Shoreside Economic Analysis for the Oregon Territorial Sea Plan
Final Report

Report to Oregon Department of Fish and Wildlife

Authors:
Taylor Hesselgrave
Charles Steinback
Cheryl Chen
Kristen Sheeran
Jon Bonkoski
Sarah Kruse
John Stevenson
Scott Fletcher
Leanne Weiss
Nick Lyman

4 October 2011

ecotrust

EXECUTIVE SUMMARY

The primary goal of this project was to understand and to detail the value and economic contribution of marine resources to the shoreside economy and communities of Oregon. More specifically, the objectives were to examine patterns of income, expenditures, and employment in marine related industries such as commercial fishing, charter fishing, recreation, and tourism. To fulfill these objectives, Ecotrust staff reviewed the literature, engaged in extensive coastal outreach, and convened several stakeholder focus groups. We also collected, summarized, and analyzed primary data on coastal businesses and recreational fishing expenditures, and leveraged this data with existing datasets to provide a more complete, comprehensive characterization of Oregon's shoreside economy. Lastly, we updated MarineMap, an important decision support tool to inform marine spatial planning, to reflect some of what we have learned about the contributions of marine resources to the shoreside economy. The resulting data, analyses, and tools form a valuable basis for informing the potential siting of renewable ocean energy projects off Oregon, and supporting marine spatial planning more broadly.

As part of this project, a total of 61 coastal businesses were surveyed, including tackle/marine suppliers, processors/distributors, ports, charters, marinas, and non-consumptive shops. Seventy-eight percent of business survey respondents reported that their success in business is "extremely influenced" by the well-being of Oregon's coast. Respondents were also asked what portion of their gross economic revenues came from tourism (40% on average across all respondents), what portion went towards wages (30%), and what portion was spent in coastal counties in Oregon (54%). Our results confirmed that the revenues of the surveyed businesses are closely tied to commercial, charter, and recreational fishing activities. We also found that the majority of jobs supported by these businesses were full-time, not part-time, with substantial seasonal variability.

To better understand the importance of Oregon's marine resources to coastal recreational users, our analysis used survey results compiled by The Surfrider Foundation. Surfrider surveyed 4,072 randomly selected individuals to obtain detailed spatial and economic data on Oregon's coastal recreational use. Surfrider found that, on average, respondents visited the coast 6.3 times a year and spent $88 per trip. Extrapolating their findings to a larger study population, they estimated that $2.4 billion was spent on coastal visits by 4.4 million permanent residents of Oregon and four Washington counties in 2010. The top three coastal recreation activities are scenic enjoyment, beach going, and photography. Coastal users spend approximately 75% of their total trip budget on lodging, dining, and food stores.

Over the course of this project and our previous work, Supporting the Oregon Territorial Sea Plan Revision (Steinback et al., 2010), we interviewed a total of 113 recreational fishermen. Reported annual recreational fishing expenditures varied greatly, from a low $100 to a high of $68,700, though the majority of responses (85%) fell below $15,000. Based on the survey responses, we determined that recreational fishermen spent more of their expenditures on fuel (24%) than on any other category of expenditures, followed by boat maintenance/expenses (12%) and gear and tackle (11%). Expenditures on food from stores, restaurants, and lodging expenses averaged approximately 12% for survey respondents. An analysis by the Research Group (2011) estimates that recreational fishing in Oregon in 2009 contributed $5.1 million in personal income to residents of the state.

As part of this project, we also interviewed 63 charter fishing owners and operators in Oregon. The average respondent received approximately 63% of his gross economic revenue from charter operations. Across all respondents, the most popular target fisheries were salmon, rockfish, and Dungeness crab, constituting 46%, 42%, and 39% of all charter trips on average respectively. Statewide, we estimated charter operators received $7 million in charter revenue in 2010, of which 15%, 15%, and 38% are spent on crew, fuel, and other operating expenses respectively.

Based on ex-vessel landings data, we estimated the value of commercially landed seafood in Oregon at $99.8 million annually. By port, landings values ranged from approximately $144 thousand (Depoe Bay) to $31.8 million (Newport) annually based on a five-year average. Dungeness crab was by far the largest fishery in Oregon contributing 41% of total landings; in fact this single fishery was responsible for 25%-75% of total landings values across the majority of port groups. In terms of average annual landings,

Newport, Astoria, and Coos Bay/Charleston together constituted almost 85% of state landings. From surveys of 244 commercial fishermen, we also determined that 71% of the average annual commercial landings value ($70.9 million) went towards commercial fishing operating costs: 31% went towards general operating costs; 28% went to crew costs; and 12% went to fuel costs.

To estimate the broader economic impacts of these human-use activities to the shoreside economy, we applied economic output multipliers to commercial and charter fishing gross revenue data and estimated personal income contributions from commercial and recreational fishing. We estimated that commercial fisheries in Oregon from 2004–2008 produced $189.3 million in total economic output from harvesting activities annually. Over the same time period, we also estimated that harvest and processing activities related to commercial fisheries produced $228.7 million in personal income statewide annually. We estimated the total economic output associated with charter fishing for the state of Oregon to be $10.8 million in 2010.

Finally, we identified and briefly addressed issues that are important to Oregon's shoreside economy but were outside of the scope of this study. These include: 1) coastal attitudes and perceptions related to wave energy and marine reserve sites; 2) motivations and reasoning behind people's decisions to reside in coastal areas and its impacts on property values; 3) the value of ecosystem services to shoreside economies and the contribution of other non-market values. Further investigation of these issues would yield a more comprehensive understanding of the contributions of marine resources to the coastal economy and state of Oregon.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

For questions or comments, please contact Charles Steinback, Ecotrust, 721 NW 9th Avenue, Suite 200
Portland, OR 97209; charles@ecotrust.org; 503.467.0777

1. INTRODUCTION

The state of Oregon is developing a comprehensive plan to guide the potential siting of renewable ocean energy projects in Oregon's Territorial Sea. To this end, the state is revising its Territorial Sea Plan (TSP), and has begun collecting information on the spatial extent of human uses which provide economic and socio-cultural benefits. One data gap identified was the value and economic contribution of marine resources to the shoreside economy of Oregon. This study can inform the Oregon Territorial Sea Plan revisions by providing previously unavailable information on the linkages between coastal and marine resources, human use activities, and shoreside economies. This information provides a baseline understanding of the relationship between the coastal economy and marine resources in the short term. Over the long term, we believe this information will be useful to support other coastal and marine planning processes and will also serve as the foundation for a longer term strategy to better understand the relationship between the Oregon Territorial Sea and coastal communities and economies.

In order to answer the multiple questions posed in this study, our research team used a variety of methods and data sources. This report details the approaches and methods we used to collect, compile, and analyze the data gathered for this study; presents our findings; and recommends next steps.

Conducting research in coastal communities is as challenging as it is rewarding. We have learned a tremendous amount from the individuals who participated in our stakeholder working groups, as well as from community members, project partners, agency staff, and observers of this project. In addition, we would like to thank the 61 business survey respondents and 43 recreational fishing respondents for their participation in our survey efforts. We continue to be grateful to the 244 commercial fishermen, 63 charter operators/owners, and 237 recreational fishermen whose information was gathered as part of the Oregon fishing community mapping project (Steinback et al., 2010) and contributed greatly to this analysis. Additionally, we thank the members in the stakeholder focus groups from the Coos Bay, Newport, and Port Orford Chamber of Commerce, the Department of Land Conservation and Development (DLCD), Fishermen Interested in Natural Energy (FINE), Fishermen's Information Service for Housing Confidential Release and Essential Distribution (FISHCRED), Marine Resource Management (MRM), The Nature Conservancy (TNC), the Nearshore Action Team (NSAT), Ocean Policy Advisory Council (OPAC), Ocean Wave Energy Trust (OWET), Oregon Department of Fish and Wildlife (ODFW), Oregon Sea Grant, Port Orford Ocean Resource Team (POORT), the Southern Oregon Ocean Resource Coalition (SOORC), Laura Anderson and the several local business owners, commercial, charter, and recreational fishermen who attended and participated. Finally, we would like to thank our project partners, NaturalEquity, Surfrider, The Research Group, and Onno Husing at the Oregon Coastal Zone Management Association (OCZMA).

Funding for this effort was provided by The Oregon Department of Fish and Wildlife (ODFW). The resulting data, analyses, and tools form a valuable basis for informing the potential siting of renewable ocean energy projects off Oregon, and supporting marine spatial planning more broadly.

2. PROJECT GOALS AND OBJECTIVES

The overarching goal of this project was to begin to estimate the value and economic contribution of marine resources to the shoreside economy and communities of Oregon.

The objectives of this project were to:

- Describe coastal and marine fishing (i.e., commercial, charter, and recreational) revenues, expenditures, and employment;
- Describe coastal visitation and marine non-consumptive recreational activities and expenditures;
- Develop data layers describing key coastal and marine consumptive and non-consumptive infrastructure;
- Develop data layers describing key visual and aesthetic scenic resources; and
- Outline methods for conducting future research on a) the relationship between coastal and marine resources and real estate values; b) the value of ecosystem services; and c) attitudes and perceptions related to changes to the coastal and marine environment from marine spatial planning (e.g., marine reserves, wave energy sites).

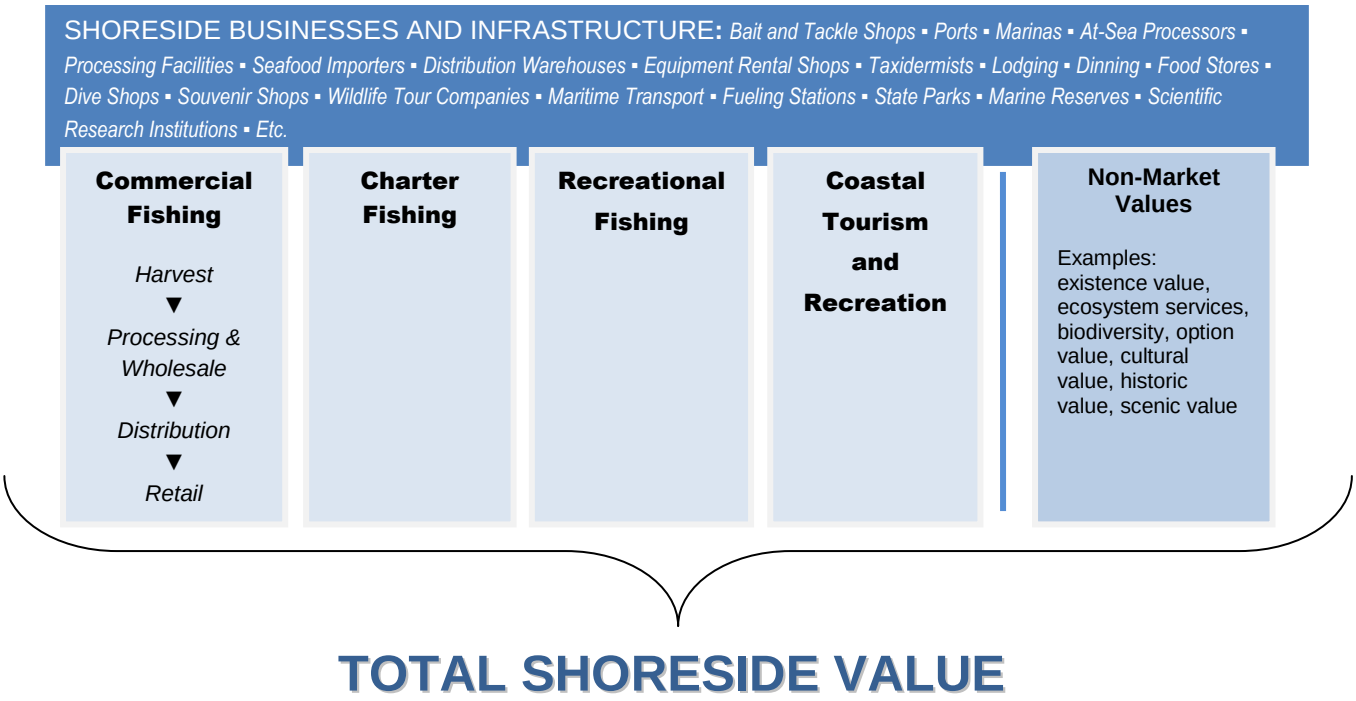
In order to complete these objectives, the core tasks of this project were as follows:

1. Literature Review
2. Outreach and education
3. Convening stakeholder focus groups
4. Data collection
5. Analysis and evaluation
6. Tool development

Each of these tasks is described in detail in subsequent sections of this report. The completion of all six tasks resulted in the development of an extensive base dataset, improvements in the decision support tool MarineMap, greater alliances amongst stakeholders, and new ideas for future directions and research. Most importantly, it contributed to an improved and more comprehensive understanding of Oregon shoreside economy.

