dsr/naturalcap/nat-cap-2.pdf>

⁹ Creason, Jared, et al. "Economic Profiles for EPA's National Estuary Programs." EPA NEP Profiles.

¹⁰ Martin, Lawrence, "Economic & Ecological Service Valuation in the National Estuary Programs." *EPA Ecological Research Program: NEP PowerPoint*, U.S. EPA, 19 Nov. 2008.

debris, watershed restoration, schoolyard habitat/garden, and energy use and ocean health.¹¹ This publication implements a willingness-to-pay (WTP) methodology which concluded that parents were willing to pay \$262.73 per child, per academic year for all Ocean Guardian program components, if Federal funding were not available.¹² This publication establishes a precedent to use WTP to monetize NOAA environmental educational programs, much like the programs supported by Sea Grant Programs across the country. This could potentially be used 1) as an example for how to develop a WTP survey for Sea Grant environmental education programs, or 2) to provide a monetized value to transfer to similar Sea Grant programs through a benefits transfer methodology. Additionally, the implemented survey in this study showed that parents ranked environmental education fifth, behind science, math, music, and art, as the most important things for their children to learn about.¹³

An economic valuation of the National Park Service (NPS) Lands and Programs, which was also included in the above ecosystem services section of this review, used choice experiment valuation method due to the nature of the study. This study concluded that the per household total economic value for all students served by NPS educational programs annually, is equal to \$682.62.¹⁴ This study further concluded that the marginal value per student served by NPS educational programs was \$16.70 per-100,000 students-per-year.¹⁵ Like the Ocean Guardian publication, this could potentially be used to determine how to develop and implement a survey of beneficiaries and to provide monetized values of educational programs that could transfer to Sea Grant educational programs through benefits transfer methodology.

Other findings include methods to value teacher effectiveness. For example, quantifying the value of higher teacher quality or determining the relationship between teacher quality and educational production/ student achievement could be of interest to the Sea Grant Network to further uncover the value of their educational programs. The Sea Grant Network may look to these publications, which use Value Added Methodology (VAM) to value teacher quality, to better understand a more holistic value of their educational programs. Another publication, “The Economic Value of Higher Teacher Quality,” argues that derived demand for teachers comes from their impact on economic impacts, and thus, a teacher of higher quality will have larger economic impacts.¹⁶ This publication concludes that, “a teacher one standard deviation above the mean effectiveness will generate a marginal gain of \$400,000 in

¹¹ Schwarzmann, D., et al. “Ocean Guardian – Parents’ Values and Opinions of an Ocean Conservation and Stewardship Educational Program.”

¹² Schwarzmann, D., et al. “Ocean Guardian – Parents’ Values and Opinions of an Ocean Conservation and Stewardship Educational Program.” Marine Sanctuaries Conservation Series ONMS-17-08. U.S. Department of Commerce, NOAA, ONMS, Silver Spring, MD 2017. pp 45.

https://nmssanctuaries.blob.core.windows.net/sanctuariesprod/media/archive/science/socioeconomic/monterey_bay/pdfs/ocean-guardian-main-report.pdf

¹³ Schwarzmann, D., et al. “Ocean Guardian – Parents’ Values and Opinions of an Ocean Conservation and Stewardship Educational Program.”

¹⁴ Haefele, Michelle, et al. “Total Economic Valuation of the National Park Service Lands and Programs: Results of a Survey of The American Public.” 30 Jun 2016.

<http://webdoc.agsci.colostate.edu/DARE/PubLinks/NPSTotalEconValue.pdf>

¹⁵ Haefele, Michelle, et al. “Total Economic Valuation of the National Park Service Lands and Programs: Results of a Survey of The American Public.” 30 Jun, 2016.

<http://webdoc.agsci.colostate.edu/DARE/PubLinks/NPSTotalEconValue.pdf>

¹⁶ Hanushek, Eric A. “The Economic Value of Higher Teacher Quality.” NBER Working Paper No. 16606 December 2010

present value of student future earnings with a class size of 20 and proportionately higher with larger class sizes.”¹⁷ Minnesota Sea Grant has been using this publication as the foundation for monetizing teacher effectiveness (Sea Grant teaches the teachers), allowing Sea Grant programs to value educational programs using this methodology.

