

**REPORT ON THE ECONOMIC IMPACT ASSESSMENT METHODS INVENTORY  
FOR THE SEA GRANT NETWORK**

RFP: 2012 National Special Projects Competition

Maine Sea Grant

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## **Preface**

Across the country, Sea Grant programs serve as the “go-to” organizations for science-based information related to coastal issues. In myriad roles, these programs enhance the economy, improve quality of life, and sustain the environment in our nation’s coastal communities. Consequently, the impacts of Sea Grant are diverse and significant. Nevertheless, a climate of increasing fiscal pressure highlights the importance of specifically the economic impacts associated with Sea Grant activities. Demonstrating these impacts in a reliable and consistent manner has thus emerged as an important priority for the Sea Grant network.

Return on investment measures for Sea Grant activities were incorporated into national reporting requirements in 2006, with refined requirements for reporting economic benefits added in 2009. While such measures represent necessary and important components in decision-making processes, many Sea Grant programs wrestle with how best to approach measuring economic impacts. Responding to this need, the National Sea Grant Office released a request for proposals to conduct an inventory of the economic assessment methods used across the Sea Grant network. By identifying the strengths and weaknesses of the network’s current practices, the aim of the inventory is to improve Sea Grant’s collective ability to articulate economic impact. This report contains the findings and recommendations from this three-month effort.

The inventory is based on reported economic impacts from 2010 and 2011. Programs reporting quantified economic benefits (i.e., dollar impacts) for these years were contacted for clarification on the calculation methods employed, the time and effort involved in these calculations, as well as more general input regarding what challenges surround measuring economic impacts in their respective programs. The inventory consists only of those programs which reported economic impact figures in dollar amounts. (Some programs, while they did report on businesses and jobs, did not report any impacts in dollar values.)

The purpose of this report 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.

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## **Background**

### *Sea Grant and the Economy*

The diversity of Sea Grant programs indicates the variety of ways in which Sea Grant contributes to economies on local, regional, and national scales. While some economic impacts may be more easily identified than others, outreach, education, research, extension, and communications efforts all have conceivable impacts on the economy. Outreach and communications serve important social functions by involving stakeholders in policy and planning, initiating collaboration between stakeholders, and generally increasing network cohesion. These impacts may contribute in significant ways to business creation and development, innovation, and increased political efficiency. Such impacts are generally evidenced by anecdotal accounts and reported in a qualitative manner within Sea Grant narratives.

Sea Grant education efforts result in economic impacts perhaps even more challenging to document, especially if we consider the potential significance of primary school experiences in motivating individuals' future scholastic endeavors and worldviews. Additionally, improved environmental awareness may manifest itself through the adoption of activities such as climate change mitigation measures, avoiding littering in environmentally sensitive areas, and increased individual efforts to reduce the risk of spreading invasive species. Beyond the problems posed by the inherent variety of these types of impacts from education, impacts such as these are also likely to be geographically scattered, extending beyond the borders of any particular state.

Impacts associated with Sea Grant-funded research are also varied and have the potential to be quite significant. These impacts may materialize in results such as technological developments which reduce costs, create profits, or increase our understanding of certain biological and social functions that lead to policy improvements. Tracking these outcomes is a priority if we are to consider the possible economic impacts resulting from research activities.

### *Types of Impacts*

Much of the difficulty of tracking economic impacts arises from a lack of familiarity with the ways in which they may be occurring. Sea Grant programs associated with industries such as tourism and fishing generally have an easier time conceiving of and locating the economic effects of their activities. Programs involving education and outreach typically find it more

difficult to quantify economic impacts. This differential is largely due to the nature of the market and nonmarket types of impacts that each of these activities tends to generate. In the following section, we distinguish between market and nonmarket impacts.

Before continuing we must emphasize an important distinction between the oft-confused terms economic impact and economic benefit.<sup>1</sup> An **economic impact** measures the economic activity associated with an industry, event, or policy in an existing regional economy. More specifically, it may represent gross direct, indirect, and induced spending (all of which are market values). An economic impact does not account for how spending may have otherwise happened if the industry, event, or policy in question didn't exist, and therefore does not reflect *net* changes in economic activity due to the presence of any of these things. An **economic benefit**, in contrast, measures social welfare—or how well-off people are (which is not necessarily represented by how much they spend), and may consist of both market and nonmarket values. Watson et al. (2007) make further distinctions between the various economic terms currently used in regional economic studies and propose a system of specific definitions to clarify their respective meanings. The terms economic impact and economic benefit represent a simplification of these definitions. This simplification, however, serves adequately for our discussions in this report.

Another distinction should be made between the marginal (or added) economic impact of an industry or resource and the economic impact of particular program efforts. We refer to these as industry and project impacts, respectively. **Industry impacts** relate the extent to which a particular industry contributes to regional, usually state, economies. Most often, these impacts are reported in terms of dollars of spending, income, or number of jobs. Economists estimate these impacts through extensive research projects, which encompass development and

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<sup>1</sup> The economic changes associated with an industry, event, or policy, are accordingly measured through two primary types of analyses: economic impact analysis and cost-benefit analysis. Economic impact analysis tracks the flow of dollars spent within a region, and considers all forms of spending as positive market impacts. For instance, recreational fishermen spend money on bait and tackle—an expenditure which represents a cost for them but a benefit for the tackle shop. Impact analyses do not account for the standing of the spender, therefore do not consider whether the dollars spent represent a cost or a benefit, interpreting them instead as aggregate economic activity. Cost-benefit analysis measures the net changes in social welfare associated with an industry, event, or policy, and includes market as well as nonmarket values. In such analyses, the spending by the angler (a cost) and the revenue to the store owner (a benefit) cancel each other out. However, the added economic benefit the angler gains from fishing (the difference between what he pays and what he is willing to pay), may also be included. Cost-benefit analyses are often used to examine the efficiency of proposed government policies. Both types of analyses require significant time, money, and expertise to complete.

distribution of surveys and the use of economic input-output models such as IMPLAN. The IMPLAN tool (IMPact analysis for PLANning) consists of software and accompanying data which calculates the direct, indirect, and induced economic impacts associated with spending in certain sectors of the economy. Studies that use IMPLAN typically require significant funding and two years or more to complete.

From industry impact studies, Sea Grant now knows that Florida's artificial reefs contributed \$253 million to Florida's economy in 2009 and that the recreational boating industry contributed \$55 million to the city of Hampton, Virginia in 2008. These studies are empirically rigorous, requiring expertise, time, and money, yet are useful for a number of reasons. First, by demonstrating the economic importance of a particular resource or industry, they serve as powerful justification for Sea Grant involvement in those arenas (in our example, artificial reefs and recreational boating). In doing so, they provide valuable baseline information about industry size and makeup that can be useful in observing longitudinal trends in future years. Attributing these trends to Sea Grant activities, however, is notoriously difficult. Consequently, while they help to motivate funding decisions on the front end, these types of statements are rarely able to provide conclusive evidence that Sea Grant projects themselves impacted these industries.

**Project impacts** provide this evidence by virtue of the fact that they measure the economic changes (marginal impacts) that result from a particular Sea Grant project. By communicating the impact of Sea Grant projects on an industry, population, or resource, these marginal impacts serve as proof that Sea Grant projects are effective. It is this proof that Sea Grant programs are being called to report. Accordingly, most of the observations in the inventory fall under the category of project impacts. As with industry impacts, most of the reported project impacts in the inventory are market impacts.

### *Market impacts*

**Market impacts** occur whenever the changes brought about by a Sea Grant project materialize in the marketplace. If an activity can be said to put a dollar in someone's pocket, so to speak, then it can be understood to have a market impact. Obvious examples include workforce development activities such as the Trade Adjustment Assistance program, direct-marketing initiatives, and technology transfer in fishing and aquaculture industries. Each of these activities may affect fishers in a number of ways, including reducing costs and increasing sales,

both of which result in higher profitability and, ultimately, more income. The value of various industry consultation services provided at no cost by Sea Grant staff represent market impacts in the form of avoided cost: these are instances where stakeholders were able to save, or “keep,” a dollar in their pockets rather than pay a fee for those consultation services. Though many programs utilize this measure in reporting, the avoided costs associated with not having to hire a private consulting firm should be considered a relatively poor measure of the value of Sea Grant activities as they help businesses in this regard. Following up with stakeholders by exploring the actual benefits that occurred as a result of Sea Grant consultations would be a preferable alternative.

Although market impacts are relatively observable, challenges do exist in attributing changes in the marketplace to specific Sea Grant programs. This “cause-effect fuzziness” constitutes the central challenge that was reported by programs across the network. In cases where industry-related Sea Grant projects engage participants directly, establishing a clear causal link can be relatively straightforward, derived from participant testimony concerning the economic impact of a workshop (for example) on their business. Perhaps, as another example, fishers who took part in a direct-marketing scheme report that their sales have increased by 20 percent. Using information on the size of their business (information also supplied by participants), the market impact of this project is easily calculable. Issues associated with this methodology include how best to illicit reliable impact estimates from participants, as well as figures describing business size or annual revenues, as business owners may be reluctant to furnish this type of information. Additionally, some Sea Grant projects impact industries in less direct ways, for example by instigating dialogue among stakeholders with varying interests or increasing public understanding of the legal issues surrounding aquaculture permits and working waterfront access. Attributing such projects to observable changes in the related industries is, to say the least, theoretically challenging. In instances such as these where the cause-effect link is less clear, it may still be possible to garner an idea of whether users consider these materials instrumental in the creation (or retention) of their business.

Empirical economic methods for capturing industry impacts involve lengthy research agendas as well as significant expertise and funding. Such impacts are generally denominated in terms of the amount of production, jobs, or income produced from activities related to a particular industry.