Figure 1 presents our conceptual model of the relationship between Oregon's marine resources and the shoreside economy. The shoreside economy is comprised of businesses and infrastructure that depend on marine resources to support a variety of economic activities, including commercial fishing, charter fishing, recreational fishing, tourism and coastal recreation. Revenues from these activities contribute directly or indirectly to economic output, income, and employment in the region. Changes in marine resources that enhance or diminish these activities, therefore, impact the shoreside economy and the well-being of those who derive their income and livelihood from it. The total shoreside value of marine resources is also dependent on a variety of "non-market" benefits.[1] Though these benefits are not tied directly to the shoreside economy, they affect the well-being of individuals in and around the region. Our analysis did not include non-market values, though we recognize the importance of those values to decision-making and planning in regards to Oregon's marine resources.

Figure 1. Conceptual model of the shoreside economy



Source: Current study

[1] Non-market values include all of the ways in which individuals benefit from a resource outside of formal market activity. Whereas the monetary value of seafood is priced in a market, the value derived from scenic coastal landscapes, biodiversity, ecosystem services, and the preservation of coastal communities and cultures is not regularly transacted in markets. To arrive at estimates of these values, economists typically rely on surveys, which ask respondents to estimate these values in dollar terms, or they infer these values by examining expenditures on closely related marketed goods, such as coastal real estate, tourism expenditures, or grey infrastructure.

3. REVIEW OF LITERATURE

A core component of this project was to provide a thorough review of the literature and an inventory of existing analyses and datasets. Our search for the relevant literature to include in this report included: a) direct contact with state/regional/federal government agencies; b) direct contact with academic and research institutions; and c) targeted searches of public and commercial websites and databases.

The general objectives of this task were to:

- Identify studies and efforts to conduct socioeconomic analyses related to marine resources, coastal communities, and/or shoreside impacts associated with changes in fisheries/coastal management;
- Annotate key findings and include a full list of citations and relevant datasets, including methods, models, and/or datasets to which project partners currently have access to and/or ownership of and relate specifically to the overarching goal of this project; and
- Leverage existing datasets, methods, and protocols in the design and execution of this project.

In addition, we sought to:

- Identify and summarize areas of scientific consensus (or lack thereof);
- Identify existing data for use in this study;
- Identify data gaps; and
- Identify approaches and methods for filling these data gaps.

Key topics researched in the review of literature included: consumptive activities, non-consumptive recreational activities, shoreside infrastructure, non-market values, ecosystem services, and attitudes and perceptions. The final version of the literature review was submitted to ODFW on November 2, 2010 as a separate document. For more details, please reference the document, entitled "*Shoreside Economic Analysis and Model for the Oregon Territorial Sea Plan: Literature Review*," presented as Appendix A.

4. STAKEHOLDER FOCUS GROUPS

To engage key stakeholders in the project and to ensure we were able to effectively access, review, and share data, methods, and results, we convened a series of stakeholder focus groups. The primary purpose of the focus groups was to review and provide feedback on our summary of existing data and knowledge gaps, to help prioritize research objectives, and to assist with project outreach in coastal communities.

Individuals and organizations asked to participate in the focus groups represented a broad range of activities and relationships within the Oregon coast (e.g. consumptive and non-consumptive users, business owners, non-profits, industry, state agencies, etc.) and, in most cases, resided or worked in one of the three focus ports: Coos Bay, Newport, and Port Orford. More specifically, we sought out individuals representing marine related businesses, recreational activities, port activities, commercial, charter, and recreational fishing, state agencies, and non-profits, among others.

Before each meeting, focus group participants were sent an agenda, a brief project overview, and the draft literature review. During the week of September 13, 2010, Ecotrust staff facilitated four focus groups to solicit feedback on our proposed research approach for the Shoreside Economic Analysis for the Territorial Sea Plan project. These focus groups were held in Portland, Newport, Coos Bay, and Port Orford. While participants in the Newport, Coos Bay, and Port Orford focus groups were primarily individuals living or working in those communities, the Portland focus group was comprised of representatives from additional government agencies, non-profit, and industry/business groups who did not have specific port affiliations.

A record of attendance and detailed notes were taken for each meeting. These and a summary of general focus group outcomes were circulated to focus group participants and revised accordingly. A final version was submitted to ODFW on November 2, 2010. For additional details, please reference the document entitled, "*Shoreside Economic Analysis and Model for the Oregon Territorial Sea Plan: Notes from Stakeholder Focus Groups*". Appendix B contains two pages from this document noting the focus group themes and participants.

Stakeholder focus group participants provided additional guidance and feedback throughout the process by reviewing the revised work plan, the draft shoreside infrastructure inventory, and the draft business survey. Feedback from stakeholders was used to update and revise both the shoreside infrastructure inventory and business survey.

In addition to working directly with key stakeholders through the focus groups, which formed the core of our outreach and education activities, we made additional outreach efforts. The aims and objectives of this project were presented at community/user group meetings for audiences such as OCZMA, FINE, FISHCRED, SOORC, etc. Furthermore, our project partners created an informative FAQ sheet regarding this project which was made publically available and circulated widely to those interested (see Appendix C).

5. DATA COLLECTION

In order to maximize the relevancy and applicability of project results to the Oregon Territorial Sea Plan process, we leveraged existing datasets to the extent possible, and focused primary data collection efforts on three key data gaps identified by ODFW and prioritized by the stakeholder working groups: 1) shoreside infrastructure; 2) business surveys; and 3) recreational fishermen expenditure surveys.

Ecotrust and project partners took every measure possible to protect the confidentiality of sensitive information provided by individuals during and after the primary data collection component of this project. These measures included consent forms for individual participants and collection and analysis protocols that mask all names and identifying characteristics. Explicit consent was obtained from all participants and recorded by Ecotrust personnel. All information on the individual level remains anonymous and confidential. Analyses and results were presented to stakeholders for review and in this report are presented in aggregate form.

The remainder of this section describes the three primary data collection efforts including both methods and results. The following sections displaying data from existing datasets and documents their respective data sources accordingly.

5.1. Shoreside Infrastructure

One key result of this study is the information gathered on the type, quantity, and location of shoreside infrastructure directly related to coastal and marine human use activities in Oregon. In this context, infrastructure was broadly defined as the shoreside business and facilities that support ocean uses.

The resulting database and data layers submitted to ODFW and uploaded to Oregon MarineMap were compiled from both existing data source and new data collection efforts. The methods and findings are both described in detail below.

5.1.1. Methods

Recognizing that number and variety of infrastructure that are likely related either directly or indirectly to coastal or marine human use activities in Oregon, Ecotrust staff, with input from ODFW and stakeholders, created a specific list of infrastructure types on which to focus. This list included infrastructure related to consumptive activities (commercial, charter, and recreational fishing), non-consumptive recreation, scientific research, and maritime commerce, detailed below. After the draft database was compiled, port specific information on infrastructure was circulated to members of the stakeholder focus groups for review. Missing infrastructure, based on their feedback, was then added to the final database.

Consumptive – The infrastructure records listed in the database as ‘consumptive’ were originally compiled by ODFW staff and were identified using Google web searches. Keyword searches used to find these records were *ports*, *marinas, charters, tackle, and marine supply*. Processors and distributors were identified using ODFW’s permits and licenses data base. These lists were restricted to coastal areas and completed in July of 2010.

Non-Consumptive – The infrastructure records listed in the database as ‘non-consumptive’ were also compiled using web searches, primarily through Google maps. While a large number of non-consumptive activities occur on the Oregon coast, keyword searches used to identify non-consumptive infrastructure were *sports*, *surf*, *dive*, and *kayak.* These words were chosen because they focused on the non-consumptive activities that are primarily related

to ocean use, which is considered priority over shore-based activities for documentation in the Territorial Sea Process by Department of Land Conservation and Development (DLCD). These searches were applied to the entire Oregon coast and were not constrained to any particular set of ports. These searches took place in October and November of 2010.

In addition, information on coastal parks and facilities was collected. These data were provided by the Oregon Parks and Recreation Department in November, 2010. The dataset originally provided included a number of park facilities west of the coast. This dataset was then edited to only include records within seven miles of the coast – a distance representing Oregon's coastal zone and recommended for use by DLCD.

In the future, the database and data layers can be updated or augmented to include both new infrastructure related to these activities and existing infrastructure related to other coastal and marine human use activities either directly (e.g., bike rentals, kite shops, etc.) or indirectly (e.g., restaurants, hotels, etc.).

Maritime Commerce – Businesses related to 'maritime commerce' were identified using similar methods as those used to consumptive and non-consumptive searches. Key search words included *shipping, maritime transportation, maritime commerce, tug boat, stevedores,* and *longshoremen.* These searches also took place coast wide; however, they were not conducted inland of Astoria because of this study's focus on the Territorial Sea, excluding a number of Columbia River shipping ports. Searches were conducted in November, 2010.

Scientific Research – Spatial and non-spatial information related to scientific research points of interest and installations were compiled by DLCD. Data include research buoy stations, wave observation radar antennas, research stations, water quality monitoring sites, research transects and tracks, and more. This information is available in a forthcoming report from DLCD.

5.1.2. Findings

The shoreside infrastructure database was used to create summary statistics and spatial data layers which were incorporated into Oregon MarineMap, see section 7. Additionally, this infrastructure database was used to inform our coastal business survey efforts, as described below in section 5.2.1. In turn, while Ecotrust staff were completing the business survey fieldwork, non-existing or non-related businesses were removed from both the survey list and the final infrastructure data layers.

Table 1 displays a summary of the shoreside infrastructure points added onto Oregon MarineMap organized by ten categories. Recreational charter operations and Oregon state parks were the largest infrastructure types accounted for, with 99 individual operations and 98 state parks identified and mapped respectively, followed by 78 seafood processors and distributors.

Table 1. Shoreside infrastructure in MarineMap, by type

Infrastructure Type	Count
Recreational charter operations	99
Oregon state parks	98
Seafood processors and distributors	78
Bait and tackle shops	50
Marinas	45
Non-consumptive recreational businesses	43
Marine supply	33
Ports	12
Research institutions	7
Maritime transportation	6
TOTAL	**471**

Source: Current study

Table 2 displays the same infrastructure points as noted above, but by city, with the exception of Oregon state parks which were not ascribed to an individual city. The city of Newport had more respective infrastructure included in MarineMap, of varying types, than any other city (49) as a result of these efforts, followed by Astoria (37).

Table 2. Shoreside infrastructure in MarineMap, by city

City	Count
Newport	49
Astoria	37
Brookings	22
Depoe Bay	22
Warrenton	22
Coos Bay	21
Lincoln City	19
Garibaldi	17
Tillamook	16
Charleston	15
Gold Beach	15
Reedsport	14
Florence	12
Winchester Bay	10
Pacific City	9
Seaside	9
Port Orford	8
Rockaway Beach	7
Waldport	7
North Bend	6
Bandon	5
Nehalem	5
Lakeside	4
Otis	4
Cannon Beach	3
Hebo	3
Wheeler	3
Yachats	3
Bay City	2
Cloverdale	1
Manzanita	1
Neskowin	1
Otter Rock	1

Source: Current study

These additions to Oregon MarineMap give a more comprehensive and detailed profile of the Oregon shoreside economy by specifying the type, quantity, and locations of shoreside infrastructure directly associated with coastal and marine human use activities in Oregon.

5.2. Coastal Business Survey

One recurring theme in the stakeholder focus groups was the desire to use a shoreside business survey to better understand linkages between coastal and marine resources and the shoreside economy; thus, within the constraints of this study, we developed and administered a brief business survey to provide a ‘first cut’ characterization of shoreside businesses.

The goal of this survey was two-fold: a) to establish a preliminary baseline assessment; and b) to demonstrate the feasibility of administering a 'rapid assessment survey', which, if successful, would suggest a methodology which could be used to update these data on a recurring basis.

5.2.1. Methods

The business survey was developed by the project team before being circulated to select shoreside business owners and stakeholder focus group members for review. Revisions were made based on feedback received and the final version of the survey may be viewed in Appendix D.

Shoreside businesses to be surveyed were consumptive and non-consumptive related businesses identified as part of the shoreside infrastructure counts that were located in the port groups of Newport, SOORC ports, and Port Orford, see Table 3.[2] Consequently, information on location and business type were already available. All surveys were conducted anonymously; however, each survey had an identification number that allowed project staff to link the survey with the pre-populated data categories.

Table 3. Business survey ports by port group

Newport	SOORC Ports	Port Orford
Depoe Bay	Winchester Bay	Port Orford
Otter Rock	Reedsport	
Newport	North Bend	
Florence	Coos Bay	
Waldport	Charleston	
Yachats	Bandon	

Source: Current study

The survey included questions asking businesses to rate the reliance of their success to the well-being of Oregon's coast, to estimate what percentage of their gross revenue came from commercial, charter, recreational fishing, shore/ocean recreation, and/or general beach town tourism. The survey also asked for counts of full-time and seasonal employment, as well as estimates of local spending by shoreside businesses. Please see Appendix D for a full copy of the coastal business survey.

In early January 2011, a total of 139 surveys were mailed to Oregon shoreside businesses, using procedures that closely followed those developed by Dillman (1978), each survey included a cover letter and a return envelope with postage. Through these efforts alone, we initially received only 28 responses. To increase the number of responses we modified our data collection method.