2.4 Attribution

As noted in Section **Error! Reference source not found.**, the determination for how to attribute the economic value of an impact developed as part of a partnership or as a contributor to the benefit was a particular challenge for the Sea Grant Network.

A World Bank¹⁸ study acknowledges the importance of addressing the attribution issue, and proposes a number of techniques for handling attribution. The study noted, “there is no single method that is best in all cases (a gold standard).” One key message from the study was the need for quantitative baseline data to best understand what would have happened in the **absence** of a specific contribution one is monetizing.

ERG and NOAA held a joint session with Sea Grant Economists to discuss attribution methodologies. During this discussion, economists mentioned that one technique used to help avoid double counting is to allocate a proportion of the total benefit according to the funding split of partners. Another technique noted during this discussion is attributing the full benefit to each partner if the benefit would not have been realized without each of the partners, but being careful to avoid double counting the same benefit when the economic benefits are aggregated.

2.5 Long-term Benefits

As noted in Section **Error! Reference source not found.**, the determination for how to calculate the economic value of a recurring benefit was a particular challenge for the Sea Grant Network. The issue here stemmed more from what is appropriate and defensible to claim more so than how this can be done from a methodology standpoint as established methodologies are available. A typical methodological approach for calculating long-term benefits includes calculating the net present value of the impact (sum the expected annual benefits and discount future values accordingly), which is used in the Office of Management and Budget’s “Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs.”¹⁹ If reporting year-to-year, one could simply continue to calculate the benefit for that year using a similar methodology before and changing assumptions as need be to account for the value of the benefit changing from year to year for any particular reason.

ERG held a meeting with Sea Grant Economists to discuss this issue and how to best handle it for this project. Several economists felt it would be important to determine whether stakeholders from the initial Sea Grant project were still benefitting in order to continue claiming the benefit. Several economists also supported the notion that it will be particularly important to consider what would have

¹⁷ Hanushek, Eric A. “The Economic Value of Higher Teacher Quality.” NBER Working Paper No. 16606 December 2010

¹⁸ Leeuw, Frans and Jos Vaessen. “Impact Evaluations and Development: NONIE Guidance on Impact Evaluation.” World Bank, 2009. Chapter 4, “Address the Attribution Problem.” pgs. 21 – 34
<http://siteresources.worldbank.org/EXTOED/Resources/chap4.pdf>

¹⁹ “Guidelines and Discount Rates for benefit-Cost Analysis of Federal Programs.” National Archives and Records Administration, 29 Oct. 1992. <https://georgewbush-whitehouse.archives.gov/omb/circulars/a094/a094.html>

happened in each year in the future had Sea Grant not participated in a project—maybe the project sped up the adoption of a technology that provided a value, but that technology might be widely-implemented anyway a year or two down the road, so there would be no justification for that benefit to continue to be counted. Some of the economists believed that when these notions could not be confirmed, it may be a conservative approach to tell the story of a project qualitatively or in an impact statement.

2.6 Benefit-Cost Analysis of Resilience Planning

Sea Grant programs often work with communities to help enhance their coastal resilience. Much of this work helps them plan for sea-level rise, coastal flooding events, and other extreme weather events. As communities adapt and increase their resiliency, they lower the risk and costs associated with sea-level rise and flooding events, which can lead to many benefits (avoided damage, increased property value, etc.). On the flip side, there is a cost associated with resilience planning and construction of green and gray infrastructure. These types of analyses are quite extensive and do involve a level of effort and expertise that may be outside the available resources of many Sea Grant programs.

ERG has worked with NOAA to develop two related methodologies. The “How to Guide”²⁰ was developed to help communities make informed decisions—calculate the costs and benefits—associated with implementing policies or green and gray infrastructure to lessen the impacts of coastal flooding. Similarly, ERG worked with NOAA to develop a “Green Infrastructure Guide”²¹ that outlined a similar set of steps for communities to take to calculate the costs and benefits associated with implementing green infrastructure to lessen the impact of inland flooding. This guide included two case studies in Toledo, OH and Duluth, MN to show how the methodology could be implemented. These resources present an opportunity for SG programs to calculate the value of potential future benefits (both avoided damage and other co-benefits) of being involved in projects that will lessen or prevent damage from sea-level rise, coastal flooding events, and other extreme weather events.