### *Nonmarket impacts*

**Nonmarket impacts** occur whenever a project results in a change in human welfare that is not reflected by changes in the marketplace. Economists might say that no marketplace exists exclusively for goods such as environmental literacy, aesthetic quality, or ecosystem services. For this reason, the prices of these goods are unknown and changes in their abundance or quality are accordingly difficult to quantify. Let us examine a beach erosion project which tracks the geological health of a beach. The data gathered through this project reveal erosion patterns and help to inform local management decisions surrounding beach enhancement through the artificial addition of more sand. Such a practice preserves beach width and in turn maintains its appeal as a recreational destination for beachgoers who contribute to the local economy—impacts which are, with enough effort, empirically trackable. In addition, however, beach enhancement may also provide more wildlife habitat as well as the improved functioning of ecosystem services such as storm surge protection, the values of which are not directly evident. In this way, we observe that any one project may (and in fact, likely does) result in both market and nonmarket impacts. Given that so many of Sea Grant's impacts are conceivably nonmarket impacts, it is in the network's interest to generate at least conservative estimates of these values in order to make a better accounting of the beneficial impacts of its efforts.

There have been extended discussions surrounding whether or not estimates of nonmarket value (including non-use values) are reliable enough to be included in damage assessments for natural resources (see Arrow et al., 1993; Carson et al., 1996). The ultimate conclusion of such discussions has been that, while certain protocols must guide how these estimates are derived, so long as the protocols are met, nonmarket estimates can be considered sound and reliable values for inclusion in public policy-making. Conceptual differences among nonmarket values dictate which empirical methods economists use to measure them, and the protocols mentioned above outline the appropriate use of the methodological techniques used in economic valuation studies. Such discussions are indicative of the growing consensus that nonmarket values do exist and, moreover, that they are often quite significant in magnitude. Given a growing interest in nonmarket values, a number of resources have been created in recent years to orient non-economists (as well as economists) unfamiliar with nonmarket valuation to the techniques used to estimate these values (King and Mazzotta 2000) and how to incorporate

these values into management decisions (e.g., Coastal Services Center 2009). As with the calculation of industry value, such original estimations of nonmarket values require significant time, expertise, and money.

Ideally, accurate nonmarket values are generated specific to every locale's environmental and social conditions. However, recognizing a lack of available funding from within Sea Grant for determining nonmarket impacts, as well as the relative importance of these impacts in telling Sea Grant stories, it is clear that a "sweet spot" must be reached between empirical rigor, and time- and cost-effectiveness in calculating these impacts. Given these requirements, benefit transfer offers promising method for estimating the nonmarket impacts. **Benefit transfer** is a valuation method that relies on the findings of empirical nonmarket valuation studies. Using this method, values from peer-reviewed studies are applied or "transferred" from their original contexts to similar contexts in other areas. As with all extrapolations, however, care must be used when employing benefit transfer to ensure the validity of final valuation estimates. Due to the theoretical considerations inherent in justifying the use of benefit transfer, a role exists for economists within Sea Grant to provide guidance on this matter. Indeed, some guidance regarding the considerations requisite in this process have already been developed within NOAA (Letson and Milon 2002) as well as without (Rosenberger and Loomis 2001). Recommendations regarding how this guidance may be incorporated into network evaluation practices are addressed in the concluding section.

## **Inventory**

### *Overview and Definitions*

The inventory, included as Appendix E, consists of methods used to obtain the economic impacts reported by state programs to the National Sea Grant Office in 2010 and 2011. For each observation, the inventory describes several characteristics. These include a description of the program being evaluated, the impact metric reported, basic identifying characteristics of the calculation method employed, data sources, time and cost requirements, and a preliminary judgment of whether or not the method must be done by an economist. Where applicable, any added training undergone by the staff member making the calculation is also described. Due to differences in calculation methods, nonmarket impacts are recorded on a separate sheet in the inventory. Table 1 shows a sample market impact observation from the inventory.

State	Program/ Industry	Description	Impact Metric	Method	Data Source	Calculation time	Collab- orative?	Economist Necessary?	Cost
CT	Shellfish Efforts	SG helped shellfish businesses obtain permits, contributing revenue to government	increased revenue	Multi- plication	industry data	minimal	yes	no	\$

Table 1. Sample market impact observation

### *Market categories*

The program category identifies the project in question in several words or less, while the description category relates a more in-depth explanation of the mechanism through which the project accomplishes economic impact. These two categories contain unique situation-specific information, whereas the remaining categories are populated according to several typologies.

The impact metric column describes what the reported dollar values represent. A project's impact metric may be classified as any one of the following: avoided cost, increased revenue, increased income, industry impact, or investment in local business. *Avoided costs* represent stakeholder dollars saved due to Sea Grant activities. Instances such as this occur when, for example, Sea Grant provides free consultation services which enable business-owners to remain in compliance with environmental regulations, or when Sea Grant staff develop fuel-saving technologies that reduce operation costs for shrimp fishers in the Gulf of Mexico.

*Increased revenue* represents the additional business coastal stakeholders receive as a result of Sea Grant involvement. Increased seafood sales resulting from a Sea Grant direct-marketing initiative provides a good example of a market impact reported in terms of increased revenue.

*Increased income* is related to increased revenue, but targets the more specific measure of additional wages earned. Impacts are most often reported in terms of increased income in cases where Sea Grant is responsible for the creation of jobs, for example graduate student or researcher incomes. *Industry impact* describes how much an industry or resource contributes to the amount of spending in local economies. Examples are again the amount of spending ultimately originating from the artificial reefs in Florida or the recreational boating industry in

the city of Hampton, Virginia. Reported impacts relate *investment in local business* whenever Sea Grant contributed either directly or indirectly to local establishments. An example of a direct contribution is Sea Grant awarding funds to communities to improve greenways, while indirect contributions involve Sea Grant's role as the facilitator of investments earned through the Trade Adjustment Assistance program, or as a collaborator in securing grants from outside organizations.

The method column relates the essential calculations involved in generating the reported impact. The methods are comprised of one or more of the following: *multiplication*, *surveys*, *expert estimate*, and, where no explicit calculation was required, *N/A*. The *multiplication* method was employed when computing the total increased revenue from a charter boat marketing effort, for example, by multiplying the revenue generated from one trip by the number of additional trips attributed to Sea Grant's involvement. *Surveys* denote that an estimate was generated primarily from information derived from either industry or stakeholder surveys, as defined in the following discussion of data sources. *Expert estimates* were quite abundant, and refer to instances where Sea Grant sought the informed opinions of stakeholders familiar with the impacts at hand. These involved what we term industry experts (usually business-owners) as well as Sea Grant experts (usually either extension staff or principal investigators). Methods which warranted an *N/A* designation refer to instances where the reported metric relates a grant amount—information that is directly lifted from Sea Grant records and that requires no further calculation.

The data sources column identifies where underlying values were sought. Items in this column include *industry data* (see Appendix B for examples of industry data sources), *industry experts*, *Sea Grant experts*, *Sea Grant records*, *tourism data*, *industry surveys*, and *stakeholder surveys*. *Industry data* has been used to obtain estimates of landings amounts, the market prices of seafood, as well as the number of new aquaculture permits acquired. These types of data are used in conjunction with participation rates in various Sea Grant programs to generate aggregate figures of increased income and increased revenue. *Industry experts* mostly consist of business owners who offer estimates of how much of their revenues or income has increased as a direct result of Sea Grant involvement. *Sea Grant experts (SG experts)*, as mentioned above, usually denotes extension staff or researchers who estimate the magnitude of economic impacts based upon their familiarity with a particular Sea Grant project. *Sea Grant records (SG records)* simply

refer to the documentation maintained by a Sea Grant program, whether this is the number of workshops carried out, the attendance at certain events, or grant award amounts, etc. A few economic impacts relied on *tourism data* furnished either by the state tourism office (publicly available) or a tourism research group (not publicly available). These sources contributed estimates of visitation and spending per trip, which were incorporated into several of the reported impact statements.

Less frequent data sources are listed where applicable, and are relatively straightforward. One unusual method made use of an economic calculator developed by economists at Michigan State University. Sea Grant staff were able to use this calculator to generate total (i.e., direct, indirect, and induced) economic impacts in the form of the total employment hours and income generated by an annual fishing tournament. The calculator required two inputs: the number of fishing teams as well as the percentage of tournament participants from outside the region. The calculator required about two weeks to develop, and also requires regular maintenance to ensure that the underlying economic input-output model and data are up to date. Two other estimates also relied upon values from peer-reviewed literature to estimate increases in oyster harvest yields and levels of behavioral change in response to an educational pamphlet about household water consumption, which were then used to compute market impacts.

Calculation times range from minimal to moderate and long. These are determined based upon the complexity of the calculation method involved (and thus, implicitly, the expertise necessary to perform the calculation) and the ease or difficulty of obtaining the underlying data. *Minimal* translates to a calculation effort consisting of less than one day of work, *moderate* means several days, and *long* encompasses months to years (as is the case for the industry impact estimates). In fact, the majority of observations labeled as requiring minimal calculation effort required only a few minutes. The next two columns contain answers to the question in the column header. As such, the *Collaborative?* column reads *yes* whenever the Sea Grant project in question is the result of a collaborative effort between Sea Grant and at least one other organization, and *no* when Sea Grant served as the sole funder and executor of the project. Similarly, if the impact calculation required the expertise of an economist, the reported estimate contains a *yes* in the column *Economist?*. Costs are dependent on estimation time. Since most estimates involved only minimal estimation time, relative costs are low (\$). Moderate calculation time generally indicates higher costs (\$\$) in the form of several days of staff or contracted work,

while longer studies involved significantly more money (\$\$\$), often in the hundreds of thousands of dollars.

*Nonmarket categories*

The *state*, *program*, and *description* categories in the nonmarket portion of the inventory are defined like those in the market section. Table 2 shows a sample line from the nonmarket sheet in the inventory.

State	Program	Description	Impact type	Benefit metric	Method	Data sources	Calculation time	Collaborative?	Economist necessary?
OR	Fish habitat restoration	OSG helped restore fish habitat to grass farm fields	value of ecosystem services	\$/acre	benefit transfer: value	USFWS value of river habitat reopened to fish passage; SG records	minimal	yes	no

Table 2. Sample nonmarket impact observation

*Impact type* describes the object being valued. *Benefit metric* describes the unit of nonmarket value measurement used. Most impacts communicate the value of the ecosystem services provided by some resource, while one impact reports the benefit visitors enjoy from visiting a beach. *Method* describes how the nonmarket impact was derived. There are two primary uses of benefit transfer. The first involves applying values obtained from peer-reviewed nonmarket valuation studies, while the second involves applying the functions derived in nonmarket valuation studies to a local situation. All of the nonmarket impacts reported relied on the former type: “value” benefit transfer. *Data sources* identifies the location of the original nonmarket value, and calculation time—as with the market impact observations—ranged from *minimal* to *moderate* and *long*. *Minimal* translates to less than a day, and more often only a few minutes. *Moderate* refers to several days, while *long* denotes that the process of data collection and calculation combined lasted anywhere from several days to several months. *Collaborative?* and *Economist necessary?* are both defined as they are in the market impact observations sheet.