In mid February 2011, 33 additional responses were solicited via in person and telephone interviews. Roughly four days were spent in the Newport area and four days in the Coos Bay area. This in-field data collection effort allowed us an opportunity to verify the infrastructure list and led us to discover several businesses which were not at the addresses noted in the database or appeared to be closed down. These places were not removed from the database as it was not clear if the mailing address of shoreside businesses were simply different than the actual location of the business or if businesses had moved locations. Only duplicates, verified closed businesses, and businesses that did not fit into the designated categories were removed from the list. Businesses at hard to find locations or located at personal residences were called and phone interviews were conducted. Also two new businesses not on the original list were added. Through these efforts we increased our survey response numbers from 28 to 61 business surveys, with a total response rate of nearly 44%. Responses by port group were as follows: Newport – 39, Coos Bay – 21, and Port Orford – 1. Response details are provided in Table 4.

[2] Other ports were not included due to time and budget constraints.

Table 4. Business survey response status

Returned to sender	23
Complete	61
Incomplete	54
Refused	1
Total surveys sent	**139**

Source: Current study

Table 5 displays the types of businesses surveyed and the respective response rates for Newport and SOORC ports. Three surveys were sent to Port Orford, of which one processor/distributor responded. The Newport port group had the highest response rates overall, with response rates of all surveyed business types at 50% or higher. The SOORC ports had slightly lower response rates, with only two business types, ports and non-consumptive businesses, reaching response rates of 50% of higher. Survey responses were generally well distributed among business types, with tackle and marine supply stores (28%) and processor/distributors (23%) having the highest number of respondents. Ports and non-consumptive recreational businesses (i.e. surf and scuba shops, etc.) made up the smallest portion of survey respondents, each approximately 8% of total respondents.

Table 5. Survey respondents by business type

	Newport			SOORC Ports			Total Respondents	
Business type	**Surveys sent**	**Number completed**	**Response rate %**	**Surveys sent**	**Number completed**	**Response rate %**	**Number**	**% of all respondents**
Tackle and Marine Supply	19	10	53%	21	7	33%	17	28%
Processor/Distributor	18	9	50%	17	4	24%	14*	23%
Port	4	3	75%	4	2	50%	5	8%
Charters	8	6	75%	14	3	21%	9	15%
Marinas	12	8	67%	9	3	33%	11	18%
Non-Consumptive	6	3	50%	3	2	67%	5	8%
Stevedores	0	0	n/a	1	0	0%	0	0%
Total	**67**	**39**	**58%**	**69**	**21**	**30%**	**61**	**100%**

** Including one processor/distributor respondent from Port Orford*

Source: Current study

These business types were chosen based on their direct relationship with people utilizing marine resources. We realize there are a number of other business types including coastal hotels, restaurants, and stores that also support individuals working on the coast or visiting the coast to recreate; however, resources to include all business types were not available at the time of this first survey effort. Our intent was to provide a first-cut estimate based on the business types listed above and provide a methodological framework for replication of this type of survey with other businesses in the future.

5.2.2. Findings

Table 6 through Table 10 display the findings of the coastal business survey. As expected, and displayed in Table 6, the vast majority of survey respondents (78%) rated the well-being of the Oregon coast as extremely influential in the success of their business, and no respondent reported ‘no influence’. Most of the respondents (31%) reported their business’ estimated gross economic revenue (GER) as ranging from $100,001-$500,000 annually, while none responded as over $10,000,000 (see Table 7).

Table 6. Level of influence of the well-being of Oregon's coast to respondents' businesses

	# of respondents	Average of total
Extremely influenced	48	79%
Very influenced	8	13%
Somewhat influenced	4	7%
Not very influenced	1	2%
Not at all influenced	0	0%
Did not answer	0	0%

Source: Current study

Table 7. GER of business respondents

Gross Economic Revenue	# of respondents	Average of total
Less than $100,000	15	25%
$100,001-$500,000	19	31%
$500,001-$1,000,000	10	16%
$1,000,001-$2,500,000	7	11%
$2,500,001-$5,000,000	2	3%
$5,000,001-$10,000,000	2	3%
More than $10,000,000	0	0%
Did not answer	6	10%

Source: Current study

Table 8 displays the average percentage of GER that business survey respondents estimated: 1) came from tourism; 2) went towards wages; and 3) went towards expenses (not including wages) and was spent in coastal counties in Oregon. Charter respondents reported the highest contribution to GER from tourism (74%), while processor/distributors reported the lowest (23%). Charter businesses also spent larger portions of their GER on wages (57%), while marinas spent the least (19%). The average percentage of total non-wage expenses made in Oregon coastal counties was 54% across all respondents, with most business types spending well over half (ports at the highest estimate of 79%) in coastal communities. Non-consumptive businesses estimated much lower non-wage expenses spent in Oregon coastal counties than other business types (29%); it is likely that the manufacturing of the majority of their goods takes place outside of Oregon.

Table 8. Average GER percentages: Tourism, wages, and coastal expenditures

Business type	% of GER from Tourism*	% of GER to wages	% of GER spent in OR coast**
Charters	74%	57%	56%
Marinas	43%	19%	48%
Non-Consumptive	38%	27%	29%
Port	69%	42%	79%
Processor/Distributor	23%	24%	74%
Tackle and Marine Supply	24%	28%	44%
All Respondents	**40%**	**30%**	**54%**

** Tourism described as visitors coming from outside Oregon coastal counties*

*** Percentage of expenses made in coastal Oregon counties (not including wages)*

Source: Current study

Coastal business respondents were asked to estimate what percentage of their business' gross revenue for 2010 came from human activities related to the Oregon coast and/or marine resources; Table 9 displays their responses by business type. The stated importance of the coast and marine resources is evident in these findings.

Table 9. Average estimates of % GER from human coastal activity

Business type	Commercial Fishing	Charter Activities	Recreational Fishing	Shore/Ocean Recreation	General Tourism	Other
Charters	1%	92%	4%	0%	2%	0%
Marinas	20%	5%	47%	5%	9%	13%
Non-Consumptive	5%	1%	30%	48%	9%	8%
Port	35%	13%	39%	6%	8%	0%
Processor/Distributor	81%	3%	5%	2%	9%	0%
Tackle and Marine Supply	50%	9%	21%	2%	6%	12%
All respondents	**39%**	**20%**	**22%**	**6%**	**7%**	**7%**

Source: Current study

Commercial, charter, and recreational fishing activities reported notable economic contributions across the varying business types. Charters, for example, estimated 92% of their GER comes from charter activities, tackle and marine supply businesses estimated 50% of their GER comes from commercial fishing activities, and marinas estimated 47% from recreational fishing activities. Processors/distributors' businesses were closely tied with commercial fishing activities, responses averaging at approximately 81% for this sector.

Shore/Ocean recreation did not support most of the business types interviewed for this survey, with the exception of non-consumptive businesses (48%). However, it should not be inferred that these activities do not support other coastal business types; as discussed in section 6.1.4, coastal visitation and non-consumptive recreational expenditures are spent primarily at coastal business types not included in this study such as lodging and dining establishments, etc. This observation is also likely true for general tourism activities. Respondents who noted some reliance on the "other" category submitted some of the following notable examples: shipping vessels, construction, local industry, local shoppers, rental property, and RV parks.

Table 10 displays the respondents' respective counts of seasonal and year round, part-time and full-time employees. Generally, the majority of employment across business types tended to be towards full-time rather than part-time employment. Processor/distributors were clearly the largest employers among the surveyed businesses, with almost no part-time employment, and relatively large seasonal increases. Charter businesses also had notable increased seasonal employment. Tackle and marine stores had the lowest total numbers of employment, followed by ports, and neither appeared to experience seasonal increases in employment.

Table 10. Average coastal employment by business type

	Year Round		Seasonal	
Business type	**Part-time**	**Full-time**	**Part-time**	**Full-time**
Charters	2	1	6	8
Marinas	3	10	1	0
Non-Consumptive	2	6	2	4
Port	1	4	0	0
Processor/Distributor	0	16	1	23
Tackle and Marine Supply	1	2	0	0
Average across all respondents	**1**	**7**	**2**	**6**

Source: Current study

It is important to acknowledge that these findings provide only a snapshot analysis of a select cross-section of coastal businesses in Oregon. This survey effort highlighted the need for a central and continually updated inventory of shoreside businesses/infrastructure in which to develop a rapid assessment sample design and that in-person or phone interview are the best method for acquiring higher response rates. Updating these data on a recurring basis would allow for trend analyses and a better understanding of change within coastal businesses that may be useful for management decisions and purposes in regards to marine planning.

5.3. Recreational Fishermen Expenditure Survey

Included in Ecotrust's project, *Supporting the Oregon Territorial Sea Plan Revision: Oregon Fishing Community Mapping Project* (Steinback et al., 2010), was a recreational fishing survey which contained a section on recreational fishing related expenditures. A total of 51 responses were received during that study and thus, as part of this study, we conducted a follow-up survey with fishermen who did not initially provide this information.[3]

While informative, the collected data represents only a select subset of the general population and cannot be extrapolated to the larger ocean recreational fishing population to estimate total recreational expenditures statewide.

5.3.1. Methods

The intent of this survey was to build upon results previously gathered (Steinback et al., 2010) to better understand expenditures made by Oregon recreational fishermen. The survey asked respondents to estimate their annual recreational fishing expenditures and then categorize the expenditures by expense type (e.g., bait, lodging, etc.). The full survey is included in Appendix E. The questions in this survey were identical to those previously asked, with the exception of asking the questions as they related to 2010 expenditures (previously the question was asked for 2008 expenditures, the results of which are displayed in 2010 dollars in this report for consistency). The decision to ask for 2010 related expenditures related to decreasing the recall effort for participants.

In early January of 2011, a total of 123 surveys were mailed[4] to the Oregon recreational fishermen who had participated in the mapping project who did not previously provide expenditure information and had indicated we may contact them again. Our mailing used procedures that closely followed those developed by Dillman (1978), in that each survey included a cover letter and a return envelope with postage (see Appendix E for the complete survey). Approximately four weeks after the first mailing, a follow up survey was emailed to those we had not yet heard back from encouraging individuals to respond. Personal phone calls were made when we did not have the respondent's email address. We thus collected 43 additional responses to the 70 responses that had been collected by previous project efforts, resulting in 113 total responses; see Table 11 and Table 12.

Table 11. Recreational survey response status

Recreational Surveys	
Returned to sender	4
Complete	43
Incomplete	75
Refused	1
Surveys Sent	**123**

Source: Current study

Table 12. Completed surveys by project

Project	# Completed
Steinback et al. (2009)	70
Current study	43
Total	**113**

Source: Current study

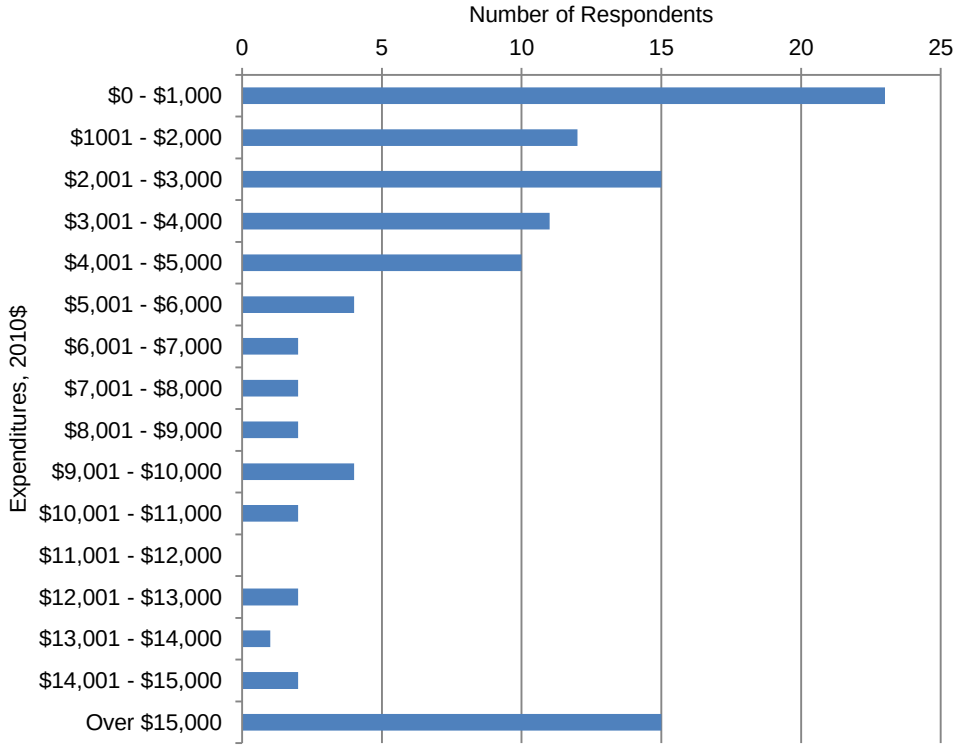
[3] Additionally, an initial pilot project surveying recreational fishermen with the Southern Oregon Ocean Resource Coalition (SOORC) in the spring of 2008 did not include an economic expenditure component. Participants in the SOORC project were asked to complete the economic portion in Oregon project (Steinback et al., 2010) and 19 responses were received. Those who did not respond in that effort were also included in the follow-up survey mailing of this study.

[4] Of the 123 surveys, 32 were emailed to respondents due to lack of complete mailing address. The survey was included as an attachment with the option to request a hard copy.