²⁰Eastern Research Group, Inc. “What will Adaptation Cost? An Economic Framework for Coastal Community Infrastructure.” NOAA Coastal Services Center. June 2013.

<https://coast.noaa.gov/data/digitalcoast/pdf/adaptation-report.pdf>

²¹ Eastern Research Group, Inc. “Economic Assessment of Green Infrastructure Strategies for Climate Change Adaption: Pilot Studies in The Great Lakes Region. NOAA Coastal Services Center. May 2014.

<https://coast.noaa.gov/data/digitalcoast/pdf/climate-change-adaptation-pilot.pdf>

Appendix A. Literature Review Tables

This provides summary tables of the literature reviewed. A more extensive table with additional filterable, and sortable categories is found in the accompanying Excel file (“NOAA_SeaGrant_EconImpact_Lit.xlsx”).

Table A-1. Ecosystem Service Valuation Literature

Title	Description	Author/ Sponsor
GecoServ Ecosystem Services Valuation Database	This valuation database houses information for: Habitat; Disturbance Regulation; Recreation; Waste Regulation; Net Primary Production; Raw Materials; Water Supply; Gas Regulations; Nutrient Regulation; Climate Regulation; Water Regulation; Erosion/Soil Retention; Soil Formation; Nutrient Cycling; Pollination/Seed Dispersal; Biological Control/Regulation; Genetic Resources; Aesthetic; Cultural/Spiritual/Historic; Science/Education; Food; Medicinal Resources; Ornamental Resources; Bequest, Existence, Option.	Harte Research Institute for Gulf of Mexico Studies (Texas A&M University)
Ecosystem Service Partnership Valuation Database: TEEB	This valuation database houses information from the TEEB-project (2008-2010). The “Estimates of monetary values of ecosystem services,” supported by many ESP-members (esp. the Biome Expert leads) and TEEB researchers developed a database on monetary values of ecosystem services which now contains over 1350 data-points from over 300 case studies. After the release of the TEEB Valuation Database in 2010, the authors continued to develop the database, both in terms of content and design, under the name “Ecosystem Services Valuation Database” (ESVD). This database will be developed further as one of the main ESP activities, in close collaboration with the biome expert group, the valuation thematic working group, the Marine Ecosystem Services Partnership and the Ecosystem Valuation Toolkit (Earth Economics).	Ecosystem Services Partnership (Foundation of Sustainable Development)
The Benefit Transfer and Use Estimating Model Toolkit	This valuation database , The Benefit Transfer and Use Estimating Model Toolkit, by Dr. John Loomis, can help analysts quantify annual economic benefits using primarily secondary data. The Fish and Wildlife Benefit Transfer toolkit provides: Use values per day of hunting, fishing, and viewing; Use and passive use values per acres of habitat; Use and passive use values per household of threatened and endangered species. These values are provided in: Spreadsheet tables that include average values; Spreadsheet tables that include average values; Spreadsheet databases of the individual studies; Meta-analysis equations that allow the analyst to tailor the benefit transfer to their study sites. There is also a set of visitor use estimating models for: Hunting, fishing, and viewing. Two use estimating models for each activity are available for: National Wildlife Refuges and Wildlife Management Areas; State level for private, state, and federal lands in 48 states. By combining the visitor use estimates with the values per visitor day, an analyst can calculate annual hunting, fishing and viewing benefits. By combining the number of acres of wildlife habitat and the values per acre the analyst can calculate annual benefits of gains or losses in wildlife habitat. As user manual and technical documentation is provided.	Dr. John Loomis (Colorado State University College of Agricultural Sciences: Agricultural & Resource Economics)