*Quantitative findings: interpreting the numbers*

While the number of projects in which Sea Grant programs engaged during 2010 and 2011 amounts to many more than those included in the inventory, this compilation targets only those projects which were associated with economic impacts as measured by a dollar value. Since the purpose of the inventory is to investigate the calculation methods involved in estimating economic impacts, projects which did not report dollar values for impacts are not included, although they may have reported jobs and businesses created or retained. In 2010, 115 out of 176 (65%) of projects reported dollar impacts; in 2011, 134 of 205 (65% again) did so. The fact that only two thirds of all economic impacts are reported as dollar values alludes to the inherent difficulty of estimating these values.

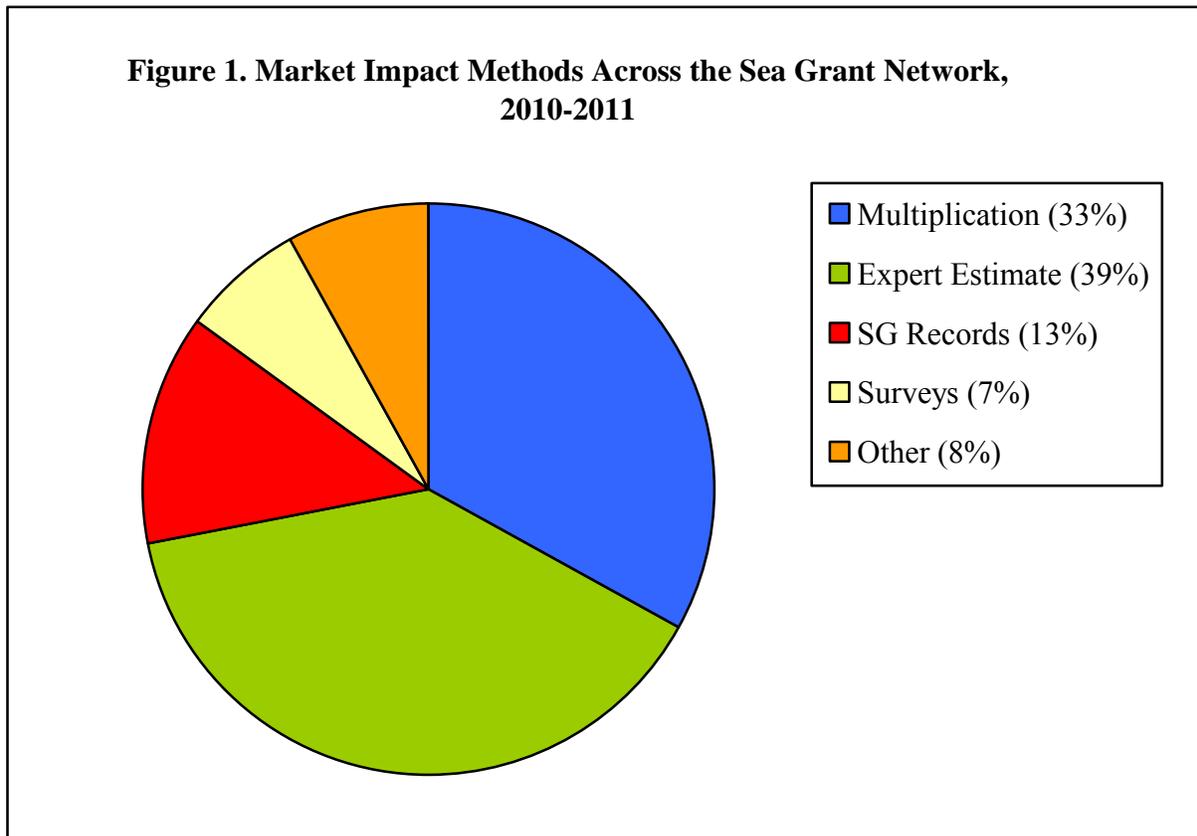
Among these economic impacts which were reported in dollars, Table 3 shows the frequency of the types of market impacts reported.

Table 3. Types of Reported Impacts

<b>Type of Impact</b>	<b>Number</b>	<b>Percent of Total Reported Impacts</b>
Market vs. Nonmarket		
Market	168	96
Nonmarket	7	4
<i>SUM</i>	<i>175</i>	<i>100</i>
Project vs. Industry		
Project	165	94
Industry	10	6
<i>SUM</i>	<i>175</i>	<i>100</i>

In total, 175 distinct economic impacts were reported across the years 2010 and 2011. The number of reported economic impacts is not greater than 175 (as the previous paragraph suggests:  $115 + 134 = 249$ ) because redundant projects across the two years were eliminated to obtain a more representative account of the types of impact assessments that are carried out in any one year. The majority of these 175 impacts were market impacts and project impacts. That is, they measured market changes due to specific Sea Grant projects. Figure 1 shows the

frequency of methods used to obtain market economic impacts. Nonmarket impacts were all generated using the “value” benefit transfer method.



While about one third of all reported impacts did not report any dollar values, many did report business and/or jobs created and/or retained. Table 4 shows the number of projects reporting these metrics as a percentage of the total number of projects.

Table 4. Percentage of Projects Reporting Jobs and Businesses Figures

Reporting Measure	Percent of Total Projects	
	2010	2011
Businesses created	17	20
Businesses retained	23	37
Jobs created	36	49
Jobs retained	28	59

Perhaps more useful statistics regarding these metrics reveal that projects which didn't report any economic impacts in dollar values nonetheless reported having impacts on jobs and businesses. Table 5 indicates the percentage of projects in each year which didn't report any dollar-valued economic impacts, but did report each of these metrics.

Table 5. Percentage of Projects Reporting Job/Business Creation/Retention, but No Economic Impacts

<b>Reporting Measure</b>	<b>Percent Reporting</b>	
	<b>2010</b>	<b>2011</b>
Businesses created	9	19
Businesses retained	9	27
Jobs created	15	31
Jobs retained	9	30

Comparing Tables 4 and 5, we observe that, while some programs reported jobs and business impacts separately from dollar-valued economic impacts, others did not. Without a shared approach regarding whether or not to quantify these metrics in terms of economic impacts, it is difficult to assess the impacts of Sea Grant programs in aggregate.

*Qualitative findings: challenges and successes*

Perhaps the most useful discoveries made by this investigation come not from the quantitative descriptions above, but from the qualitative comments compiled from Sea Grant programs across the network. There appears to be a network-wide recognition that Sea Grant's actual impacts number far greater than those which are reported. One of the most widespread remarks gathered from the network concerned a lack of expertise in social science, particularly in economics. Eleven programs have indicated that they have economists on staff, or have recently hired an economist. (It should be noted here that economists' areas of expertise are diverse. Regional economists may specialize in developing industry impact statements, thus generally focusing on the market values associated with clearly defined industries, while resource economists may concentrate on areas such as damage assessments, nonmarket valuation, or resource management.)

Programs frequently raised questions such as: how do you value the implementation of environmentally-friendly building codes or density ordinances? How do you value the roles that Sea Grant may play as connector, catalyst, and collaborator? How may we value behavioral changes within regulatory agencies, or student and public marine education efforts? Even for economists and other social scientists, these are formidable inquiries.

At the heart of such questions lies the issue of what one person aptly dubbed “cause-effect fuzziness.” The challenge here surrounds the faintness of the behavioral trail which connects Sea Grant activities to observable outcomes, and how Sea Grant may credibly justify the links between the two. At the moment, the linkage between projects and their impacts is often substantiated by expert opinion and stakeholder testimony. Evaluating the effectiveness of industry-related Sea Grant projects by relying on stakeholder judgments is a method commonly used in many Cooperative Extension programs. Examples of constituent groups include participants in workforce development workshops, recipients of free-of-charge consulting services, and those businesses that may benefit from seafood education efforts. Nonmarket impacts may be obtained through similar survey work, though complications exist, and should be the subject of seminars on effective survey design, such as those currently being conducted by the Great Lakes Social Science Network. Establishing guidelines which define acceptable levels of the strength of the cause-effect relationship, and which outline the appropriate interpretation and communication of impacts, are a priority. These and other concrete recommendations stemming from the observations above will be addressed in the following section.

Another challenge which has been identified throughout the network is a lack of understanding of how to interpret the requested metrics, a challenge we understand has already been made known to the NSGO. If programs may be interpreting these metrics in different ways, there is some collective concern that the reporting process may be inadvertently comparing oranges and apples. For example, should jobs be reported in numbers created or retained, or the dollar value of the direct income earned by those employed, or both? What constitutes a mile of restored coastline? Without clarity on the definitions of each reporting metric and other qualifications, programs ultimately settle on their own respective interpretations, a practice which necessarily influences the reported figures. In this way, collaborative development of clear metric definitions may be a useful first step towards standardizing reporting practices.

Another common challenge that programs identified is difficulty in obtaining data, for example baseline industry data, information on fishers' business costs, and recreational visitation data. While some economists may work regularly with various market and nonmarket data sources, it is apparent that these sources are not well-known across other disciplines within the Sea Grant network. Appendix B provides a list of sample resources. Expanding this list in order to develop an annotated index of databases with brief descriptions of their contents and areas of application could prove useful to a variety of Sea Grant staff.

While the network as a whole identified many challenges in reporting economic impacts, this investigation has also revealed instances in which Sea Grant programs have been successful in identifying and tracking some impacts. Industry impacts generated with the use of input-output models are obvious examples of accurate and defensible impact estimates, which include not only direct, but indirect and induced impacts, as well. Despite the significant financial commitment these studies require, investing in these estimates may prove worthwhile in some instances—for example, in order to justify the continuation of prominent Sea Grant projects associated with well-defined and important industries.