5.3.2. Findings

Respondents were asked to estimate their recreational fishing related expenditures for one year. The responses varied greatly from $100 at minimum to approximately $68,700 at maximum. The majority of respondents, however, (86%) estimated their expenditures to be under $15,000. Figure 2 displays the number of respondents that fall into distinct expenditure ranges. The top four recreational spenders estimated that an average of 85% of their expenditures were made in the 'power boat purchase' category.

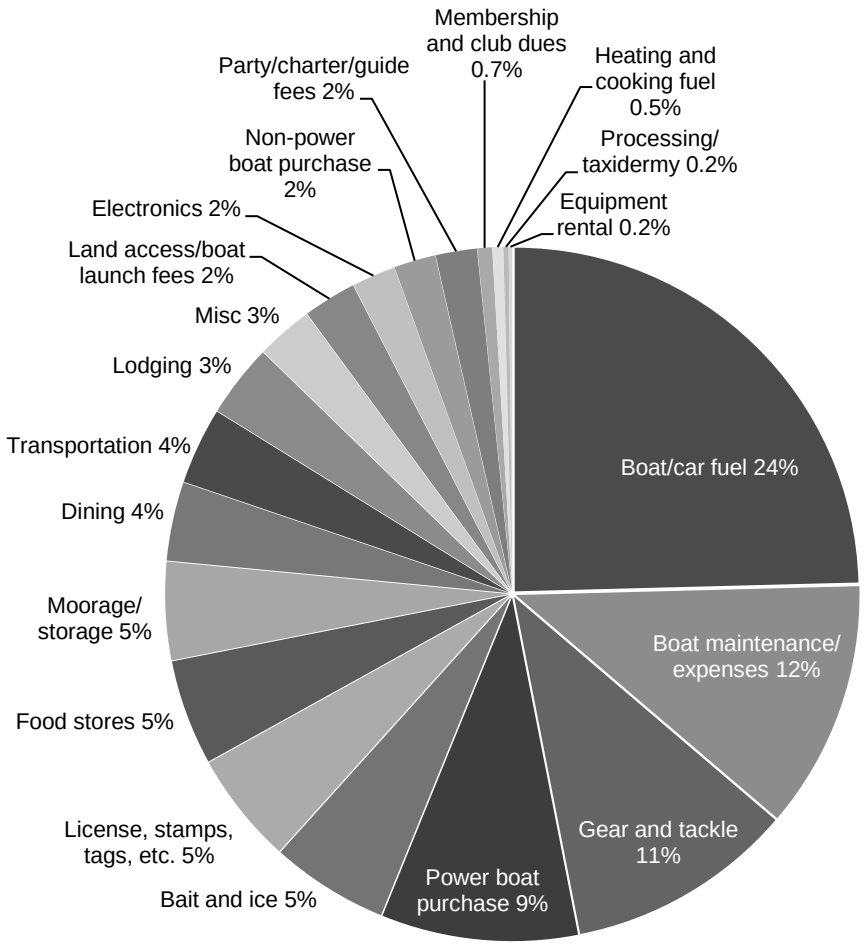
Figure 2. Total estimated annual recreational expenditures, all respondents, 2010



Source: Current study

Figure 3 displays the expenditure profile of an averaged individual across all included categories. Spending on fuel (24%) was greater than in any other category, and generally remained consistently so across respondents in varying expenditure ranges. This was followed by boat maintenance/expenses (12%), spending on gear and tackle (11%), and power boat purchases (9%). While relative expenditures in the top three categories remained relatively consistent across all respondents, this was not true for power boat purchases, or for most other categories. The average portion of expenditures attributed to power boat purchases across only respondents who did spend in this category was closer to 50%. Therefore, it is unlikely that most recreational fishermen spend 10% on powerboat purchases annually as suggested in Figure 3. Lastly, it is interesting to note that, while only slightly, respondents tended to spend more on food from grocery stores than restaurants; combined, food and lodging account for 12% of total expenditures.

Figure 3. Averaged individual expenditure profile, 2010



Source: Current study

6. ANALYSIS AND EVALUATION

In this section, we present a variety of statistics on human use activities along the Oregon coast in regards to commercial fishing, charter fishing, recreational fishing, and coastal visits primarily focused on non-consumptive recreational activities. For each activity, we describe how information was gathered and present summary statistics and relevant findings.

The commercial, charter, and recreational fishing data and findings presented in sections 6.1, 6.2, and 6.3 come from Ecotrust's work supporting the Oregon Territorial Sea Plan revision completed in 2010 (Steinback et al.). The overarching goal of that project was to compile the first-ever comprehensive map (or series of maps) illustrating the commercial, charter, and recreational fishing use patterns and values along the entire Oregon coast, from Astoria to Brookings, capturing the expert knowledge of fishermen. In addition to collecting spatially explicit information using a custom-built Geographic Information System (GIS) application known as Open OceanMap[5], non-spatial socioeconomic questions were also a part of each interview. Appendix F provides a more detailed description of the methods used in that study.

[5] For more information on Open OceanMap, see http://www.ecotrust.org/ocean/OpenOceanMap.html.

Additional data on commercial seafood importing, processing, wholesale and distribution, and retail presented in section 6.1.3 comes from NOAA (2011). In section 6.4, coastal visitation and non-consumptive recreation data is presented from an original study by the Surfrider Foundation, NaturalEquity, and Ecotrust (LaFranchi and Daugherty, 2011).

6.1. Commercial Fishing

Data informing sections 6.1.1 and 6.1.2 come from Ecotrust's work supporting the Oregon Territorial Sea Plan revision (Steinback et al., 2010) completed in 2010 where personal interviews between field staff and 244 commercial fishermen were conducted.[6] To represent the economic value of commercial fishing, the project's sampling goal of representing at least 50% of the total commercial ex-vessel landings revenue from 2004–08 for each landing port/fishery combination was often met and even exceeded. We present relevant socioeconomic data and estimated costs to commercial fishermen extrapolated from responses gathered during the interview process.

Information regarding sales made in commercial seafood importing, processing, wholesale and distribution, and retail, and associated employment is presented in section 6.1.3, cited from NOAA (2011).

6.1.1. Summary statistics

The average Oregon commercial fishermen respondents was a 53 year-old male with 31 years of fishing experience who derived 90% of his annual income from commercial fishing. It should be noted, however, that this income estimate is an average value, and that the majority of respondents in each port reported 100% of their income came from commercial fishing.

Table 13 displays more port-specific details on respondents' demographics by home port group; the number sampled, their average age, average years experience as a commercial fisherman, average number of crew at the time of the interview, and the average percentage of their income that comes from commercial fishing.

Table 13: Respondent demographics by home port group

		Average			
Home port	**# sampled**	**Age**	**Years experience**	**# of crew**	**Income from fishing (%)**
Astoria	39	51	34	2.19	93%
Garibaldi	11	60	27	2.05	80%
Depoe Bay	6	60	38	2.00	61%
Newport	46	51	32	2.49	95%
Florence	6	63	26	2.25	96%
Winchester Bay	12	54	27	2.14	91%
Coos Bay/Charleston	65	55	33	1.79	91%
Port Orford	20	52	23	1.90	91%
Gold Beach	6	50	27	1.00	72%
Brookings	33	51	29	2.03	86%
Total	**244**	**53**	**31**	**2.06**	**90%**

Source: Steinback et al. (2010)

Table 14 displays survey responses on demographics, fishery-related income, and vessel information broken out by commercial fishery. In regards to average income from a specific fishery, urchin divers reported the highest average income (68%), followed by Dungeness crab – trap fishermen (65%). It is interesting that these two fisheries, differing significantly in terms of size, financially support their respective participating fishermen in similar proportion. Rockfish – longline (dead) accounted for only 0.25% of respondents' total average income, which may be attributed to reductions in the quota allocated to rockfish permit holders and the increased spatial restrictions on longline gear and the establishment of Rockfish Conservation Areas (RCAs).

[6] Appendix F details the survey methods used in Steinback et al., 2010.

Respondents who participated in the salmon fishery had the most years of experience in a particular fishery, with 28 years, on average, while respondents who participated in the hagfish fishery had the lowest average years of experience (4). Data for fisheries with only three respondents or fewer are withheld from Table 14 for confidentiality purposes as indicated by the asterisk symbol.

Table 14. Respondent demographics/characteristics by fishery and gear type

			Averages			Fishery-specific averages		
Fishery	**# sampled**	**# male**	**Age**	**Years experience**	**Income from fishing (%)**	**Years experience**	**Income from fishery (%)**	**# of days fishing**
Dungeness Crab - Trap	159	157	52	30	94%	24	65%	69
Hagfish - Trap	9	9	51	29	98%	4	15%	84
Pacific Halibut - Longline	45	44	53	28	97%	18	4%	9
Petrale Sole - Bottom Trawl	30	30	51	34	99%	25	12%	46
Pink Shrimp - Trawl	37	37	50	32	97%	23	42%	83
Rockfish - Hook and Line (dead)	46	45	56	24	76%	15	15%	62
Rockfish - Hook and Line (live)	32	31	52	24	84%	16	44%	66
Rockfish - Longline (dead)	12	12	55	23	91%	16	0%	54
Rockfish - Longline (live)	16	16	52	24	97%	16	4%	63
Rockfish - Trap	1	*	*	*	*	*	*	*
Sablefish - Longline	56	55	52	29	97%	20	23%	36
Sablefish - Trap	14	14	49	31	100%	17	19%	22
Salmon - Troll	113	113	55	30	90%	28	36%	48
Sardine - Net (Seine)	1	*	*	*	*	*	*	*
Seaward RCA Trawl	34	34	50	33	98%	25	38%	105
Shelf Bottom Trawl	19	19	51	34	99%	25	19%	53
Tuna - Troll	109	108	51	29	89%	21	20%	40
Urchin - Dive	4	4	53	25	86%	14	68%	80
Whiting - Midwater Trawl	14	14	48	34	98%	25	49%	44
Total	**244**	**241**	**53**	**31**	**90%**	**—**	**—**	**—**

** indicates data were collected but cannot be shown due to confidentiality constraints*

Source: Steinback et al. (2010)

6.1.2. Earnings and expenditure estimates

Table 15 displays the average total annual landings revenues for each port-fishery combination over the years of 2004–08 (2008$). As these averages were created over a span of five years, some years likely vary according to changes in fishery regulations and policy. Across the Oregon coast an estimated landings value of $99.8 million on average was realized annually, with individual ports bringing in approximately $144 thousand (Depoe Bay) to $31.8 million (Newport) each. Newport, Astoria, and SOORC ports[7] brought in the largest estimated annual landings revenue at approximately $31.8 million, $30 million, and $23.7 million respectively, constituting 31%, 30%, and 24% respectively of total statewide landings (see Table 17).

[7] SOORC Ports include the commercial fishing ports of Winchester Bay Coos Bay, and Charleston

Table 15. Average total annual landings revenues per port per fishery (2004–08) 2008$

Fishery	Astoria	Garibaldi/ Tillamook	Depoe Bay	Newport	Florence	SOORC Ports	Port Orford	Gold Beach & Brookings	Oregon State
Dungeness crab - trap	$7,803,274	$2,503,184	$81,939	$13,357,017	$85,112	$10,764,801	$1,882,082	$4,412,997	$40,890,406
Hagfish - trap	$67,415	*	–	$80,269	–	$358,068	$7,561	–	$515,276
Pacific Halibut - longline	$240,514	$7,499	–	$405,871	$2,077	$208,631	$21,863	$1,006	$887,461
Petrale Sole - trawl	$1,019,637	$19,980	–	$274,076	–	$626,028	–	$106,198	$2,045,919
Pink Shrimp - trawl	$2,117,304	$416,933	–	$3,064,363	–	$2,421,917	–	$275,339	$8,295,856
Rockfish - hook & line (dead)	*	$52,841	$4,494	$23,673	–	$22,795	$14,721	$37,887	$156,437
Rockfish - hook & line (live)	–	*	$3,258	$979	–	$1,220	$376,941	$333,853	$726,407
Rockfish - longline (dead)	$450	$11	–	*	–	$4,024	$3,848	$190	$10,187
Rockfish - longline (live)	–	–	–	–	–	–	$79,042	*	$79,375
Rockfish - trap	$100	$25,664	–	$214	–	$512	–	*	$26,581
Sablefish - longline	$292,140	$4,853	–	$982,122	*	$568,748	$829,093	$61,473	$2,739,048
Sablefish - trap	$588,975	$11,082	–	$991,000	*	$677,826	*	$17,313	$2,287,703
Salmon - troll	$432,984	$414,845	$12,382	$1,957,953	$29,495	$1,964,162	$305,748	$238,392	$5,355,961
Sardine - seine	$5,323,771	*	–	$16,080	–	–	–	–	$5,345,068
Seaward RCA - trawl	$4,858,353	$5,813	–	$2,618,846	*	$2,878,060	–	$1,085,026	$11,449,598
Shelf Bottom - trawl	$1,565,374	$1,927	–	$265,366	–	$152,842	–	*	$1,991,862
Tuna - troll	$3,166,626	$239,161	$8,092	$3,763,149	$57,980	$2,499,685	$13,706	$51,736	$9,800,135
Urchin - dive	–	$1,257	$33,838	*	–	$24,758	$88,125	$24,746	$172,964
Whiting - midwater trawl	$2,540,369	–	–	$3,986,364	–	$534,481	–	–	$7,061,214
TOTAL	**$30,017,312**	**$3,722,386**	**$144,003**	**$31,789,246**	**$178,894**	**$23,708,558**	**$3,624,126**	**$6,652,933**	**$99,837,458**

** indicates data were collected, but cannot be shown due to confidentiality constraints*

Source: Landings data from ODFW

The majority of all ports' landings revenues came from the Dungeness crab – trap fishery which constituted between 25%-75% of their total landings revenue. Astoria seems to be the most diversified port, as it participated in more fisheries than any other, sixteen out of nineteen. Depoe Bay on the other hand was the least diversified, participating in only six fisheries, reliant primarily on Dungeness crab – trap (57%) and Urchin – dive (23%).