Table A-1. Ecosystem Service Valuation Literature

Title	Description	Author/ Sponsor
Total Economic Valuation of the National Park Service Lands and Programs: Results of a Survey of The American Public	This publication was pulled from the Benefit Transfer and Use Estimating Model Toolkit presents the first-ever comprehensive estimate of the total economic value of the National Parks Service. The estimate covers administered lands, waters, and historic sites as well as NPS programs, which include protection of natural landmarks and historic sites, partnerships with local communities, recreational activities and educational programs.	Haeefe, M., J. Loomis, and L.J. Bilmes. (2016). Total Economic Valuation of the National Park Service Lands and Programs: Results of a Survey of The American People.
USER MANUAL: Benefit Transfer and Visitor Use Estimating Models of Wildlife Recreation, Species and Habitats	This publication houses information on Wildlife Recreation, Species and Habitats.	Dr. John Loomis and Leslie Richardson. (2008). Dept. of Agricultural and Resource Economics, Colorado State University, Fort Collins, CO 80523-1172
Fish and Wildlife Benefit Transfer	This publication houses information on Fish and Wildlife	John Loomis, Timm Kroeger, Leslie Richardson, and Frank Casey. (2008)
Hunting, Fishing, and Viewing Benefit Transfer	This publication houses information on Hunting, Fishing, and Viewing	John Loomis, Timm Kroeger, Leslie Richardson, and Frank Casey. (2008)
Valuation of national park system visitation: the efficient use of count data models, meta-analysis, and secondary visitor survey data.	This publication describes how The National Park Service (NPS) currently manages a large and diverse system of park units nationwide which received an estimated 279 million recreational visits in 2011. This article uses park visitor data collected by the NPS Visitor Services Project to estimate a consistent set of count data travel cost models of park visitor willingness to pay (WTP). Models were estimated using 58 different park unit survey datasets. WTP estimates for these 58 park surveys were used within a meta-regression analysis model to predict average and total WTP for NPS recreational visitation system-wide. Estimated WTP per NPS visit in 2011 averaged \$102 system-wide, and ranged across park units from \$67 to \$288. Total 2011 visitor WTP for the NPS system is estimated at \$28.5 billion with a 95% confidence interval of \$19.7-\$43.1 billion. The estimation of a meta-regression model using consistently collected data and identical specification of visitor WTP models greatly reduces problems common to meta-regression models, including sample selection bias, primary data heterogeneity, and heteroskedasticity, as well as some aspects of panel effects. The article provides the first estimate of total annual NPS visitor WTP within the literature directly based on NPS visitor survey data.	Neher, C, et al. "Valuation of National Park System Visitation: The Efficient Use of Count Data Models, Meta-Analysis, and Secondary Visitor Survey Data." Environmental Management., U.S. National Library of Medicine, Sept. 2013, www.ncbi.nlm.nih.gov/pubmed/23716008.

Table A-1. Ecosystem Service Valuation Literature

Title	Description	Author/ Sponsor
Economic Valuation of Restoration Actions for Salmon and Forests and Associated Wildlife in and along the Elwha River: Final Report	This publication houses NOAA valuation information for salmon, forests, and additional wildlife. "The National Oceanic and Atmospheric Administration (NOAA) is evaluating the economic benefits arising from restoration activities in coastal wetlands. NOAA is undertaking this pilot project through a joint effort between the National Marine Fisheries Service Office of Habitat Conservation, Restoration Center; and the National Ocean Service Office of Response and Restoration. This project responds to the desire to move beyond the basic evaluation of economic impacts and account for the broader range of ecosystem services provided by restoration actions This study was designed to explore Ecosystem Services Valuation (ESV) by assessing ecosystem service benefits generated from the restoration activities associated with the Elwha River Flood Plain restoration project on the Olympic Peninsula in Washington State."	Stratus Consulting. 2015. Economic Evaluation of Restoration Actions for Salmon and Forests and Associated Wildlife in and Along the Elwha River. Boulder, CO.
Valuation of Cultural and Natural Resources in North Cascades National Park: Results from a Tournament-Style Contingent Choice Survey	This publication presents the results of a new, tournament-style design of a contingent choice survey about management options at North Cascades National Park (NCNP). In our tournament-style survey, each respondent explicitly ranks several sets of scenarios and in addition several other rankings are implicit. Including the implicit rankings does not change our findings much, suggesting that the tournament-style format can add usefully to the data collected by a survey. We find strong evidence of nonuse values for both cultural and natural resource protection; indeed, nonuse values seem to dominate preferences even for those who have visited NCNP. We further find that respondents in general seem to value the protection of natural resources more than the protection of cultural resources, though both are valuable.	Turner, Robert W. and Willmarth, Blake, "Valuation of Cultural and Natural Resources in North Cascades National Park: Results from a Tournament-Style Contingent Choice Survey" (2014). Economics Faculty Working Papers. 38.
Ecosystem Valuation: Dollar-based Ecosystem Valuation Methods	This database was developed by Drs. Dennis King (University of Maryland) and Marisa Mazzotta. Each valuation method in contains a step-by-step valuation methodology and a case study for each methodology. Examples include: Market Price Method, Productivity Method, Hedonic Pricing Method, Travel Cost Method, Damage Cost Avoided, Replacement Cost, and Substitute Cost Methods, Contingent Valuation Method, Contingent Choice Method, and Benefit Transfer Method.	Funded by: US Department of Agriculture Natural Resources Conservation Service and National Oceanographic and Atmospheric Administration (2000)
The Value of New Jersey's Ecosystem Services and Natural Capital	This publication summarizes the results of a two-year study of the economic value of New Jersey's natural capital. Natural capital consists of those components of the natural environment that provide a long-term stream of benefits to individual people and to society; the value of natural capital is defined in this report as the present value of that benefit stream. Many of the benefits provided by natural capital come from ecological systems ("ecosystems"); an ecosystem is a dynamic complex of plant, animal, and microorganism communities and their nonliving environment, all interacting as a functional unit.	Robert Costanza, Matthew Wilson, Austin Troy, Alexey Voinov, Shuang Liu, John D'Agostino (2006).