Less technical, but still reliable, estimates are perhaps the most encouraging successes because they suggest that extensive studies are not absolutely necessary in order to arrive at reasonable estimates of economic impact. An example of such market impacts are the avoided costs resulting from shrink-wrap recycling programs in several states. With the advent of the recycling program, marinas saved on costs which ordinarily would have been charged for disposal of this material. Data for the estimates were obtained from the participating marinas, which kept records of the amount of recycled material, as well as had information on the disposal costs. With these two pieces of information, calculating the avoided costs due to the program was quite simple.

Another intriguing example of a market impact calculation involved the use of an economic impact calculator by Michigan Sea Grant. Given that Sea Grant staff are able to track and supply two inputs, the number of fishing tournament teams and the percentage of participants from outside the region, this calculator generates direct, indirect, and induced economic impacts to the state economy based upon an underlying economic input-output model and accompanying data. As is evident, the calculator was designed to be easy for non-economists to use. Its development required some funding, the expertise of economists, and required about

two week's time to complete. Continued updates to the underlying model require current data and added time from an economist. This method represents a middle ground between extensive industry impact studies and simpler calculations consisting essentially of multiplication and soliciting expert opinions.

Several nonmarket impact estimates were also encouraging. The majority of reported nonmarket value estimates described the value of the ecosystem services retained through Sea Grant restoration efforts. Among these are restored dunes in Connecticut, which act as a first line of defense against storm damage and its associated costs, and restored tidelands in Washington, which provide valuable flood-prevention capacity. One reported nonmarket impact measured nonmarket values associated with recreation, specifically the value of total consumer surplus associated with use of South Boston beaches in 2011. **Consumer surplus** is calculated by subtracting what users paid to use the beach from the maximum they would be willing to pay, thus measuring the value of the benefit that beachgoers gained. A staff member at MIT Sea Grant consulted an economist for guidance on how to generate the total nonmarket value associated with recreational swimming, given values of consumer surplus developed from peer-reviewed articles on the value of beach visits in Massachusetts and on the estimated number of beach visits per day. Combined with daily sampling data on beach closures, it was estimated that total consumer surplus generated from healthy beaches was \$3.9 million. (Note that this value is the equivalent of a nonmarket "industry impact," as it does not represent the direct impact of Sea Grant program, but provides justification for continuing projects such as beach monitoring. For an expanded explanation of consumer surplus, see Letson and Milon 2002, p. 25.)

Both the challenges as well as the successes identified through the inventory suggest recommendations and next steps for the Sea Grant network in better articulating economic impacts using methods that are both feasible and defensible.

## **Recommendations**

From comments gathered throughout the network, it has become clear that there is a need for guidance on conceptualizing, quantifying, and reporting the economic impacts of Sea Grant projects. Our recommendations are structured to address the two main components of a solution: first, we make suggestions regarding the content of the needed guidance, and second, we propose several ideas for the implementation of that guidance. Essentially we seek to spark further

discussion on the following questions. What guidance should be developed in order to improve the network's capacity to estimate a project's economic impacts? How should this guidance be administered? Accordingly, in addition to recommendations regarding guidance content, we also suggest steps how this content may be developed.

### *Developing guidance*

Developing the specific guidelines which will direct economic impact estimation in Sea Grant programs necessitates a focused effort, specifically through collaboration among those who are familiar with the challenges inherent to this process. Economists will therefore be an essential part of this group, knowledgeable as they are regarding the theoretical and practical issues which arise in determining even basic measures of direct economic impact. The priorities of this collaboration should include determining standard metric definitions, the appropriate use of multipliers, and general approaches for estimating impacts tailored to each area of Sea Grant programming (extension, communications, outreach, education, and research). In instances where no reasonable quantification is possible, it may be useful to establish ways in which programs can communicate the possible or even probable economic impacts that result from Sea Grant projects. Regarding nonmarket impacts, guidelines should direct Sea Grant staff to established resources for benefit transfer application and databases for nonmarket values. Alternatively, it may be concluded that entirely new guidelines should be established, tailored to generating the market and nonmarket impacts of Sea Grant projects. Below, we provide a preliminary consideration of each of these issues.

If Sea Grant programs are to report numeric impacts, consistency among the reported numbers is paramount. Without such consistency underlying reported economic impacts, meaningful comparison and aggregation is impossible. For this reason, collaborators should work toward consensus on a number of issues. These issues are summarized in Appendix C. Clear metric definitions should be established to provide guidance on each of the measures requested including economic benefit, businesses created and retained, jobs created and retained, and may also consider if other suitable metrics exist. Specifically, helpful guidelines would describe conditions under which Sea Grant may reasonably claim economic impacts or jobs and businesses created/retained, as well as the appropriate time scale for reporting these impacts. Developing these guidelines will involve a consideration of what types of evidence provide

satisfactory proof linking Sea Grant activities to market and nonmarket impacts, and therefore implicitly, how much assumption Sea Grant is willing to tolerate in these calculations. Perhaps, for example, this proof may be supplied directly by the stakeholders associated with Sea Grant activities who report on how Sea Grant has affected their business, career opportunities, knowledge, or competency.

Simply introducing more flexible language into the “jobs and businesses created or retained” reporting requirement would relieve a considerable burden on Sea Grant at both the state and national level to provide definitive proof of its role in the creation and retention of jobs and businesses. While Sea Grant does play an important role in creating and retaining coastal jobs and businesses across the country, the extent to which Sea Grant can claim sole responsibility for these is debatable; this was communicated by sources within the network during the compilation of the inventory. For instance, the reporting requirement could be modified from “jobs and businesses created or retained,” to something such as “jobs and businesses helped to create or retain.” While this would translate to potentially less noteworthy success stories (e.g. from “Sea Grant created X jobs” to “Sea Grant assisted in the creation of X jobs”), it would ease the burden of proof placed on the network, as well as arguably improve the integrity of reported measures.

Collaborators should also examine whether or not Sea Grant programs should use multipliers, and if so, what acceptable multipliers may be. Lack of a common network-wide practice regarding the use of multipliers in calculations of economic impact renders comparison of reported numbers inappropriate, and may lead to multiplier inflation as programs seek to secure continued funding, a phenomenon which has already occurred among economic consulting firms in the private sector. Additionally, given the diverse characteristics of the impacts from Sea Grant programs, a single methodological strategy for estimating economic impacts will not suffice. For this reason, these collaborators should consider methods for evaluating the economic impacts of extension, outreach, education, communications, and research activities in isolation. For example, extension activities such as workforce development and technological transfer generate tangible market impacts. Educational activities, while they may generate few definitive market impacts, may produce nonmarket impacts such as increased student engagement, satisfaction, and performance—results which may be associated with nonmarket values in the valuation literature. In essence, since the calculation of nonmarket

impacts is constrained by the existence (or lack thereof) of values available in the literature, an exploration of the network's capacity in this arena should stem from an account of potentially relevant existing nonmarket values. Examples of these values include estimates for the worth of various ecosystem services, recreation days at beaches, or aesthetic amenities. In this way, the unique characteristics of each area of Sea Grant programming demand attention in isolation from each other—attention sensitive to the kinds of impacts typical to each area.

In cases where market impacts cannot be credibly proved, and where applicable nonmarket values do not exist, the best approach available may be to relate conceivable economic impacts. Through the use of qualifying language, it may still be possible to tell stories which have a high degree of truth and likelihood, even if they cannot be reliably proved or estimated. By using phrases such as “contributed to,” “initiated,” and so on, Sea Grant may nonetheless be able to find an outlet for the economic impacts whose cause and effect chain cannot be definitively demonstrated. A separate reporting category for these less confident types of impacts may be warranted.

### *Implementing guidance*

While these more technical economic considerations regarding the content of economic impact assessment guidelines deserve concentrated attention from economists, those who are familiar with the “stories” associated with the types of impacts which occur in extension, outreach, education, communications, and research areas must also be involved. The perspectives of directors, communicators, extension members, and fiscal officers, among others, may lend practical insights improving the ease-of-use of the calculation methods proposed by economists. This leads to several immediate recommendations regarding how the requisite content of the guidance could be developed and delivered:

- 1) Sea Grant staff perform a version of the Possible Training Module in Appendix A, in order to generate a list of the types of impacts typical to each area of Sea Grant programming.
- 2) Convene Sea Grant economists to develop standard guidelines for metric definitions and multiplier usage, as well as systematic approaches for quantifying impacts related to extension, outreach, education, communications, and research activities, based on the impacts generated in Step 1).

- 3) Involve a broader group consisting of representation from across Sea Grant staff (directors, communicators, extension members, fiscal officers, etc.) to evaluate for on-the-ground feasibility of the brainstormed assessment methods. Revise as necessary.
- 4) Strategize the most appropriate method for incorporating these guidelines into staff training based on input from the Sea Grant staff above.

Possible strategies for incorporating these guidelines into staff training (as brainstormed during the Return on Investment session during Sea Grant Week 2012) include developing training modules to be conducted either within state programs, the Great Lakes Social Science Network, the Coastal Services Center, or the Sea Grant Academy curriculum. Associated guidance documents could also be provided to stakeholders (including Congress) interested in how Sea Grant's economic impacts are derived.

Appendix A provides a draft training module for review. It is aimed at improving staff capacity to conceptualize and quantify economic impacts. Appendix B presents an initial list of resources to be developed into a more comprehensive annotated list identifying the types of information each resource holds, as well as indication of which resources are most likely to be of interest to various staff members (e.g., extension, communicators, etc). Appendix C provides sample discussion questions for inclusion in the collaboration effort to develop guidance on metric definitions and estimation methods. We supply possible answers to these questions in order to jumpstart a focused discussion on these topics. Appendix D proposes possible step-by-step estimation models, again in an effort to precipitate further discussion on their potential applicability. Appendix E contains the Economic Assessment Methods Inventory.