Table 16 displays Oregon's commercial fisheries in order of largest to smallest average annual landings values over 2004–2008. Dungeness crab was by far the largest fishery in Oregon contributing approximately 41% of total landings revenues on average. Following fisheries were Seward RCA trawl (11.5%) and tuna – troll (9.8%). The smallest landings values occurred in the following fisheries: hagfish – trap (0.5%), Urchin – dive (0.2%), and all rockfish varieties (combined at 0.3%).

Table 16. Average annual landings revenues, by fishery in Oregon (2004–2008) 2008$

Fishery	Landings (1000 $)	% of Total
Dungeness crab - trap	$40,890	41.0%
Seaward RCA - trawl	$11,450	11.5%
Tuna - troll	$9,800	9.8%
Pink Shrimp - trawl	$8,296	8.3%
Whiting - midwater trawl	$7,061	7.1%
Salmon - troll	$5,356	5.4%
Sardine - seine	$5,345	5.4%
Sablefish - longline	$2,739	2.7%
Sablefish - trap	$2,288	2.3%
Petrale Sole - trawl	$2,046	2.0%
Shelf Bottom - trawl	$1,992	2.0%
Pacific Halibut - longline	$887	0.9%
Rockfish - hook & line (live)	$726	0.7%
Hagfish - trap	$515	0.5%
Urchin - dive	$173	0.2%
Rockfish - hook & line (dead)	$156	0.2%
Rockfish - longline (live)	$79	0.1%
Rockfish - trap	$27	0.0%
Rockfish - longline (dead)	$10	0.0%
TOTAL	**$99,837**	**100.0%**

Source: Landings data from ODFW

Table 17 displays the statewide average annual landings revenues per port over the five year period 2004–2008. Newport (31.8%), Astoria (30.1%), and SOORC ports (23.7%) made up the largest share of average annual landings revenues, 84% combined. Florence (0.2%) and Depoe Bay (0.1%) were the smallest ports in Oregon in terms of shares of average annual landings revenues.

Table 17. Average annual landings revenues, by port in Oregon (2004–2008) 2008$

Port	Landings (1000 $)	% of Total
Newport	$31,789	31.8%
Astoria	$30,017	30.1%
SOORC Ports	$23,709	23.7%
Gold Beach & Brookings	$6,653	6.7%
Garibaldi/ Tillamook	$3,722	3.7%
Port Orford	$3,624	3.6%
Florence	$179	0.2%
Depoe Bay	$144	0.1%
TOTAL	**$99,837**	**100.0%**

Source: Landings data from ODFW

Table 19 estimates the total annual operating costs for commercial fishermen broken out by port. During the interview process, respondents in each port were asked to estimate the percentages of their gross economic revenue (GER) that go to crew, fuel, and all other commercial fishing operating costs. These percentages were averaged across ports and then applied to the average annual landings revenues per port, producing estimates of the average total costs spent on commercial fishing operating costs per port. Average annual landings revenues were assumed to be roughly equal to commercial fishermen's GER given the majority of respondents that reported 100% income reliance on commercial fishing (70%). Results are reported in 2008 dollars.

Of the estimated $99.8 million average annual landings revenues, $70.9 million (71%) was estimated as spent on commercial fishing costs. Statewide, displayed in Table 18, all other costs (31%) and crew costs (28%) were estimated to account for nearly 60% of GER together while fuel costs made up the lowest proportion of costs to commercial fishermen at 12%.

.

Table 18. Estimated annual commercial fishing cost percentages, state of Oregon

% of GER spent on crew	% of GER spent on fuel	% of GER spent on other costs
28%	12%	31%

Source: Authors' estimates using Steinback et al. (2010) data

Table 19. Estimated average annual commercial fishing operating costs (port specific), (2004–2008) 2008$

Port	GER (1000 $)	% to crew	% to fuel	% to other costs	Crew costs (1000 $)	Fuel costs (1000 $)	Other costs (1000 $)	TOTAL COSTS (1000 $)
Astoria	$30,017	30%	12%	29%	$9,086	$3,572	$8,605	$21,263
Garibaldi/Tillamook	$3,722	28%	13%	29%	$1,059	$501	$1,078	$2,638
Depoe Bay	$144	16%	16%	34%	$24	$23	$49	$96
Newport	$31,789	30%	13%	33%	$9,676	$4,133	$10,642	$24,450
Florence	$179	24%	9%	42%	$43	$16	$74	$133
Winchester Bay	$1,425	25%	10%	26%	$359	$142	$372	$873
Coos Bay/Charleston	$22,283	22%	11%	30%	$4,845	$2,451	$6,660	$13,956
Port Orford	$3,624	26%	11%	40%	$934	$410	$1,432	$2,775
Gold Beach	$356	12%	14%	50%	$43	$49	$178	$269
Brookings	$6,297	26%	13%	32%	$1,629	$807	$2,006	$4,443
State Total	**$99,837**				**$27,697**	**$12,103**	**$31,096**	**$70,896**

Source: Authors' estimates using Steinback et al. (2010) data

Table 19 reveals that costs as a percentage of revenue were estimated as higher in Newport than in Coos Bay/Charleston in each expense category. Most notably, the crew cost percentage of total revenue in Newport was more than 10% higher than that in Coos Bay/Charleston. Although Newport had the highest landings values on average, according to the cost information provided by the fishermen, fishermen in this port likely spent more of total revenue (77%) on costs than those in any other port, except for, interestingly, Port Orford. Referencing back to Table 13, Newport did have the highest average number of crew among all port groups. Percentages of GER spent on fuel tended not to differ as much among ports, accounting for 12% of GER statewide, Florence having spent the least amount on fuel (9%), Depoe Bay the most (16%).

Accounting for crew, fuel, and all other operating costs left commercial fishermen an estimated $28.9 million in net landings revenue, as displayed in Table 20. By port, Astoria was estimated to have the largest amount of net revenue to fishermen on average with Coos Bay/Charleston close behind, at $8.8 and $8.3 million respectively.

Table 20. Estimated annual net revenue by port, (2004–2008) 2008$

Port	% of net revenue	Net revenue (1000 $)
Astoria	29%	$8,754
Coos Bay/Charleston	37%	$8,327
Newport	23%	$7,339
Brookings	29%	$1,855
Garibaldi/Tillamook	29%	$1,085
Port Orford	23%	$849
Winchester Bay	39%	$552
Gold Beach	24%	$86
Depoe Bay	33%	$48
Florence	26%	$46
Total		**$28,941**

Source: Authors' estimates using Steinback et al. (2010) data

6.1.3. Commercial Processing, Sales, and Employment

The data presented above presents an in-depth examination of the economic contribution of commercial harvesting activities in Oregon. Beyond harvesting, Oregon seafood processors, wholesalers, and retailers also contribute to the shoreside economy. Data presented in this section comes directly from NOAA's (2011) annual "Fisheries Economics of the U.S." report and is specific to the state of Oregon for the years 2008 or 2009 as indicated below.

Table 21 displays NOAA's (2011) estimates of the total employment and sales, or economic output, as associated with each of the following sectors of the commercial seafood industry in Oregon in 2009: harvesting, processing, importing[8], wholesale and distribution, and retail. Total economic output, including secondary economic activity (see Figure 6 below), from Oregon's commercial seafood industry was estimated at $1.1 billion dollars total. The largest contribution came from the seafood importing sector at $481.1 million (43%); this was followed by retail ($277.1 million, 25%), and then commercial harvest ($194.3, 17%).

The seafood retail sector supplied the largest amount of jobs in 2009 at 6,708 jobs, while wholesale and distribution supplied the fewest, 618. NOAA (2011) estimates the there were 3,507 commercial seafood jobs directly in harvesting, or fishing in 2009. It is interesting to note that seafood importing accounted for nearly 43% of all commercial seafood related economic output in Oregon in 2009; it was responsible for only 13% of total associated employment.

[8] Importing estimates try to account for imported product from both foreign countries and other states (NMFS, 2011).

Table 21. Estimated employment and total economic output, 2009

Industry	Jobs	Economic output (millions $)
Commercial Harvesters	3,507	$194.3
Seafood processors and dealers	1,173	$100.4
Importers	1,749	$481.1
Seafood wholesalers and distributors	618	$74.5
Retail	6,708	$277.1
Total Impacts	**13,754**	**$1,127.4**

Source: Adapted from NOAA (2011)

NOAA annually reports the number of non-employer firms and employer establishments for seafood preparation and packaging, wholesale, and retail. A non-employer business is one that has no paid employees, has annual business receipts of $1,000 or more, and is subject to federal income taxes. Most non-employers are self-employed individuals operating small unincorporated businesses, which may or may not be the owner's principal source of income. Non-employer's receipts include gross receipts, sales, commissions, and income from trades and businesses, as reported on annual business income tax returns. Table 22 displays the non-employer statistics for Oregon in 2008. According to NOAA (2011), the number of these types of firms has increased by 138% in Oregon from 2000 levels, although the number of firms fluctuates annually. While the number of retail non-employer firms has stayed relatively constant, the number of non-employer preparation and packing firms fell to zero for some years before rising again. Receipts from these firms totaled approximately $3.1 million in 2008.

Table 22. Oregon non-employer firms, 2008

Non-Employer firms	Firms	Receipts (millions $)
Seafood product prep. & packaging	19	$1.0
Seafood sales, retail	16	$2.1

Source: Adapted from NOAA, 2011

Employer establishments in Oregon, displayed in Table 23, totaled 62 in 2008 (NOAA, 2011). Since the year 2000, the number of product preparation and packaging and wholesale establishments has decreased, while the retail number has stayed somewhat constant. Payroll, on the other hand, has increased. For more information on these data and trends, please see NOAA (2011).

Table 23. Oregon employer establishments, 2008

Employer Establishments	Establishments	Employees	Payroll (millions $)
Seafood product prep. & packaging	23	850	$27.6
Seafood sales, wholesale	18	n/a	n/a
Seafood sales, retail	21	178	$3.4

Source: Adapted from NOAA, 2011

Combining non-employers' receipts and available employer payrolls from 2008, produces an estimate of the total earnings of workers in seafood processing and sales industries in Oregon, $34 million. However, since wholesale employer payroll data was not available, this is likely a low-bound estimate. Assuming each non-employer firm represents one employee, we can estimate the total seafood processing and sales employment in Oregon in 2008 at approximately 1,063 employees. Similarly, because wholesale employment information is not available, this is likely a low-bound estimate.

NOAA (2011) also reports out on employee and payroll information for establishments related to transport, support, & marine operations, though much of this information for Oregon is either not available or cannot be shown due to confidentiality purposes.

6.2. Charter Fishing

The data presented in this section come from Ecotrust's work supporting the Oregon Territorial Sea Plan revision (Steinback et al., 2010) completed in 2010.[9] Ecotrust field staff interviewed a total of 63 charter operators/owners—constituting an almost complete census of marine charter operators on the Oregon coast. By port group, Astoria comprised the highest number of respondents including 23 charter owners and operators from Ilwaco, Astoria, Warrenton, and Hammond. Depoe Bay (13) and Newport (11) both had a large number of respondents as well; charter respondents from Winchester Bay/Reedsport, Charleston, and Bandon were combined into one port group, SOORC Ports, with nine respondents. The remaining ports had five or fewer respondents each. Garibaldi is not represented in this section as these ports' charter operators declined to participate in the survey. Port Orford is not represented in this section as there were no charter operations in this port at the time of the survey (2010).

6.2.1. Summary statistics

Of the 63 respondents, the majority (76%) of charter respondents owned their own vessel(s). The average charter owner owned two vessels for 17 years, while the average charter operator operated one vessel and had 23 years of operating experience. The average charter respondent was a 52 year-old male who worked with a vessel of 38 feet. The average respondent fished an average of 117 days per year and had nine passengers and one crewman. More port-specific details are displayed in Table 24.

Charter respondents were asked to identify which fisheries they target on charter trips, how frequently, and the average cost to the charter client(s), or anglers, per targeted species (see Table 25). Combo trips, where more than one species is fished per outing, were common. Across all respondents, the most popular fisheries were salmon, rockfish, and Dungeness crab, constituting an average of 46%, 42%, and 39% of all charter trips respectively. Both albacore tuna and Pacific halibut were targeted less frequently; additionally, on average, both these fisheries represented the largest costs to charter clients at $273 and $196 dollars per client per trip respectively.