Table A-1. Ecosystem Service Valuation Literature

Title	Description	Author/ Sponsor
Economic Profiles for EPA's National Estuary Program	<p>This publication on The National Estuary Program (NEP) was established in 1987 by amendments to the Clean Water Act to identify, restore, and protect nationally significant estuaries of the United States. The purpose of this paper is to provide detailed estimates of economic conditions in NEP study areas, with a special emphasis on the tourism industry. To do this, we illustrate a method for allocating IMPLAN county-level economic data across watershed boundaries. This report aggregates the results of individual economic profiles that were done for each of the 27 NEP areas that were studied (see Appendix B). The lack of availability of comparable data for Puerto Rico from sources such as the U.S. Bureau of Economic Analysis and the U.S Bureau of Labor Statistics precluded doing an economic profile the San Juan Bay NEP. The individual profiles provided each program with information on demographics, economic activity, and the industries within their study boundaries, summarizing how many people each industrial sector employs, the total wages they pay, and the value of their total economic output. These economic profiles allow the NEP community to assess the trends in employment by each of 528 industrial sectors, as well as the jobs and wages supported by tourism. While each of the NEPs have invested considerable resources in characterizing the environmental conditions of their study areas, this analysis responds to the need identified by many program directors for more economic information and analysis. While many of the NEPs have done detailed economic studies, this analysis is the first to apply a consistent data set and methodology across all of the programs where information was available. Responding to increased interest in the effect of tourism on local economies, particularly on those rich in environmental amenities, this paper estimates the "Tourism GDP" of 27 NEP sites (there are 28 NEPs, but comparable data was not available for San Juan Bay, Puerto Rico). If we aggregate the results from those 27 models, tourism in the 27 NEP study areas employs 1.2 million people, and the total tourism expenditures for the NEP study areas is \$87 billion. In terms of employment, the tourism industries ranked in the top 10 in 25 out of 27 NEPs. In terms of output, the tourism industries ranked in the top 10 in 12 out of 27 NEPs.</p>	Jared Creason, Jamal Kadri, Gregg Serenbetz, and Travis Warziniack (2003).
Economic & Ecological Service Valuation in the National Estuary Programs	This NEP publication is PowerPoint with information on the Economic & Ecological Service Valuation in the National Estuary Programs	Lawrence Martin, Office of Science Policy Office of Research and Development November 19, 2008

Table A-1. Ecosystem Service Valuation Literature

Title	Description	Author/ Sponsor
Valuing Coastal Resources: A Handbook for Coastal Managers	This publication describes natural resource services provided by ecosystems, although accepted as real and important in meeting human needs, are typically undervalued because it is difficult to quantify the benefits they supply. For example, many of the services provided by natural resources are not traded in commercial markets, and thus there is no monetized or dollar value associated with them. In contrast, activities that threaten resource services such as urban expansion and industrial development can clearly be linked to commercial production, job growth, and other measures of economic output. This asymmetry of information – quantified estimates of commercial benefits vs. qualitative assessments of non-commercial uses – often leads to decisions that do not fully consider the economic value provided by specific natural resources. Resource valuation provides an opportunity to address this potential shortcoming by quantifying the benefits of natural resources and environmental services in comparable economic terms. Although the magnitude of resource values will vary by location, even a cursory consideration of the general services provided by estuarine areas suggests that they provide important economic benefits (see exhibit 1.1).	EPA NEP (2001).