## **Conclusion**

While the challenges associated with estimating economic impacts from Sea Grant activities abound, the inventory has revealed some encouraging success stories. An important conclusion is that, more than data limitations, difficulty in conceptualizing economic impacts presents one of the most significant barriers to estimating impacts more regularly across the network. For this reason, current network priorities should focus not only on developing guidance on economic impact assessment methods, but also more generally on increasing Sea Grant staff capacity to look upon their projects through an "economic lens," attuned to the

potential market and nonmarket impacts which may be occurring. Because stakeholder feedback may become a key source in justifying economic impacts, increasing staff familiarity and comfortability with basic surveying practices could greatly enhance the network's capacity for estimating economic impact.

Since credibility remains one of Sea Grant's most valuable assets, in closing we wish to reemphasize the importance of developing standards which define minimum criteria to be met in order to confidently justify Sea Grant activities as causes of identified impacts. Given that a full accounting of the scope and magnitude of economic impacts associated with any Sea Grant project requires significantly more resources than funds permit, it has become evident that reasonably reliable and feasible methods must be developed which guide estimation efforts in the Sea Grant network. It is our intention that this report will initiate such development.

## **Appendix A: Possible Training Exercise for Sea Grant Staff**

### Conceptualizing and Quantifying Economic Impacts

#### Conceptualizing

- 1) Brainstorm a list of all of the conceivable impacts/outcomes of a particular project.
- 2) For each conceivable impact, identify any ways in which it may translate into market and nonmarket economic impacts. (Market: does this impact/outcome “put or keep a dollar in anyone’s pocket”? Nonmarket: does this impact/outcome improve the environment or human welfare in any way?)

#### Quantifying

- 1) What units could we use to measure these market and nonmarket impacts? (See Possible General Estimation Models in Appendix D for examples.)
- 2) How could we measure the units associated with each impact? (Can we find them in an existing database? If not, how much effort would it take to measure these units ourselves?)

## Appendix B: Resources

This list is intended to serve as a starting point for further contribution by economists and others throughout the network who are familiar with the data sources that may serve useful in generating economic impact estimates related to Sea Grant activities.

### *Industry Data Sources*

Bureau of Economic Analysis (BEA) Economic Information for Coastal Areas:

<http://www.bea.gov/regional/docs/noaa.cfm>

National Ocean Economics Program market data:

<http://www.oceaneconomics.org/Market/>

NOAA Economics: Coastal Ocean Watch (ENOW) Explorer:

<http://www.csc.noaa.gov/enow/explorer/>

Independent Sector value of a volunteer hour, by state:

[http://www.independentsector.org/volunteer\\_time](http://www.independentsector.org/volunteer_time)

National Marine Fisheries Service fisheries data:

<http://www.st.nmfs.noaa.gov/st1/recreational/queries/index.html>

State Departments of Marine Resources

### *Nonmarket Value Databases*

Environmental Valuation Reference Inventory (EVERI):

<https://www.evri.ca/Global/Splash.aspx>

National Ocean Economics Program nonmarket data:

<http://www.oceaneconomics.org/nonmarket/NMsearch2.asp>

Earth Economics Ecosystem Service Valuation Toolkit:

[http://www.esvaluation.org/evt\\_demo.php](http://www.esvaluation.org/evt_demo.php)

Natural Capital Project Integrated Valuation of Environmental Service and Tradeoffs (InVEST) Tool:

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

*Guidance on Nonmarket Values and Benefit Transfer*

- Coastal Services Center “Econ 120: Two Minutes of Economic Sense.” Accessed 17 October 2012, at <http://www.csc.noaa.gov/digitalcoast/socialcoast/econ120>.
- Coastal Services Center. 2009. “Introduction to economics for coastal managers.” Charleston, SC: NOAA Coastal Services Center.
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- Letson, D. and Milon, J. 2002. “Florida coastal environmental resources: A guide to economic valuation and impact analysis.” Gainesville, FL: Florida Sea Grant College Program.
- Lipton, D., Wellman, K., Sheifer, I., & Weiher, R. (1995) “Economic valuation of natural resources: A handbook for coastal resource policymakers.” NOAA Coastal Ocean Program Decision Analysis Series No. 5. Accessed 26 April 2013. <http://www.mdsg.umd.edu/programs/extension/valuation/handbook.htm>
- Rosenberger, R.S. and Loomis, J.B. 2001. Benefit transfer of outdoor recreation use values: A technical document supporting the Forest Service Strategic Plan (2000 revision). Gen. Tech. Rep. RMRS-GTR-72. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

## Appendix C: Guidance Development Questions

- Is Sea Grant interested in economic impacts, economic benefits, or both? Should economic impacts be reported in terms of dollars, or should some reported figures remain in terms of jobs and businesses created?
  - These questions may involve consideration of what metrics most accurately represent human welfare, as well as which metrics may be of most federal interest.
- How should the following be defined: jobs and retained, jobs created, businesses retained, jobs and businesses created, economic impact?
  - Job created or retained: Count a job if it has taxable income and if the employee reports that Sea Grant was “instrumental” in the creation or retention of this job.
  - Businesses created or retained: Count a tax-paying business if the business owner reports that Sea Grant was “instrumental” in the creation or retention of this job.
  - Economic impact: Count dollars of impact either when definitively documented, or as justified by expert or stakeholder opinion. Impacts may be measured in terms of avoided costs, increased revenues, increased income, increased local spending, possibly others to be determined. (Related question: should any of these metrics be a priority when estimating dollar impacts?)
- What constitutes proof that a Sea Grant activity resulted in a particular impact? (How much assumption is Sea Grant willing to tolerate?)
  - Possible proof could include expert or stakeholder determination of Sea Grant as “instrumental” in the creation/retention of jobs/businesses and economic impacts (e.g. avoided costs, increased revenue/income, increased local spending).
- Should multipliers be used? If so, what should these values be?
  - These questions involve a consideration of how multipliers may affect Sea Grant credibility and the potential issues associated with using different multipliers for different regions and industries across the network. Perhaps in the interest of preserving credibility, no multipliers should be used. Another possible conclusion could be that multipliers should not exceed 2.
- In estimating economic impacts (market and nonmarket) should Sea Grant consider the hypothetical counterfactual outcome when listing the outcomes of Sea Grant projects? In

other words, should Sea Grant attempt to measure its marginal impact, or will it suffice to measure actual outcomes?

- Given the theoretical challenges inherent in identifying counterfactual scenarios and the amount of effort that this task would involve, it may be most worthwhile to concentrate on how Sea Grant might prove its involvement in actual outcomes.

## Appendix D: Possible General Estimation Models

### *Market impacts*

<b>Step 1</b>		<b>Step 2</b>		<b>Step 3</b>
Quantify the tangible market outcome	→	Assign value to units of market outcome	→	Aggregate these values to determine the total market impact of this outcome for this project
(e.g. units may be number of jobs, businesses, increased dollars of income, etc)		(using per unit values as supported by official data, expert opinions, etc)		

### *Nonmarket impacts: tangible, environmental impacts resulting in intangible social impacts*

<b>Step 1</b>		<b>Step 2</b>		<b>Step 3</b>
Quantify the tangible environmental outcome	→	Assign a value to units of environmental (social) outcome	→	Aggregate these values to determine the total environmental nonmarket value of this outcome for this project
(e.g. acres of coastline restored)		(using an existing, nonmarket value, such as the value of ecosystem services)		

### *Nonmarket impacts: intangible social impacts (welfare impacts)*

<b>Step 1</b>		<b>Step 2</b>		<b>Step 3</b>
Quantify the intangible social outcome (i.e. welfare impact)	→	Assign value to the quantified unit of social outcome	→	Aggregate these values to determine the total nonmarket welfare impact of this outcome for this project
(e.g. a change in a scaled 1-5 rating of aesthetic satisfaction with a certain environmental amenity)		(e.g. a nonmarket value which describes willingness-to-pay for a 1-level increase on a scale of aesthetic appreciation)		

Note: A review of the existing nonmarket values may serve useful before quantifying nonmarket impacts in order to easily value these impacts. For example, if a nonmarket value exists for acres of coastline restored, then it makes sense to measure the outcome in terms of acres. As another example, if a nonmarket value is measured in terms of dollars of consumer surplus per beach trip, then a survey aiming to measure changes in beachgoer satisfaction due to a Sea Grant erosion control program should seek to illicit responses in terms of the change in the number of trips per year.

## Appendix E: Economic Assessment Methods Inventory

### *Market Impacts Methods*

State	Project/ Industry	Description	Impact metric	Method	Data source	Calculati on time	Collab- orative?	Economist necessary?	Cost
CT	Shellfish Efforts	SG helped shellfish businesses obtain permits, contributing revenue to government	increased revenue	multiplication	industry data	minimal	yes	no	\$
DE	MSP Stakeholder Workshop	SG hosted a workshop on marine spatial planning that provided value to attendees	avoided cost (cost of workshop used as proxy for avoided consultation cost)	N/A	SG records	minimal	no	no	\$
FL	Economic relief claims	SG helps local waterfront users file claims with BP for losses due to oil spill	investment in local business	addition	SG records	moderate	yes	no	\$
FL	Waterfront Access Negotiations	SG helps facilitate negotiations between entities to allow local fishers to use waterfront	increased income	expert estimate	industry expert	minimal	yes	no	\$
FL	Oyster Relay Program	Transmits oysters from non-harvestable to harvestable areas	increased income	expert estimate	industry expert	minimal	yes	no	\$
FL	Shellfish School workshop	SG teaches product safety and marketing	increased revenue	expert estimate	industry expert	minimal	no	no	\$
FL	FL Keys Seafood Festival	SG helped organize a festival which raised money for local fishing industry	investment in local business	expert estimate	industry expert	minimal	yes	no	\$
FL	Commercial Fishing Festival	SG helps organize festival which raises money to support waterfront access	investment in local businesses	expert estimate	industry expert	minimal	yes	no	\$
FL	Water Access Study	Study helps get grant money to improve boat ramp, bringing more new permits to Taylor county	spending in local economy	multiplication	industry expert	minimal	yes	no	\$
FL	Kids Fishing Program	SG develops program which pays fishermen to educate youth about fishing	increased income	multiplication	SG records	minimal	no	no	\$