[9] Appendix F details the survey methods used in Steinback et al., 2010.

Table 24: Summary of charter response by port

	Number of respondents		Average					Operators		Owners	
Port	**Operators**	**Owners**	**Age (years)**	**Vessel Length (ft.)**	**Days fishing per year**	**# of passengers**	**# of crew**	**# of vessels operated**	**# of years operating**	**# of vessels owned**	**# of years owned**
Astoria	7	16	50	38	88	8	1	1	19	2	20
Depoe Bay	3	10	54	40	142	11	1	1	38	1	18
Newport	5	6	50	41	159	11	1	1	20	2	15
Florence	—	1	62	31	52	4	1	—	—	2	4
SOORC Ports	—	9	57	37	114	7	1	—	—	2	14
Gold Beach	—	3	59	29	125	5	0	—	—	2	20
Brookings	—	3	35	31	100	8	1	—	—	2	11
All respondents	**15**	**48**	**52**	**38**	**117**	**9**	**1**	**1**	**23**	**2**	**17**

Note: All respondents were male

Source: Steinback et al. (2010)

Table 25: Percentage of trips for each species and average cost to angler

Fishery		**Astoria**	**Depoe Bay**	**Newport**	**Florence**	**SOORC Ports**	**Gold Beach**	**Brookings**	**All respondents**
Albacore Tuna	# of respondents	11	0	9	0	6	1	1	**28**
	Avg. % of trips	10	—	14	—	—	10	5	**11**
	Avg. cost to angler	$323	—	$212	—	—	$300	—	**$273**
Dungeness Crab	# of respondents	2	13	10	1	8	1	0	**35**
	Avg. % of trips	28	26	56	10	—	83	—	**39**
	Avg. cost to angler	—	$14	$14	$30	—	—	—	**$14**
Pacific Halibut	# of respondents	9	11	10	1	7	1	0	**39**
	Avg. % of trips	6	10	10	35	—	25	—	**10**
	Avg. cost to angler	$216	$193	$188	$175	—	$225	—	**$196**
Rockfish	# of respondents	13	13	11	1	8	3	3	**58**
	Avg. % of trips	8	51	51	6	—	87	73	**42**
	Avg. cost to angler	$138	$71	$80	$70	—	$95	$80	**$90**
Salmon	# of respondents	23	13	11	1	9	3	2	**62**
	Avg. % of trips	67	37	21	35	—	4	50	**46**
	Avg. cost to angler	$118	$85	$104	$145	—	$113	$130	**$106**

Source: Steinback et al. (2010)

6.2.2. Earnings and expenditure estimates

Table 26, Table 27, and Table 28 display the economic cost data estimates gathered from marine charter respondents for 2008. It should be noted that only 39 of the 63 respondents provided financial information on their operations. Total revenue and cost estimates across ports and statewide are thus estimated using two steps: 1) averaging the information provided across respondents by port group; and 2) applying these averaged estimates to those in the same port group who declined to answer.

Each respondent was asked what percentage of their gross economic revenue (GER) comes from charter operations. The averaged responses are displayed next to their respective port groups. Newport respondents depended most heavily on charter operations for their annual GER (89%), while respondents in Astoria reported that charter operations make up only 48% of their annual GER. Statewide, while not all respondents relied solely on charter operations for their income, nearly 50% respondents reported that they receive 75% or more of their income from charter operations and over one–third reported 100% reliance on income from charter operations.

Table 26. Percentage of income from charter activities, by port

Port Group	% of income from Charter
Astoria	48%
Depoe Bay	82%
Newport	89%
SOORC Ports	56%
Gold Beach	67%
Brookings	40%
Statewide	**63%**

Source: Authors' estimates using Steinback et al. (2010) data

Additionally, each respondent was asked the percentage of his GER spent on charter operating, fuel, and labor costs. The averaged port responses were applied to the respective total estimated port GER to estimate the total amounts spent per port in each cost category. Assuming the respondents who did not provide operating information had similar revenue and spending patterns as other operators in their port, we estimated $7 million in charter revenues accruing annually to charter respondents coast-wide. As previously mentioned, this estimate is likely a low-bound estimate for all Oregon charter operations since revenues in Garibaldi and Florence were not accounted for. Because all respondents in Brookings declined to answer the financial part of the interview informing Table 28, state averages were applied to respondents in that port to estimate state totals.

Table 27. Estimated annual charter fishing cost percentages, state of Oregon

% of Charter GER spent on crew	% of Charter GER spent on fuel	% of Charter GER spent on other costs
14%	**15%**	**36%**

Source: Authors' estimates using Steinback et al. (2010) data

Table 28. Estimated annual charter fishing costs (port specific), 2010

Port Group	Charter GER (1000 $)	% to crew	% to fuel	% to other costs	Crew costs (1000 $)	Fuel costs (1000 $)	Other costs (1000 $)	TOTAL COSTS (1000 $)	Net revenue (1000 $)
Astoria	$2,569.9	10%	18%	23%	$253.0	$449.7	$582.5	$1,285.3	$1,284.6
Depoe Bay	$1,228.5	9%	12%	48%	$114.3	$144.3	$583.5	$842.1	$386.4
Newport	$1,787.5	29%	13%	43%	$513.9	$223.4	$759.7	$1,497.0	$290.5
SOORC Ports	$869.0	9%	12%	44%	$76.7	$108.1	$380.0	$564.9	$304.2
Gold Beach	$235.0	1%	18%	50%	$2.4	$41.5	$118.3	$162.2	$72.9
Brookings	$313.6	10%	16%	37%	$32.8	$49.8	$116.6	$199.2	$114.5
Grand Total	**$7,003.5**	**14%**	**15%**	**36%**	**$993.0**	**$1,017.0**	**$2,540.6**	**$4,550.6**	**$2,452.9**

Source: Authors' estimates using Steinback et al. (2010) data

Table 28 also allows for comparison of charter operating costs across ports. Among all responding ports, Astoria had the lowest percentage of operating costs (23%) while Gold Beach had the highest (50%). Fuel costs remained fairly consistent among the ports (12–18%), similar to commercial spending, only slightly higher. Gold Beach spent the least on labor, 1%, while, similar to the commercial findings, Newport respondents spent significantly more than all other port groups on labor at 29% of GER.

In most ports, however, charter fishermen spent the least of their GER on crew costs. This was not surprising as most charter operators work as individuals and the average number of crew over all ports was just one employee. Comparing commercial and charter fisheries, overall the percentage of revenues spent on costs were similar at approximately 70% each statewide.

6.3. Recreational Fishing

The summary statistics data presented in this section also comes from Ecotrust's work supporting the Oregon Territorial Sea Plan revision (Steinback et al., 2010) completed in 2010.[10] Because the socioeconomic component of the survey for recreational fishermen was removed part way through that study and resumed in this study, as previously described, the corresponding expenditure findings have already been presented above in section 5.3.

For Steinback et al.'s (2010) work, the recreational fishing community was stratified into three key user groups:

- Dive anglers;
- Kayak anglers; and
- Private vessel anglers.

Table 29 shows the number of recreational surveys completed by user group. Private vessel respondents were the largest group; out of 237 respondents, 208 (87.8%) completed a private vessel survey.

Table 29: Number of respondents for each sector

User group	Total surveys
Dive	11
Kayak	18
Private vessel	208
Total responses	**237**

Source: Steinback et. al (2010)

[10] Appendix F details the survey methods used in Steinback et al., 2010.

Based on responses provided by survey participants, the average respondent for the private vessel user group is a 53 year-old male who had operated a vessel for 30 years and owned a vessel for 26 years. On average, private vessel users had 33 years of fishing experience and fished 55 days per year.

The average kayak respondent was a 48 year-old male who had 14 years of kayak angling experience and fished from a kayak 44 days per year. The average diver/spear angler was a 46 year-old male with 20 years experience who dived to fish 52 days per year. In addition, the majority of dive respondents stated that they were SCUBA divers who used a boat as their primary access method. Additional information is provided in Table 30.

Table 30: Recreational respondent characteristics

	Average		
	Private vessel	**Kayak**	**Dive**
Age	53	48	46
Years experience	33	14	20
Average annual number of days active	55	44	52
Years operating a private vessel	30	—	—
Years of vessel ownership	26	—	—
Vessel length (ft.)	21	—	—
Dive access method			
- Boat	—	—	7
- Shore/kayak	—	—	3
- No response	—	—	1
Type of trip			
- SCUBA	—	—	9
- Free	—	—	2

Source: Steinback et. al (2010)

Table 31: Number of responses for each fishery in each sector and region

Sector	Fishery	Astoria	Garibaldi	Salmon River	Depoe Bay	Newport	Florence	Winchester Bay/ Reedsport	Coos Bay/ Charleston/ Bandon	Port Orford	Gold Beach	Brookings	Oregon
Dive	Dungeness Crab	0	0	0	0	4	0	0	0	1	0	0	5
	Pacific Halibut	0	0	0	0	0	0	0	0	0	0	0	0
	Rockfish/Bottomfish	0	0	0	0	5	1	0	1	1	0	3	11
	Salmon	0	0	0	0	0	0	0	0	0	0	0	0
	Flatfish	0	0	0	0	1	0	0	0	0	0	0	1
	Other*	0	0	0	0	4	1	0	0	2	0	2	9
	All	**0**	**0**	**0**	**0**	**14**	**2**	**0**	**1**	**4**	**0**	**5**	**26**
Kayak	Dungeness Crab	0	1	0	0	2	0	0	4	1	0	0	8
	Pacific Halibut	0	1	0	0	0	0	0	2	0	0	0	3
	Rockfish/Bottomfish	1	2	0	1	1	1	0	7	2	0	0	15
	Salmon	1	2	0	1	1	0	0	6	0	0	0	11
	Flatfish	0	0	0	0	0	0	0	0	0	0	0	0
	All	**2**	**6**	**0**	**2**	**4**	**1**	**0**	**19**	**3**	**0**	**0**	**37**
Private vessel	Dungeness Crab	16	19	62	5	18	8	6	32	2	3	5	176
	Pacific Halibut	8	10	34	5	20	7	2	29	1	0	2	118
	Rockfish/Bottomfish	14	12	55	7	23	7	4	36	2	4	6	170
	Salmon	19	22	63	8	21	8	6	35	1	3	6	192
	Flatfish	3	1	0	0	3	0	0	1	0	0	2	10
	All	**60**	**64**	**214**	**25**	**85**	**30**	**18**	**133**	**6**	**10**	**21**	**666**

** Other includes abalone, scallops, clams, and other shellfish*

Note: Because a respondent may participate in multiple fisheries in multiple ports, the total number of responses per home port or statewide will be greater than the actual 237 number of respondents interviewed.

Source: Steinback et. al (2010)

Table 31 above displays the number of recreational respondents per port group, per fishery, per recreational activity. Similarly, there were more private vessel responses (666) than kayak (37) or dive (26); response numbers were higher overall than the total number of respondents because a respondent may have participated in multiple fisheries in multiple ports.

By port group, Salmon River had the highest number of respondents per fishery at 214 respondents, all private vessel anglers. Coos Bay/Charleston/Bandon had 153 respondents by fishery with 133 private vessel respondents, one dive respondent, and the highest number of kayak respondents by fishery and by port at 19. Newport had the greatest number of dive responses by port (14). While all ports had recreational respondents for at least one recreational user group, several ports had no responses for one or two of the user groups. Salmon River, Winchester Bay/Reedsport, and Gold Beach, for example, only had recreational responses by private vessel anglers.

Among dive respondents, rockfish/bottomfish was the most popular fishery with 42% (11 out of 26) of total dive respondents participating in this fishery. Of dive respondents, 35% claimed “other”, targeting abalone, scallops, clams, and other shellfish. Kayak respondents also participated mostly in the rockfish/bottomfish (41%) and salmon (30%) fisheries. Among private vessel respondents, salmon (29%), Dungeness crab (26%), and rockfish/bottomfish (26%) were the most popular fisheries.

For more information on the largest recreational response group, private vessel, see Table 32 which displays private vessel respondent details by port group.

Table 32: Private vessel average responses by port

	Average responses											
	Astoria	**Garibaldi**	**Salmon River**	**Depoe Bay**	**Newport**	**Florence**	**Winchester Bay/ Reedsport**	**Coos Bay/ Charleston/ Bandon**	**Port Orford**	**Gold Beach**	**Brookings**	**Oregon**
Count of individuals	**19**	**22**	**70**	**8**	**25**	**8**	**6**	**36**	**2**	**4**	**8**	**208**
Age	55	58	46	52	53	53	61	57	44	67	60	53
Years experience	33	31	29	31	31	29	39	38	21	45	40	33
Average annual number of days fishing in a private vessel	54	31	63	118	47	22	74	49	40	59	72	55
Years operating a private vessel	29	30	31	31	30	33	31	36	18	32	32	30
Years of vessel ownership	23	24	31	31	24	31	33	31	6	31	27	26
Vessel length (ft.)	22	20	18	20	20	29	20	22	21	18	23	20

Source: Steinback et. al (2010)

Recreational survey participants were asked to list their top launch ports or access points (up to four) based on frequency of usage (see Table 33). Although 30% of private vessel anglers did not answer, the top three launch ports of those who did respond were Depoe Bay, Salmon River, and Siletz River. Kayak anglers answered with Sunset Lake as their top launching site.