Table A-2. K – 12 Environmental Education Programs

Title	Description	Author/ Sponsor
Total Economic Valuation of the National Park Service Lands and Programs: Results of a Survey of The American Public	This publication presents the first-ever comprehensive estimate of the total economic value of the National Parks Service. The estimate covers administered lands, waters, and historic sites as well as NPS programs, which include protection of natural landmarks and historic sites, partnerships with local communities, recreational activities and educational programs.	Haefele, M., J. Loomis, and L.J. Bilmes. (2016). Total Economic Valuation of the National Park Service Lands and Programs: Results of a Survey of The American People. (Colorado State University College of Agricultural Sciences: Agricultural & Resource Economics)
Ocean Guardian – Parents’ Values and Opinions of an Ocean Conservation and Stewardship Educational Program	This publication describes the Ocean Guardian School (OGS) program, a federally funded grant program coordinated out of NOAA’s Office of National Marine Sanctuaries and supported by the National Marine Sanctuary Foundation. The program was designed to further the educational goals of the National Marine Sanctuaries by supporting hands-on, ocean stewardship projects in schools. Schools are awarded small grants (up to \$4,000) to carry out their own school or community-based conservation project that makes a difference in the health and protection of their local watersheds and/or the world’s ocean. Up until this point, little has been known about the benefits parents and children receive from the OGS program. This study uses a survey to estimate the value that parents place on their child’s participation in this program.	Schwarzmann, D., Nachbar, S., Pollack, N., Leeworthy, V., & Hitz, S. 2017. Ocean Guardian – Parents’ Values and Opinions of an Ocean Conservation and Stewardship Educational Program. Marine Sanctuaries Conservation Series ONMS-17-08. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries, Silver Spring, MD. pp 45.
The Value of America’s Greatest Idea: Framework for Total Economic Valuation of National Park Service Operations and Assets and Joshua Tree National Park Total Economic Value Case Study	This publication is an economic valuation framework that creates a framework for a total economic valuation of the National Park Service. This framework will be based upon a wide span of economic literature with a focus on environmental economics. The framework incorporates direct use and passive use values within park units, and a valuation category for cooperative programming outside the boundaries of those units. The framework includes a graphical representation of the valuation model and descriptors of each value field.	Francis Choi, Tim Marlowe; A report provided to the National Park Service Developed for the Policy Analysis Exercise Requirement at the Harvard Kennedy School of Government Final Version – March 20, 2012