FL	Sustainable Angling Program	SG program pairs fishers with charter boat captains, who are paid	increased revenue	multiplication	SG records	minimal	no	no	\$
FL	Regional Waterway Management System	SG program streamlines permitting and saves tax money	avoided cost	multiplication	town permit records	minimal	no	yes	\$
FL	Energy Efficiency Grant	SG helped secure a grant to reduce greenhouse gas emissions	investment in local businesses	N/A	SG records	minimal	yes	no	\$
FL	Oyster Industry Grant	SG helps secure grant to support oyster industry compliance	investment in local businesses	N/A	SG records	minimal	yes	no	\$
FL	TAA Program for fishers	SG TAA program gives fishers access to investment funds	increased income	surveys	stakeholder surveys	minimal	yes	no	\$
FL	Value of artificial reef	SG funded study estimating the economic value of artificial reefs in Florida	industry impact (local spending)	surveys, IMPLAN	industry data, industry surveys, IMPLAN	long	yes	yes	\$\$\$
FL	Value of aquaculture	SG funded a study estimating the economic value of aquaculture in Florida	industry impact (local spending)	surveys, IMPLAN	industry data, industry surveys, IMPLAN	long	yes	yes	\$\$\$
FL	Commercial Sponge Fishery	SG provides consulting to sponge fishery	industry impact (local spending)	surveys, IMPLAN	industry data, industry surveys, IMPLAN	long	yes	yes	\$\$\$
FL	Kid's Cup Redfish Tournament	SG hosts tournament for kids, bringing money into local economy	industry impact (local spending)	surveys, IMPLAN	stakeholder surveys	long	yes	yes	\$\$\$
FL	Value of Waterway Access	SG implements a user-based economic analysis to support a rural coastal community's efforts to enhance waterway access for nature-based tourism.	industry impact (local spending), grant amount	surveys, IMPLAN	stakeholder surveys, IMPLAN	long	yes	yes	\$\$\$
GA	TAA for shrimp fishers	SG provides trainings which make fishers eligible for business funds	investment in local business	multiplication	SG records	minimal	yes	no	\$

HI	UH Energy efficiency savings	UH saves energy by using technology HSG was involved in developing/implementing	avoided cost	expert estimate	industry expert	minimal	yes	no	\$
HI	New jobs created along the coast	HSG created 54 new jobs	increased income	multiplication	SG records	minimal	no	no	\$
HI	UH Coastal Storms Program	SG created jobs in local economies through the Coastal Storms Program	increased income	N/A	SG records	minimal	yes	no	\$
HI	Marine Science Curriculum Development	HSG developed "Exploring Our Fluid Earth" marine science curriculum	investment in local business	N/A	SG records	minimal	yes	no	\$
HI	Aquaculture Development	HSG helped development of sponge, coral, and giant clam aquaculture development in the US-affiliated Pacific Islands	investment in local business	N/A	SG records	minimal	yes	no	\$
HI	Commercial Aquaponics	HSG involved in developing commercial aquaponics on Maui	investment in local business	N/A	SG records	minimal	yes	no	\$
HI	Renewable Energy System for UH	HSG involved in installing solar power for UH's Hawaii Institute of Marine Biology	investment in local business	N/A	SG records	minimal	yes	no	\$
HI	Waikiki Sea Water Air Conditioning Project	HSG staff involved in developing technology, helping to secure a grant for further development	investment in local business	N/A	SG records	minimal	yes	no	\$
HI	Hanauma Bay Education Program	HSG educates people about marine ecology	investment in local business	N/A	SG records	minimal	no	no	\$
IL-IN	Aquaculture Development	SG extension specialist provided business assistance to aquaculture	increased income	expert estimate	SG expert estimate	minimal	yes	no	\$
IL-IN	Bill Insert Program	Inserts in water bills educate consumers on how to save water, saving them money	avoided cost	multiplication	peer-reviewed article, market price of water, local multiplier	minimal	yes	no	\$
LA	Legal consultations	Provided legal information to fishermen who are engaged in the Delcambre direct seafood sales program.	avoided cost	expert estimate	industry expert	minimal	no	no	\$

LA	TAA for shrimp fishers	2,300 shrimp harvesters in Louisiana received a total of 27,600 credit hours of education and will receive \$9.2 million in Phase-I payments.	investment in local business	multiplication	SG records	minimal	yes	no	\$
LA	Regulation compliance for processing facility	Assist alligator processing facility meet waste water treatment requirements to stay in business.	avoided cost	expert estimate	industry expert	minimal	no	no	\$
LA	Fishery Gear Enhancement Program	SG helped make the Louisiana fishery industry more profitable by reducing overhead, improving efficiency, and enhancing quality.	avoided cost	expert estimate	industry expert	moderate	no	no	\$\$
LA	Marine Debris Program	SG helped mobilize watermen to seek and report marine debris 'targets' to be included in removal by FEMA-funded efforts.	avoided cost	multiplication	industry expert, SG records	minimal	yes	no	\$
LA	Tilapia Eradication Program	Tilapia Eradication Program utilized Sea Grant personnel and guidance on designing and implementation of largest invasive fish eradication effort in history of Louisiana.	avoided cost	multiplication	industry expert, SG records	minimal	yes	no	\$
LA	'Go Fish' Video	Crescent City Farmers Market utilized Sea Grant interviews, guidance, and text to promote locally caught seafood, increasing profits to local fishermen.	avoided cost	expert estimate	industry expert	minimal	yes	no	\$
LA	Crawfish production improvements	Improved efficiencies in energy and input use in crawfish production in coastal watersheds.	avoided cost	expert estimate	industry expert	minimal	no	no	\$
LA	Recreational pond management	SG helped to reduce management costs for recreational ponds within the coastal zone.	avoided cost	expert estimate	industry expert	minimal	yes	no	\$
LA	Deepwater Horizon response and recovery meetings	SG held meetings to address Deepwater Horizon response and recovery issues, allowing fishermen to increase knowledge to deal with crisis.	avoided cost	expert estimate	SG expert	minimal	no	no	\$
LA	Fishermen safety trainings	SG in conjunction with the Texas Health Science Center conducted safety training programs, helping fishermen raise awareness and increase knowledge in sea safety.	avoided cost	expert estimate	SG expert	minimal	yes	no	\$
LA	Facilitating regulation compliance	SG delivered translated fishing closure information to Vietnamese Gulf Coast fishermen, reducing violations incurred and tickets issued.	avoided cost	multiplication	ticket amount, SG records	minimal	yes	no	\$

LA	Cameron Back to the Dock Grant	The LSU Ag Center/Sea Grant program served as technical advisors for the project.	avoided cost	expert estimate	industry expert	minimal	yes	no	\$
LA	Operation Blessing	SG helped identify fishermen in need of equipment and delivered these donations to the selected fishermen.	investment in local business	expert estimate	industry expert	minimal	yes	no	\$
LA	Delcambre Direct seafood marketing program	SG-sponsored program has been directly responsible for increasing income to fishers and is creating ancillary seafood related business opportunities.	increased revenue	expert estimate	industry expert	minimal	yes	no	\$
LA	Nonpoint source pollution outreach	SG outreach has contributed to the implementation of physical and management strategies to reduce polluted runoff, supporting construction jobs.	avoided cost, increased revenue	expert estimate	industry expert	minimal	yes	no	\$
LA	Martin Environmental expansion	SG assisted Martin Environmental, which recently expanded its facility and hired new employees.	increased revenue and income	expert estimate	industry expert	minimal	yes	no	\$
LA	Bucktown Harbor Complex development	Bucktown Harbor Complex has benefitted from SG expertise, helping fishermen to stay in business.	avoided cost, increased income	expert estimate	industry expert	minimal	yes	no	\$
LA	Market Umbrella marketing project	SG guided much of the development of this marketing project.	investment in local business	expert estimate	industry expert	minimal	yes	no	\$
LA	Sponsoring histamine test kit use	Sea Grant sponsored use of histamine test kits for primary receivers.	avoided cost	multiplication	SG records	minimal	no	no	\$
LA	Processor compliance consultations	Sea Grant worked directly with processors to resolve issues raised in FDA 483 forms and communicated with FDA to retain businesses using safe handling practices	avoided cost	multiplication	industry expert, SG records	minimal	no	no	\$
LA	Alligator research facility funding	Alligator farmers raised money to build a research facility at LSU to address production issues.	investment in local business	N/A	SG records	minimal	no	no	\$
LA	Plaquemines Parish TED workshops	SG provided workshops and dock visits for TED inspections along Plaquemines Parish, therefore preventing expensive fines.	avoided cost	multiplication	fine amount, SG records	minimal	yes	no	\$
LA	Green Stick Gear Project	SG project allowed for job opportunities for local shrimpers and businesses necessary to sustain the research project.	increased income	expert estimate	industry expert	minimal	yes	no	\$

LA	Fuel saving technologies for shrimp fishermen	SG helped to identify shrimpers in the Southeast region interested in new fuel saving gear for shrimp boats.	avoided cost	multiplication	industry expert, SG records	minimal	yes	no	\$
ME	Zone C Lobster Hatchery closed	Savings from closure of Zone C lobster hatchery	avoided cost	expert estimate	industry expert	minimal	yes	no	\$
ME	Ogunquit development	Revenue from opening clam flats in Ogunquit.	increased revenue	expert estimate	industry expert	minimal	yes	no	\$
ME	Beach Profiling Project	Resort renovations in Old Orchard Beach.	increased revenue	expert estimate	industry expert	minimal	yes	no	\$
ME	TAA Program for fishers	Sea Grant delivered \$1,200,000 to fishermen through first phase of TAA for lobster; an estimated 100 TAA participants stayed in business because of the program; 50 consultants funded.	investment in local business	multiplication	SG records	minimal	yes	no	\$
ME	Midcoast Maine Fishing Heritage Alliance vouchers	Credit vouchers issued by Midcoast Maine Fishing Heritage Alliance to six Maine fishermen.	investment in local business	multiplication	SG records	minimal	yes	no	\$
ME	Lobster Sampling Research Project	Sea Grant research informed state's decision to cease lobster sampling program for cost savings	avoided cost	N/A	SG records	minimal	yes	no	\$
MD	Oyster remote setting training	Training of new oyster farmers led to the production of 32 million spat on shell	increased revenue	multiplication	industry data	minimal	yes	yes	\$
MD	Oyster Aquaculture Training	SG provided technical assistance and helped farmers secure business loans	industry impact (local spending)	surveys	industry survey	moderate	yes	yes	\$\$\$
MD	Cryogenic Freezing of Crabmeat	Technical assistance to crabmeat industry increases competitiveness and value of crabmeat	increased revenue	surveys, multiplication	industry survey	moderate	no	yes	\$\$\$
MD	Crabmeat Quality Assurance Program	Inspected crabmeat gets a special logo, which increased sales 20%	increased revenue	surveys, multiplication	industry survey, industry expert	minimal	yes	yes	\$
MI	Grand Haven Salmon Festival	SG helped start the festival and continues to be involved in planning and programming	local spending	economic calculator	economic calculator, stakeholder survey,	minimal	yes	yes	\$\$