It should also be noted that the launch/access sites provided by respondents were grouped together. For example, respondents who indicated Knight's Park or Salmon River were all grouped together as Salmon River. Within these areas, kayak launch sites could be boat ramps or an adjacent shore.

Table 33: Private vessel and kayak top launching sites

Private vessel launch/access site	Total
Did not provide	63
Depoe Bay	24
Salmon River	21
Siletz River	12
Port Orford	11
Astoria	10
Newport	10
Garibaldi/Tillamook	9
Brookings	7
Charleston	7
Winchester Bay	6
Gold Beach	5
Siuslaw	5
Pacific City	4
Ilwaco	3
Non-ocean	3
Hammond	2
Nestucca Bay	2
Cannon Beach	1
Cape Kiwanda	1
Florence	1
Waldport	1
Total	**208**

Kayak launch/access site	Total
Astoria, Sunset Lake Beach	5
Salmon River	2
Newport	2
Port Orford	2
Charleston	2
Pacific City	1
Siuslaw	1
Depoe Bay	1
Reedsport	1
Non-ocean	1
Total	**18**

Source: Steinback et. al (2010)

6.4. Coastal Visitation including Non-Consumptive Recreation

The following findings are cited from the Oregon Non-Consumptive Recreational Use Study submitted on March 3rd, 2011 by the Surfrider Foundation (LaFranchi and Daugherty, 2011). The study, a collaborative effort between the Surfrider Foundation, NaturalEquity, and Ecotrust, investigated activity participation, geographic use, and direct financial impacts of non-consumptive ocean recreational users in the state of Oregon. This information was intended to help inform Oregon's public process to update the Territorial Sea Plan.

This study was designed and implemented to meet the following goals to:

- identify and estimate the size of the Oregon non-consumptive recreational ocean user community;
- supply spatially explicit information on current non-consumptive recreational ocean use including activity, extent, and demographics;

- estimate the direct financial impacts of non-consumptive recreational ocean use to Oregon's communities;
- and integrate baseline data into Oregon MarineMap to inform Oregon's TSP update and other relevant decision-making.

A total of 4,072 randomly selected individuals completed surveys to provide the socioeconomic data for this study. The sample panel was designed to be representative of the total study population of all Oregon residents and residents from four Washington counties (Clark, Cowlitz, Pacific, Wahkiakum).

Data were collected on the demographics of respondents, whether or not the respondent visited the coast in the last 12 months, coastal activities undertaken, the spatial distribution and frequency of such activities across a set of coastal areas, and financial expenditures from the most recent coastal trip. Two survey "waves" were conducted to account for seasonal differences, and U.S. Census data was used to verify that the sample panel population was representative of the entire study population. Findings from the sample population were then extrapolated to the study population estimating key aspects of private coastal use of the Oregon coast statewide, such as the total number of trips and associated total direct expenditures.

The following sections highlight key findings from this study; for further information on the purpose, methods, and findings of this study, the entire report is available online from the Surfrider Foundation's website.[11] Additionally, the data from this study were used to create the non-consumptive recreational layers available on Oregon MarineMap.

6.4.1. Summary statistics

Approximately 80% of the panel respondents indicated that they visited the Oregon coast at least once in the past 12 months. Over all respondents, the average number of coastal trips taken over the past year was approximately 6.3 trips.[12] The distribution of trips to the Oregon coast is reported by county counties in Table 34. Almost three-quarters of reported trips occurred in the three northernmost counties, Lincoln, Clatsop, and Tillamook.

Table 34. Distribution of coastal trips reported by panel survey respondents

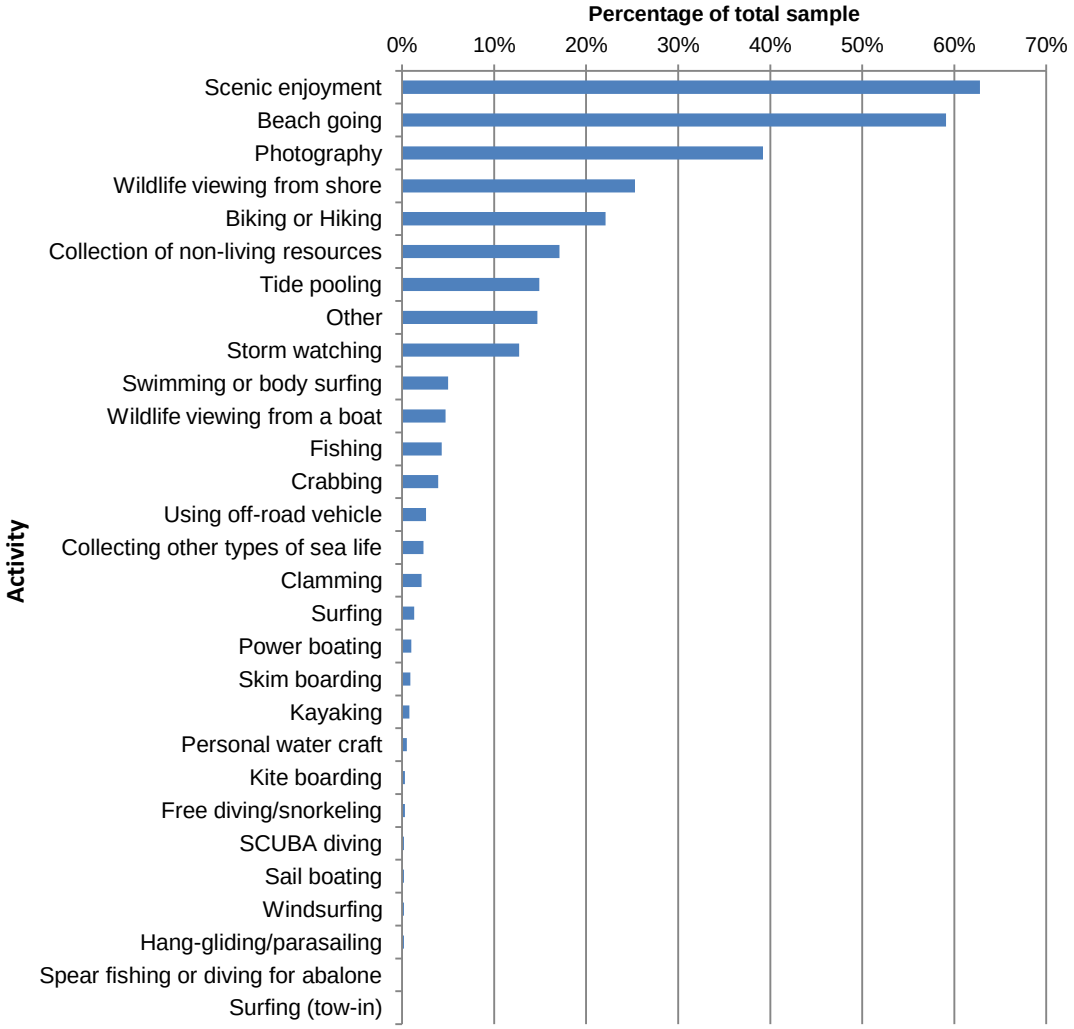
Oregon county of trip	Percent of total trips
Lincoln	43%
Clatsop	18%
Tillamook	14%
Lane	9%
Coos	8%
Curry	5%
Douglas	4%
Total	**100%**

Source: LaFranchi and Daugherty (2011)

Figure 4 displays the various coastal activities that survey respondents participated in as a percentage of the total sample. Of all respondents, scenic enjoyment, beach going, and photography were the most popular activities with participation rates of approximately 63%, 60%, and 40% respectively. While the last several activities listed in Figure 4 had low participation percentage rates (ten or fewer total participating respondents), no activity received zero participation.

[11] http://www.surfrider.org/publications
[12] Some survey respondents, likely coastal residents, responded that they took 365 trips to the coast each year.

Figure 4. Participation in coastal activities as a percent of all survey respondents, 2010



Source: LaFranchi and Daugherty (2011)

6.4.2. Expenditure estimates

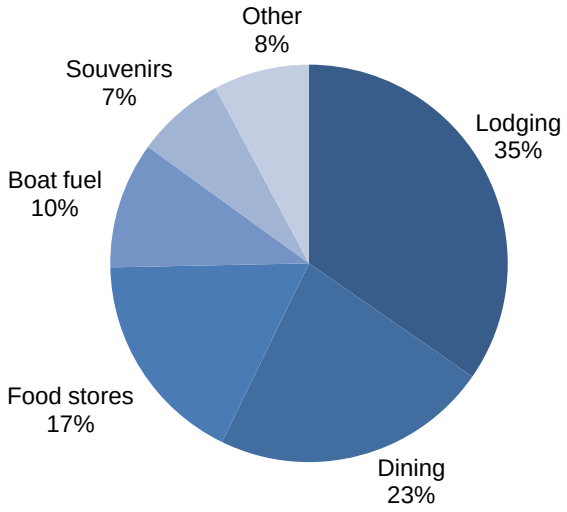
The survey elicits data on trip expenditures made during their most recent coastal visit for respondents who indicated that they visited the coast at least once in the past year. Of these respondents, 88% reported that the primary purpose of their trip was recreation. Durable goods expenditures and travel costs were not included in the final cost estimates as the survey was targeting trip expenditures that would not have occurred if a respondent did not take a trip to the coast. Table 35 displays the average expenditures reported by survey respondents, $87.72 per trip.

Table 35. Average expenditures reported by survey respondents

Expenditure category	Average expenditure per person
Lodging	$30.39
Food and beverages, restaurant, bar	$19.79
Food and beverages from a store	$15.32
Souvenirs	$6.34
Museum, aquarium, or other entrance fee	$1.90
Sundries	$1.17
Boat fuel	$9.03
Charter fee (whale watching, fishing, etc.)	$1.36
Car rental	$0.23
Boat rental	$0.47
Parking cost	$0.51
Bike rental	$0.24
Lessons, clinics, camps	$0.12
One-day fishing license fee	$0.31
Surfboard or bodyboard rental	$0.08
Kayak rental	$0.11
Ramp fees	$0.31
Dive equipment rental and air fills	$0.02
Hang glide rental	$0.01
Total	**$87.72**

Source: LaFranchi and Daugherty (2011)

Figure 5. Average expenditures per coastal trip, 2010



Source: LaFranchi and Daugherty (2011)

Assuming that the proportion of survey respondents who undertake trips to the coast, practice recreational activities, and spend money is approximately representative of the entire study population, the study estimates that $2.4 billion is spent by approximately 4.4 million permanent residents annually on Oregon coast trips. Again, this estimate does not include durable goods or travel cost expenditures.

Table 36. Total estimated coastal visitation and expenditures, 2010

Total population	4,384,959
Average # annual trips from sample	6.3
Total estimated coastal trips	27,625,242
Average direct expenditure per trip	$87.72
Total direct expenditures	**$2,423,286,202**

Source: LaFranchi and Daugherty (2011)

Table 37 displays the total estimated expenditures by county; this was estimated by applying the relative percentages of county trips to total expenditures, and assuming that trips in separate counties result in similar expenditures. Lincoln County received an estimated $1 billion in coastal visitation related expenditures, and Douglas County received an estimated $91.6 million.

Table 37. Estimated coastal visitation expenditures by county, 2010

County	Estimated expenditures (millions $)
Lincoln	$1,020.5
Clatsop	$439.4
Tillamook	$324.4
Lane	$219.1
Coos	$201.8
Curry	$126.5
Douglas	$91.6
TOTAL	**$2,423.3**

Source: Authors' estimates using data from LaFranchi and Daugherty (2011)

While non-consumptive recreational activities were the primary focus of this study, the resulting economic data also includes a portion of trips whose primary purpose was not recreation (12%) and some recreationists participating in consumptive activities as well.

6.5. Broader Economic Impacts

In this section we estimate the broader economic contributions of commercial fishing, charter fishing, recreational fishing, and coastal visitation and non-consumptive recreation to the shoreside economy. Table 38 summarizes the human use activity data and sources presented in Sections 6 above.

Table 38. Summary of human use activity data and sources

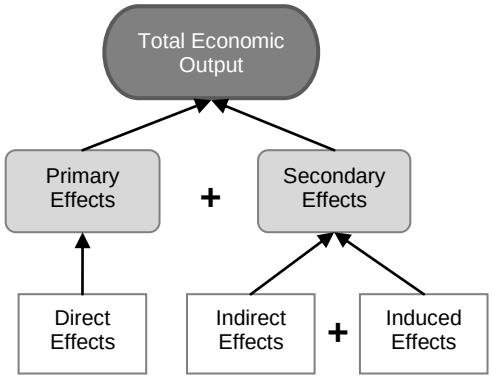
Activity	(millions $)	Value source	Data year
Revenues from commercial fishing	$99.8	ODFW landings data, 2004–2008	Annual average 2004-08, 2008$
Revenues from charter fishing	$7.0	Author's calculations from Steinback et al., 2010 data	2010
Expenditures related to coastal visitation including non-consumptive recreation	$2,423.3	LaFranchi and Daugherty, 2011	2010

Source: Current Study

Commercial fishing, charter fishing, and recreational fishing contribute directly and indirectly to the shoreside economy. For example, commercial fishing generates revenues for commercial fisherman. This is a direct economic contribution. But each commercial fisherman spends a portion of his or her revenues on hiring a crew and purchasing fuel, bait, and other supplies. These backward linked economic activities provide a new source of income for crew members and suppliers. As crew members and suppliers spend their income in the shoreside economy – at local shops, restaurants, etc. - they induce even more economic activity. The total economic output resulting from commercial fishing, therefore, includes these indirect and induced effects. The same is also true for charter fishing and recreational fishing.