Table A-2. K – 12 Environmental Education Programs

Title	Description	Author/ Sponsor
The Economic Value of Higher Teacher Quality	This publication presents analyses of teacher quality. Most analyses of teacher quality end without any assessment of the economic value of altered teacher quality. This paper combines information about teacher effectiveness with the economic impact of higher achievement. It begins with an overview of what is known about the relationship between teacher quality and student achievement. This provides the basis for consideration of the derived demand for teachers that comes from their impact on economic outcomes. Alternative valuation methods are based on the impact of increased achievement on individual earnings and on the impact of low teacher effectiveness on economic growth through aggregate achievement. A teacher one standard deviation above the mean effectiveness annually generates marginal gains of over \$400,000 in present value of student future earnings with a class size of 20 and proportionately higher with larger class sizes. Alternatively, replacing the bottom 5-8 percent of teachers with average teachers could move the U.S. near the top of international math and science rankings with a present value of \$100 trillion.	The Economic Value of Higher Teacher Quality Eric A. Hanushek NBER Working Paper No. 16606 December 2010 JEL No. H4,I2,J2
Teachers and Student Achievement in the Chicago Public High Schools	This publication estimates the importance of teachers in Chicago public high schools using matched student-teacher administrative data. A one standard deviation, one semester improvement in math teacher quality raises student math scores by 0.13 grade equivalents or, over 1 year, roughly one-fifth of average yearly gains. Estimates are relatively stable over time, reasonably impervious to a variety of conditioning variables, and do not appear to be driven by classroom sorting or selective score reporting. Also, teacher quality is particularly important for lower-ability students. Finally, traditional human capital measures—including those determining compensation—explain little of the variation in estimated quality.	Daniel Aaronson, Lisa Barrow, and William Sander, "Teachers and Student Achievement in the Chicago Public High Schools," <i>Journal of Labor Economics</i> 25, no. 1 (January 2007): 95-135.
Teacher Quality in Educational Production: Tracking, Decay, and Student Achievement	This publication describes an emerging consensus that teacher quality is an extremely important determinant of student achievement and a promising lever by which educational outcomes can be improved. Value-Added Models (VAMs) attempt to distinguish good from bad teachers, using observational data to measure teachers' effects on student achievement. I develop falsification tests for the assumptions about student-to-teacher assignments on which VAMs rely, using the idea that teachers in later grades cannot have causal effects on students' test scores in earlier grades. A simple VAM indicates that 5th grade teachers have nearly as large effects on 4th grade gains as on 5th grade gains, implying that assignments are not ignorable. An extension of this test shows that VAMs that allow for tracking on the basis of students' permanent ability are similarly misspecified: Teacher assignments evidently respond dynamically to year-to-year fluctuations in student achievement. I propose models of the assignment process that permit identification. Estimates that are consistent in the presence of (some forms of) dynamic tracking yield very different assessments of teacher quality than those obtained from common VAMs. VAMs need further development and validation before they can support causal interpretations or policy applications.	Rothstein, Jesse. 2010. "Teacher quality in educational production: Tracking, decay, and student achievement." <i>Quarterly Journal of Economics</i> 25, no. 1.
The Big Payoff: Educational Attainment and Synthetic Estimates of Work-Life Earnings	This publication illustrates the economic value of an education, that is, the added value of a high school diploma or college degree. It explores the relationship between educational attainment and earnings and demon-strates how the relationship has changed over the last 25 years. Additionally, it pro-vides, by level of education, synthetic estimates of the average total earnings adults are likely to accumulate over the course of their working lives.	Jennifer Cheeseman Day and Eric C. Newburger (2002).

Table A-3. Attribution

Title	Description	Author/ Sponsor
Chapter 4: Address the Attribution Problem	This publication describes multiple factors that can affect the livelihoods of individuals or the capacities of institutions. For policy makers as well as stakeholders it is important to know what the added value of the policy intervention is, apart from these other factors. The attribution problem is often referred to as the central problem in impact evaluation. The central question is to what extent changes in outcomes of interest can be attributed to a particular intervention. Attribution refers to both isolating and estimating accurately the particular contribution of an intervention and ensuring that causality runs from the intervention to the outcome.	Leeuw, Frans and Jos Vaessen. "Impact Evaluations and Development: NONIE Guidance on Impact Evaluation." World Bank, 2009. Chapter 4, "Address the Attribution Problem." pgs. 21 - 34

Table A-4. Long-Term Benefits

Title	Description	Author/ Sponsor
Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs	The goal of this Circular publication is to promote efficient resource allocation through well-informed decision-making by the Federal Government. It provides general guidance for conducting benefit-cost and cost-effectiveness analyses. It also provides specific guidance on the discount rates to be used in evaluating Federal programs whose benefits and costs are distributed over time. The general guidance will serve as a checklist of whether an agency has considered and properly dealt with all the elements for sound benefit-cost and cost-effectiveness analyses.	Office of Management and Budget Circular No. A-94 Revised (1992).

Table A-5. Benefit Cost of Resilience Planning

Title	Description	Author/ Sponsor
<p>What Will Adaptation Cost? An Economic Framework for Coastal Community Infrastructure: Final Report</p>	<p>The purpose of this publication is to help communities begin to find answers to these difficult questions. By understanding the costs and benefits of different adaptation strategies, decision-makers can make more fully informed decisions that are fiscally responsible in the short and long terms. More importantly, economically informed decision-making will lead to safer, more responsible, economically sound communities. In the long run, the entire community benefits by investing in adaptation efforts: after a flood event, utilities will be restored quicker, stores and banks will be open sooner, children will return to school faster, and residents will be back at work with minimal disruption. Up-front investments can help ensure a successful future. By accounting for the full costs of inundation risks, leaders can make strategic choices about where, when, and how to make investments in adaptation responses to maximize benefits and minimize risk.</p>	<p>Eastern Research Group, Inc. (Written under contract of NOAA Coastal Services Center) (2013).</p>
<p>Economic Assessment of Green Infrastructure Strategies for Climate Change Adaptation: Pilot Studies in The Great Lakes Region: Final Report</p>	<p>The purpose of this publication was to assess the economic benefits of green infrastructure (GI) as a method of reducing the negative effects of flooding in Duluth, Minnesota, and Toledo, Ohio. A secondary purpose of the study was to develop an analytical framework that can be applied in other communities to 1) consider and estimate predicted changes in future precipitation, 2) assess how their community may be impacted by flooding with increased precipitation, 3) consider the range of available green infrastructure and land use policy options to reduce flooding, and 4) identify the benefits (as well as co-benefits) that can be realized by implementing GI.</p>	<p>Eastern Research Group, Inc. (Written under contract of NOAA Coastal Services Center) (2014).</p>