					IMPLAN				
MI	Oil Reclamation program	SG Clean Marina Program established new system for oil reclamation, eliminating disposal costs and creating added revenue	avoided cost, increased revenue	multiplication	industry expert	minimal	no	no	\$
MI	Whitefish industry development	SG helped whitefish producers sell fish parts to new markets	increased revenue	multiplication	industry expert	minimal	yes	no	\$
MI	Shrinkwrap recycling	SG established recycling program	avoided cost	multiplication	SG records	minimal	no	no	\$
MI	Bike trail grants to local greenways	SG helped two villages secure grant money to connect bike trails	spending in local economy	N/A	SG records	minimal	yes	no	\$
MI	Greenway grants to local communities	SG helped start Downriver Linked Greenways, an organization which awarded 8 grants to help communities improve their greenways	spending in local economy	N/A	SG records	minimal	yes	no	\$
MIT	Hearing aid company established	SG funded a grant which led to the development of a patented hearing aid technology, which helped create Lantos Technologies	industry impact (net value of new business)	expert estimate	industry expert	minimal	yes	no	\$
MIT	Bluefin Lab gets Naval contract to build AUV's	SG helped to establish Bluefin Lab, and an MIT SG researcher developed the AUV to be built there	investment in local business	expert estimate	industry expert	minimal	yes	no	\$
MIT	eOSB	Electronic publication of Ocean Science Bowl Booklet saved money	avoided cost	multiplication	SG records	minimal	no	no	\$
MIT	Cape Ann Fresh Catch CSF	Fishermen who participate generally make about 50 cents more per pound, leading to an increase of \$500,000 in revenues.	increased revenue	multiplication	industry expert, industry data	minimal	yes	no	\$
MN	Dredge waste recycling	Collaborative and creative recycle and beneficial-reuse for dredge material reduce disposal costs	avoided cost	expert estimate	industry expert	minimal	yes	no	\$
MN	Invasive species prevention	SG helped prevent zebra mussels from invading a native environment	avoided cost	expert estimate	industry expert	minimal	yes	no	\$
MN	GL Ballast Water Collaborative	SG involvement avoided probable lawsuit	avoided cost	expert estimate	industry expert	minimal	yes	no	\$

MN	Stop Aquatic Hitchhikers! Campaign	SG helped prevent the spread of invasive species	avoided cost	expert estimate	industry expert	minimal	yes	no	\$
MN	Seafood outreach efforts	Lake herring sales increase because of attention focused on sustainable fishery	increased revenue	expert estimate	industry expert	minimal	yes	no	\$
MN	AIS-HACPP	SG allowed one business to ship bait out of state	increased revenue	expert estimate	industry expert	minimal	yes	no	\$
MN	Rip Current Outreach	SG educates public about rip currents, and assumes 1 person every 10 years is saved due to these efforts	avoided cost (value of a statistical life)	multiplication	industry data (US DOT)	minimal	yes	no	\$
MN	Conservation Design	SG provided free-of-charge conservation design to improve community water quality, resulting in cost of treatment savings	avoided cost	multiplication	peer-reviewed article, SG expert estimate	minimal	yes	no	\$
MN	Stormwater Strategic plan	SG provided free-of-charge consulting to develop a Regional Stormwater team strategic plan	avoided cost	expert estimate	SG expert estimate	minimal	no	no	\$
MS-AL	Oyster farming training	Contributed to successful oyster farming operation	increased income	expert estimate	industry expert	minimal	no	no	\$
MS-AL	Improved acclimation techniques for raising shrimp	Shrimpers increased harvest by an average of 200lbs per acre	increased revenue	multiplication	industry data	minimal	no	no	\$
MS-AL	Shrimper TAA	Shrimpers who participated in training were eligible for \$4,000	investment in local business	multiplication	SG records	minimal	yes	no	\$
MS-AL	Green works project intern	MS-AL SG involvement made it possible for the city to hire an intern for the project	increased income	N/A	SG records	minimal	yes	no	\$
MS-AL	Dolphin SMART training program	SG sponsored Dolphin SMART training workshops	local spending	N/A	SG records	minimal	yes	no	\$
NY	Fishing Package Tours	NY SG worked with Travelocity.com to promote charter fishing trips to international visitors	increased revenue	expert estimate	industry expert	minimal	no	no	\$
NC	Flood Research	SG involved in research to map and mitigate flooding, resulting in better risk awareness and lower insurance premiums	avoided cost	expert estimate	industry expert	minimal	yes	no	\$

NC	Hybrid striped bass aquaculture	SG helped develop production methods to establish the hybrid striped bass aquaculture industry	increased revenue	expert estimate	industry expert	minimal	yes	no	\$
NC	Flounder Aquaculture	SG helped develop the flounder aquaculture industry	increased revenue	expert estimate	industry expert	minimal	yes	no	\$
NC	Blue Ocean Farms LLC	SG performed research and demonstrations which helped retain Blue Ocean Farms LLC	increased revenue	expert estimate	industry expert	minimal	yes	no	\$
NC	Carolina Flounder LLC	SG provided industry assistance to Carolina Flounder LLC	increased revenue	expert estimate	industry expert	minimal	yes	no	\$
NC	Little River Trails Aquaculture LLC	SG provided industry assistance to Little River Trails Aquaculture LLC	increased revenue	expert estimate	industry expert	minimal	yes	no	\$
NC	Great Bay Aquaculture LLC	SG provided industry assistance to Great Bay Aquaculture	increased revenue	expert estimate	industry expert	minimal	yes	no	\$
NC	TAA for the shrimp fishery	SG held workshops which enabled shrimp fishermen to receive monies to spend on business expenses	investment in local business	multiplication	SG records	minimal	yes	no	\$
OH	Aquatic visitor's center	Re-opened aquatic visitor's center at Put-In Bay	increased income	expert estimate	industry expert	minimal	yes	no	\$
OH	Ashtabula county visitor bureau	Ashtabula county visitor bureau	spending in local economy	expert estimate	industry expert	minimal	yes	no	\$
OH	Shrinkwrap recycling	Reduced shrinkwrap waste in 100+ marinas	avoided cost	multiplication	SG records	minimal	no	no	\$
OH	Put-In-Bay Stone Lab and Programs	22,200 visitors to Put-In-Bay to visit stone lab and participate in Stone Lab Programs (\$13 ferry per visitor)	increased revenue	multiplication	SG records	minimal	yes	no	\$
OH	Construction at Stone Laboratory	Construction at Stone Laboratory	increased revenue	N/A	SG records	minimal	no	no	\$
OH	Maumee River Restoration	SG restored portions of the Maumee River	spending in local economy	N/A	SG records	minimal	yes	no	\$
OH	Lake tourism	Quantify the impact of lake tourism on Ohio's economy	industry impact (local spending)	surveys, IMPLAN	industry data, tourism data	long	yes	yes	\$\$\$

OH	Steelhead angling	Quantify the impact of steelhead angling activity on Ohio's economy	industry impact (local spending)	surveys, multiplication	stakeholder surveys	long	yes	yes	\$\$\$
OR	West Coast Surimi Industry Development	OSG contributed to improved processing methods for the industry, leading to increased revenues	increased revenue	expert estimate	industry data	minimal	yes	no	\$
OR	Red algae/ Abalone technology	SG helped develop commercial technologies used in these industries	industry impact (local spending)	expert estimate	industry data	minimal	yes	no	\$
OR	Barotrauma reduction work	OSG performed barotrauma reduction development and outreach, saving the groundfishing industry money	avoided cost	expert estimate	industry expert	minimal	yes	no	\$
OR	Former SG students get jobs	Aquarist graduates find industry jobs thanks to OSG training and support	increased income	expert estimate	industry expert	minimal	no	no	\$
OR	Sockeye Suzie Site	OSG helped develop Sockeye Suzie website for local company	increased revenue	expert estimate	industry expert	minimal	yes	no	\$
OR	Schneider custom packer for pouches	OSG faculty spent time and effort assisting the packer	increased revenue	expert estimate	industry expert	minimal	no	no	\$
OR	New seafood products	OSG helped develop new seafood products for Northwest Gourmet	increased revenue	expert estimate	industry expert	minimal	no	no	\$
OR	New seafood sauces	OSG helped develop new seafood sauces for Northwest Gourmet	increased revenue	expert estimate	industry expert	minimal	no	no	\$
OR	Fish health video instruction	Ornamental fish health video instruction course impacts	avoided cost	expert estimate	SG expert estimate	minimal	no	no	\$
OR	Value-added packaging	OSG involved in development of value-added packaging, which creates jobs	increased income	expert estimate	SG expert estimate	minimal	yes	no	\$
OR	Home Canning workshop	Clatsop county home canning workshop	avoided cost	multiplication	industry expert	minimal	no	no	\$
OR	Food preservation workshop	Clatsop county smoked seafood and pickling workshop	avoided cost	multiplication	industry expert	minimal	no	no	\$
OR	Marine fish health consultations	OSG provided consultations on marine fish health	avoided cost	multiplication	industry expert	minimal	no	no	\$