Table A-6. Previous Work Done by Sea Grant in this Area

Title	Description	Author/ Sponsor
<p>The Importance of Gulf of Mexico Marine Dependent Industries and Measuring Sea Grant Programming Benefits of Those Industries</p>	<p>This publication describes The National Sea Grant program. This Final Report adds to those previous reports in a couple of ways. First, this document provides a number of examples of Sea Grant programming, specific to the Gulf of Mexico Region Sea Grant Programs (Alabama-Mississippi, Louisiana, Texas, and Florida). The benefits and impacts reported for those programmatic activities are discussed. This report is unique in that it is written by Sea Grant economists and provides our views, based on our knowledge of economics, on those program achievements that involve benefits that can be quantified using economic metrics.</p> <p>In addition, this report provides measures of the economic importance of marine-dependent industries in the Gulf of Mexico region, including the economic metrics associated with commercial and recreational fishing, marine and coastal tourism and recreation, as well as other marine dependent industries. That portion of the report provides an avenue for Sea Grant programs to provide qualitative impacts of programming, where quantitative analysis is not possible, while still displaying the importance of the programming using hard numbers. In those cases where quantitative analysis directly related to Sea Grant activities is not possible, it is highly likely that the programming impacted an industry (commercial fishing, recreational fishing, birding tourism, etc.) that has easily calculated economic impacts and the qualitative Sea Grant impacts can be magnified by displaying the economic importance of the industry to the local or regional economy.</p>	<p>Prepared by the Sea Grant Gulf of Mexico Economics Working Group: Andrew J. Ropicki, Texas Sea Grant; Charles M. Adams, Florida Sea Grant; Rex H. Caffey, Louisiana Sea Grant; Mike Haby, Texas Sea Grant (2016).</p>
<p>Report on the Economic Impact Assessment Methods Inventory for the Sea Grant Network</p>	<p>The purpose of this publication is to use the findings of the inventory to recommend next steps for improving the ability of the Sea Grant network to report on the economic impacts of its programs. While we review some terminology and concepts fundamental to this discussion, we direct the reader to more comprehensive resources where appropriate. The term “economic impacts” is commonly used throughout the network to refer to a variety of metrics (encompassing dollars of impact as well as jobs and businesses created or retained); however, in this report, job and business metrics are considered separate from economic impacts. We use the term “economic impacts” to refer specifically to benefits reported in dollar values.</p>	<p>Maine Sea Grant: Kate Farrow, Kristen Grant, Paul Anderson, Beth Bisson (2012).</p>

<p>Sea Grant Economic Impacts Fora: A Submission to 2017 Economic Impacts Forum(s) (Special Projects)</p>	<p>This publication describes Sea Grant Week and resulting discussions/ analyses. During the 2016 Sea Grant Week (SGW), experts from Texas Sea Grant (TXSG, Dr. Andrew Ropicki), Louisiana Sea Grant (LASG, Dr. Rex Caffey), Florida Sea Grant (FLSG, Dr. Chuck Adams), and the National Sea Grant Office (NSGO, Mr. Chris Hayes) led a panel discussion entitled, “Communicating Economic Impacts Derived from Sea Grant Activities.” Georgia Sea Grant (GASG, Dr. Mona Behl) participated in the panel as well. The session was attended by more than 50 participants from across the Sea Grant network. Several participants expressed the need to continue discussions on identifying credible mechanisms to communicate the value of Sea Grant work.</p>	<p>NOAA Sea Grant Economic Impact Fora (2017)</p>
---	--	---