OR	Prevention of invasive species release	OSG helped schools not release invasive species	avoided cost	multiplication	industry expert	minimal	no	no	\$
OR	Barge Hull Decontamination Procedure	OSG helped develop new decontamination procedures which saved money and provided income for workers	avoided cost, increased income	multiplication	industry expert	minimal	yes	no	\$
OR	SG Extension students hired	Former SG Extension students get jobs, thanks to training and support from OSU	increased income	multiplication	industry expert	minimal	no	no	\$
OR	Yakima Tribal member cannery	OSG helped create new jobs at the Yakima Tribal Member Cannery	increased income	multiplication	industry expert	minimal	no	no	\$
OR	Columbia River tribal summer steelhead	OSG helped create new jobs for Columbia River tribal summer steelhead	increased income	multiplication	industry expert	minimal	no	no	\$
OR	Oregon Ocean Seafoods production	OSG helped create new jobs at Oregon Ocean Seafoods	increased income	multiplication	industry expert	minimal	no	no	\$
OR	Westport Microcanner facilities	OSG helped create new jobs at Westport Microcanner facilities	increased income	multiplication	industry expert	minimal	no	no	\$
OR	Seafood cannery/ Coos Bay new pouch format	OSG faculty spent time and effort assisting the Oregon Seafoods cannery	increased income	multiplication	industry expert	minimal	no	no	\$
OR	Haines Packing	OSG provides technical consultation to Haines packing	increased income	multiplication	industry expert	minimal	no	no	\$
OR	KHV disease testing	OSG developed technique for disease screening, which saved ornamental fish	avoided cost	multiplication	industry expert, industry data	minimal	yes	no	\$
OR	Shipping marine ornamental fish	Value of ornamental fish saved due to OSG-developed shipping technique	avoided cost	multiplication	industry expert, SG records	minimal	no	no	\$
OR	Marine reserve initiative	OSG involved in Marine reserve initiative which created jobs	increased income	multiplication	SG expert estimate	minimal	yes	no	\$
OR	Consult for recommendation letters	OSG provided consultation to Oregon Ocean Seafoods on nutritional labels	avoided cost	multiplication	SG records	minimal	no	no	\$

OR	Consult for recommendation letters	OSG provided consultation to Oregon Ocean Seafoods processor for recommendation letters	avoided cost	multiplication	SG records	minimal	no	no	\$
OR	At-sea SGI data collection	OSG paid commercial fishermen to train, fish and collect data during closed salmon season.	increased income	multiplication	SG records	minimal	yes	no	\$
OR	Commercial Fishermen Assisting Wave Energy	OSG paid commercial fishermen to assist with wave energy projects	increased income	multiplication	SG records	minimal	no	no	\$
OR	SG-funded employees	SG provided income to employees	increased income	multiplication	SG records	minimal	no	no	\$
OR	Research jobs for funded project	OSG funded a research project on how seasonal and interannual ocean variability affects albacore catches, which employed two people	increased income	multiplication	SG records	minimal	no	no	\$
OR	Non-SG-funded SG employees	SG funded university researchers	increased income	multiplication	SG records	minimal	no	no	\$
OR	CROOS sampling project	CROOS sampling project creates work for commercial fishing boats	increased income	multiplication	SG records, industry data	minimal	yes	no	\$
OR	Early Detection and Rapid Response	Early Detection and Rapid Response plan connects youth programs to watershed management	avoided cost	multiplication	SG records, industry expert	minimal	no	no	\$
OR	OSG Marine Education Programs	OSG Education programs attracted visitors who spent money in the local economy	increased revenue	multiplication	tourism data, SG records	minimal	no	no	\$
OR	Hazards adaption plans for a city and county	OSG hired an employee to develop hazards adaption plans for city of Neskowin and Tillamok county	increased income	N/A	SG records	minimal	yes	no	\$
OR	Programs create business for video technology producer	Master naturalist and watershed programs create business for video technology producer	increased income	N/A	SG records	minimal	yes	no	\$
OR	Web development	Watershed and land use project creates work for web developer	increased income	N/A	SG records	minimal	no	no	\$
OR	LID project employment	LID project creates work for design engineer and land use planner	increased income	N/A	SG records	minimal	no	no	\$

OR	NNMREC Award	OSG funded a pilot project which helped create NNMREC, and OSG provides ongoing extension support, as well.	increased income, spending in local economy	N/A	SG records	minimal	yes	no	\$
OR	New Packaging Process	OSG developed/installed new large retort packaging process for a local company	increased revenue	expert estimate	industry expert	minimal	no	no	\$
OR	New and continuing SG students being paid	OSG provides graduate stipends for new and continuing MS and PhD students	increased income	multiplication	SG records	minimal	no	no	\$
TX	Coastal Volunteerism	SG helps train volunteers, who then contribute valuable hours to coastal communities	avoided cost	multiplication	industry data, SG records	minimal	yes	no	\$
TX	Trawler efficiency improvements	Measured gas usage before and after efficiency measures. Efficiencies resulted in 25-38% less gas used.	avoided cost	multiplication	primary data on energy savings, SG records, market price of fuel	minimal	no	no	\$
TX	TAA	Business trainings for fishermen, and money for participation	investment in local business	multiplication	SG records	minimal	yes	no	\$
UC	Spartina densiflora prevention	SG provided information on the impact of an invasive species to management, saving on clean-up costs	avoided cost	expert estimate	SG expert estimate	minimal	yes	no	\$
UC	Kelp raking initiative	By raking kelp off beaches, SG saved removal costs of mulched invasive plant material	avoided cost	expert estimate	SG expert estimate	minimal	yes	no	\$
UC	STARR program	SG pays charter boats to practice catch and release program with anglers	increased revenue	expert estimate	SG records	minimal	yes	no	\$
VA	Assistance to boating community	Helped recreational boating community secure funding	investment in local businesses	IMPLAN	SG records	long	yes	yes	\$\$\$
VA	Aquaculture Development	SG helped launch the aquaculture industry for a new species	industry impact (local spending)	surveys, IMPLAN	stakeholder surveys	long	no	yes	\$\$\$
WA	Gear damages negotiations	SG facilitates agreements between fishermen and towboat operators in order to reduce usage overlap, thereby saving damage costs	avoided cost	expert estimate	industry expert	minimal	no	no	\$

WA	Pollution outreach	WSG promotes consumer awareness about pollution prevention, saving restoration money	avoided cost	expert estimate	industry expert	minimal	yes	no	\$
WA	Fisheries consulting	SG provided consultation to NW Indian tribes, resulting in a larger and higher quality salmon catch	increased revenue	expert estimate	industry expert	minimal	yes	no	\$
WA	Oyster Aquaculture Development	SG provided consultation services to new oyster farms	increased revenue	expert estimate	industry expert	minimal	no	no	\$
WA	Oyster Aquaculture Research	WSG research showed better places to raise oysters, resulting in higher yields	increased revenue	multiplication	peer-reviewed article, industry data, SG expert estimate	moderate	yes	no	\$
WHOI	FVCOM Water Quality Model	The Massachusetts Water Resources Authority used FVCOM water quality model to modify their waste water treatment facility monitoring program and saved approximately \$1 million /year.	avoided cost	expert estimate	industry expert	minimal	no	no	\$
WI	Bell Aquaculture	SG provides consultation, helping company to develop aquaculture techniques	investment in local business	expert estimate	industry expert	minimal	yes	no	\$
WI	J.J. Perch Company	SG provides consultation, helping company to develop aquaculture techniques	investment in local business	expert estimate	industry expert	minimal	yes	no	\$
WI	Milwaukee Fish Company	SG provides consultation, helping company to develop aquaculture techniques	investment in local business	expert estimate	industry expert	minimal	yes	no	\$
WI	Fish Port Ltd.	SG provides consultation, helping company to develop aquaculture techniques	investment in local business	expert estimate	industry expert	minimal	yes	no	\$

*Nonmarket Methods*

State	Project	Description	Impact type	Benefit metric	Method	Data sources	Calculation time	Collaborative?	Economist Necessary?	Training?
CT	Value of Coast as Buffer	SG restored dune which buffers inland from storm damage costs	Value of ecosystem services	\$/acre	Value benefit transfer	Peer reviewed article, SG records on acres restored	Moderate	yes	no	
CT	Value of Riparian Ecosystem Services	SG restored riparian habitat that has ecosystem services benefits	Value of ecosystem services	\$/acre	Value benefit transfer	Peer reviewed article, SG records on acres restored	Moderate	yes	no	
MIT	Healthy South Boston Beaches	Consumer surplus value of beach visits to (healthy) South Boston beaches	Use value	\$/trip	Value benefit transfer	Peer reviewed articles, program data on closures	Moderate	yes	no	consulted with economist for benefit transfer calculation
OR	Fish habitat restored	OSG helped restore fish habitat to grass farm fields	Value of ecosystem services	\$/acre	Value benefit transfer	USFWS value of river habitat reopened to fish passage; OSG records of area opened	Minimal	yes	no	
OR	Watershed restoration	OSG involved in Coos watershed restoration prioritization, opening acres of habitat	Value of ecosystem services	\$/acre	Value benefit transfer	USFWS value of economic impacts of river barrier removal per acre restored; number of acres is OSG estimate	Minimal	yes	no	
OR	Culvert replacements	OSG involved in culvert replacements which opened acres of salmonid habitat	Value of ecosystem services	\$/acre	Value benefit transfer	USFWS value of the economic impact of river barrier removal for salmonids	Minimal	yes	no	
WA	Value of Restored Tidelands	SG restored tidelands	Value of flood prevention services	\$/acre	Value benefit transfer	Peer reviewed article, SG records on acres restored	Minimal	yes	no	

## Glossary

**Benefit transfer:** a valuation method which applies the findings of empirical nonmarket valuation studies to local situations.

**Consumer surplus:** a measure of benefit calculated by subtracting what consumers actually paid for a good or service from the maximum they would be willing to pay for the good or service

**Economic benefits:** measures social welfare, and may consist of both market and nonmarket values.

**Economic impact:** measures the economic activity associated with an industry, event, or policy in an existing regional economy. More specifically, it represents gross direct, indirect, and induced spending (all of which are market values).

**Industry impacts:** measure extent to which a particular industry or resource contributes to a regional economy. These impacts are most often reported in terms of dollars of spending, income, or number of jobs.

**Market impacts:** measures changes in economic values as observed through the marketplace.

**Nonmarket impacts:** measures changes in economic values that are not directly observable in the marketplace.

**Project impacts:** measure the changes in economic values that result from a particular SG project (i.e. marginal benefit).

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