To estimate the direct and indirect economic contributions of these activities to the shoreside economy, we applied economic multipliers. Economic multipliers are factors used to estimate the indirect and induced economic activity generated by a given level of revenue or expenditure in an industry (see Figure 6).[13] For example, a multiplier of 1.5 implies that $1.00 of direct expenditures on recreational fishing, for example, generates an additional $0.50 in economic activity, for a total economic output of $1.50. The purpose of applying multipliers is to capture the ripple effects of economic activity; simply, a direct change in one industry affects other industries. Direct effects are the most straightforward; they constitute the initial economic activity itself as used for wages and output. Indirect effects account for the additional purchases made for supplies, equipment, and any other additional necessary services in related industries. Induced effects measure the purchases made by those employed in the direct and indirect sectors on further goods and services not related to the direct activity, but made possible by the additional income it generates. Indirect and induced effects together comprise secondary effects.

Figure 6. Economic multiplier effects



Source: Current study

In the following sections, we estimate the broader economic contributions of commercial fishing, charter fishing, and recreational fishing by applying economic multipliers to derive estimated economic output (EEO) or estimated personal income (EPI). Estimated personal income (EPI) is a measure of the portion of direct and indirect economic activity associated with sales or expenditures in a certain sector that accrues to households in the study area in the form of wages, salaries, and profits.

6.5.1. Commercial Fisheries: Estimated Economic Output

Table 39 displays the economic multipliers used to estimate the direct, indirect, and induced effects, or total estimated economic output (EEO), of each commercial fishery in Oregon. Commercial fishing multipliers specific to the state of Oregon were secured through personal communications with NOAA staff and are based on the agency's forthcoming "Fisheries of the United States, 2010" report. Although the economic multipliers vary among fisheries due to differences in harvesting patterns, sale prices, etc., the multipliers fall within a relatively narrow

[13] Economic multipliers, invaluable tools in economic analyses, are derived from input-output (I-O) models that describe the structure of an economy in terms of the inputs to its various industry sectors and the distribution of the outputs from those sectors. I-O models are the most comprehensive economic accounts at the level of the whole economy. In the United States, it is common to use multipliers derived through IMPLAN (IMpact analysis for PLANning, a privately owned computer based I-O modeling system developed by the Minnesota IMPLAN Group, Inc. (MIG). See http://implan.com for more information); the multipliers used in this report were derived from IMPLAN.

range of 1.78-1.95. Applying these multipliers to our commercial landings data, we were able to estimate that commercial fisheries generated $189.3 million annually between 2004-2008 in total economic output statewide.

Table 39. Estimated annual economic output of commercial fishing, 2008$

Fishery	Economic multiplier	Estimated economic output (millions $)			
		Direct	Indirect	Induced	Total
Dungeness crab - trap	1.95	$40.9	$21.9	$16.9	**$79.7**
Hagfish – trap	1.86	$0.5	$0.2	$0.2	**$1.0**
Pacific Halibut - longline	1.86	$0.9	$0.4	$0.4	**$1.7**
Petrale Sole - trawl	1.90	$2.0	$1.0	$0.8	**$3.9**
Pink Shrimp - trawl	1.84	$8.3	$3.6	$3.3	**$15.3**
Rockfish - hook & line (dead)	1.90	$0.2	$0.1	$0.1	**$0.3**
Rockfish - hook & line (live)	1.90	$0.7	$0.4	$0.3	**$1.4**
Rockfish - longline (dead)	1.90	$0.0	$0.0	$0.0	**$0.0**
Rockfish - longline (live)	1.90	$0.1	$0.0	$0.0	**$0.2**
Rockfish – trap	1.90	$0.0	$0.0	$0.0	**$0.1**
Sablefish - longline	1.90	$2.7	$1.4	$1.1	**$5.2**
Sablefish – trap	1.90	$2.3	$1.1	$0.9	**$4.3**
Salmon – troll	1.86	$5.4	$2.1	$2.5	**$9.9**
Sardine – seine	1.83	$5.3	$2.8	$1.6	**$9.8**
Seaward RCA - trawl	1.90	$11.4	$5.7	$4.6	**$21.8**
Shelf Bottom - trawl	1.86	$2.0	$0.9	$0.8	**$3.7**
Tuna – troll	1.78	$9.8	$4.8	$2.8	**$17.4**
Urchin – dive	1.87	$0.2	$0.1	$0.1	**$0.3**
Whiting - midwater trawl	1.90	$7.1	$3.5	$2.8	**$13.4**
State total		**$99.8**			**$189.3**

Source: Authors' estimates using data from ODFW and NOAA economic multipliers.

These estimates include the 'ripple effect' of economic activity associated with or supported by commercial fishing landings revenues. This includes, for example, the economic activity generated by the purchase of bait, fuel, equipment, etc., and the additional spending of earnings by commercial fishermen, their crew, and their suppliers on other goods and services throughout the economy at large. Forward linked economic activities associated with commercial fishing, such as processing, wholesale, distribution, and retail, are not included in this estimate. NOAA (2011) estimated that Oregon commercial seafood harvesting, processing, and sales produced $1.1 billion in total economic output and supported approximately 3,507 commercial seafood jobs in 2009, see section 6.1.3.

6.5.2. Commercial Fisheries: Estimated Personal Income

Measures of estimated personal income (EPI), the portion of direct and indirect economic activity that accrues to households in terms of wages, salaries, and profits, were derived using economic factors from the Fisheries Economic Assessment Model (FEAM). The FEAM, produced by The Research Group (2005), utilizes the basic framework of a secondary input/output model combined with local industry information and IMPLAN data to create factors estimating the total personal income generated from harvester and processor activities. The resulting factors used in this project were originally derived in a vessel-level framework and were modified in 2011 specifically to fit the fishery profiles used in Oregon MarineMap for the uses of this project and to support future assessments within the MarineMap tool. For more information on the FEAM, please see Appendix G or The Research Group (2005).

The total estimated personal income (EPI) is measured by applying the FEAM factors to the averaged annual commercial ex-vessel landings values. Table 41 displays the FEAM economic factors adjusted for application to landings revenues (as opposed to landings volume) by port-fishery combination. In certain cases, an adjusted state-level factor was used where a port-fishery specific factor was unavailable. It is important to note that the

FEAM model classifies Oregon coastal ports referred to in this report into five port groups, as summarized below in Table 40. Therefore, the economic factors associated Florence are the same as those associated with Coos Bay for example. This is because FEAM operates at the county (regional) level and the state level. The state EPI estimates are greater than the summed Oregon coastal region estimates as some of the leaked value from the coastal region is included in the state estimates.

Table 40. FEAM Oregon commercial port groups

Astoria	Tillamook	Newport	Coos	Brookings
Astoria	Tillamook/Garibaldi	Newport	Florence	Port Orford
	Pacific City	Depoe Bay	Winchester Bay	Gold Beach
			Coos Bay	Brookings
			Charleston	

Source: The Research Group (2011)

The resulting EPI estimates see Table 42 for each port group and the coastal region and Table 43 for the state of Oregon, include contributions from both harvesting *and* processing activities. This is unlike an analysis using an economic multiplier as forward-linked processing values are included, and the resulting estimates cannot be aggregated with the EEO estimates presented in Table 39.

Table 41. Adjusted FEAM Economic Factors

Fishery	Astoria	Garibaldi/ Tillamook	Depoe Bay	Newport	Florence	SOORC Ports	Port Orford	Gold Beach & Brookings	Oregon State
Dungeness crab – trap	1.50	1.24	1.44	1.44	1.23	1.23	1.12	1.12	1.75
Hagfish – trap	1.77	1.67	1.76	1.76	1.86	1.86	1.73	1.73	2.17
Pacific Halibut – longline	1.45	1.28	1.37	1.37	1.38	1.38	1.14	1.14	1.61
Petrale Sole – trawl	1.44	1.28	1.40	1.40	1.27	1.27	1.13	1.13	1.74
Pink Shrimp – trawl	1.94	1.55	1.89	1.89	1.96	1.96	1.18	1.18	2.32
Rockfish - hook & line (dead)	2.28	1.23	1.55	1.55	1.29	1.29	1.18	1.18	1.94
Rockfish - hook & line (live)	1.26	1.09	1.25	1.25	1.21	1.21	1.12	1.12	1.47
Rockfish - longline (dead)	2.28	1.23	1.55	1.55	1.29	1.29	1.18	1.18	1.94
Rockfish - longline (live)	1.26	1.09	1.25	1.25	1.21	1.21	1.12	1.12	1.47
Rockfish - trap	1.26	1.09	1.25	1.25	1.21	1.21	1.12	1.12	1.47
Sablefish - longline	1.40	1.22	1.29	1.29	1.18	1.18	1.13	1.13	1.59
Sablefish - trap	1.40	1.22	1.29	1.29	1.18	1.18	1.13	1.13	1.59
Salmon - troll	1.38	1.10	1.30	1.30	1.23	1.23	1.09	1.09	1.53
Sardine - seine	5.55	5.20	5.24	5.24	5.33	5.33	5.21	5.21	6.53
Seaward RCA - trawl	2.00	1.37	1.75	1.75	1.40	1.40	1.23	1.23	2.26
Shelf Bottom - trawl	2.00	1.37	1.75	1.75	1.40	1.40	1.23	1.23	2.26
Tuna - troll	1.57	1.18	1.43	1.43	1.14	1.14	0.93	0.93	1.76
Urchin - dive	1.33	1.24	1.24	1.24	1.22	1.22	0.94	0.94	1.55
Whiting - midwater trawl	3.22	3.52	3.71	3.71	4.21	4.21	3.53	3.53	4.42

Source: Authors' estimates using data from The Research Group (2011)

Table 42. Estimated personal income contributions from commercial harvesting and processing, 2008$ (1000 $)

Fishery	Astoria	Garibaldi/ Tillamook	Depoe Bay	Newport	Florence	SOORC Ports	Port Orford	Gold Beach & Brookings	Coastal Oregon Region
Dungeness crab - trap	$11,721	$3,092	$118	$19,208	$105	$13,282	$2,113	$4,953	**$54,592**
Hagfish - trap	$119	*	–	$141	–	$668	$13	–	**$944**
Pacific Halibut - longline	$348	$10	–	$557	$3	$287	$25	$1	**$1,231**
Petrale Sole - trawl	$1,465	$26	–	$385	–	$794	–	$120	**$2,790**
Pink Shrimp - trawl	$4,104	$647	–	$5,789	–	$4,739	–	$324	**$15,603**
Rockfish - hook & line (dead)	*	$65	$7	$37	–	$29	$17	$45	**$200**
Rockfish - hook & line (live)	–	*	$4	$1	–	$1	$421	$372	**$811**
Rockfish - longline (dead)	$1	$0	–	*	–	$5	$5	$0	**$14**
Rockfish - longline (live)	–	–	–	–	–	–	$88	*	**$89**
Rockfish - trap	$0	$28	–	$0	–	$1	–	*	**$29**
Sablefish - longline	$408	$6	–	$1,271	*	$670	$933	$69	**$3,357**
Sablefish - trap	$823	$13	–	$1,282	*	$798	*	$19	**$2,937**
Salmon - troll	$596	$458	$16	$2,538	$36	$2,413	$333	$259	**$6,649**
Sardine - seine	$29,559	*	–	$84	–	–	–	–	**$29,670**
Seaward RCA - trawl	$9,727	$8	–	$4,596	*	$4,029	–	$1,339	**$19,704**
Shelf Bottom - trawl	$3,134	$3	–	$466	–	$214	–	*	**$3,824**
Tuna - troll	$4,973	$282	$12	$5,379	$66	$2,848	$13	$48	**$13,622**
Urchin - dive	–	$2	$42	*	–	$30	$82	$23	**$180**
Whiting - midwater trawl	$8,171	–	–	$14,772	–	$2,249	–	–	**$25,192**
Total	**$75,149**	**$4,680**	**$199**	**$56,509**	**$216**	**$33,059**	**$4,044**	**$7,582**	**$181,438**

* *indicates data were collected, but cannot be shown due to confidentiality constraints*

Source: Authors' estimates using data from ODFW and The Research Group (2011)

During the years 2004-2008, the state average annual estimated personal income from commercial harvesting and processing activities was approximately $228.7 million. The Dungeness crab – trap, sardine – seine, and whiting – midwater trawl fisheries had the highest EPI at $71.6 million, $34.9 million, and $31.2 million respectively. The lowest EPI contributing fishery was Rockfish – longline (dead) at $20 million.

Table 43. Average annual estimated personal income from commercial harvesting and processing in Oregon, 2008$

Fishery	Average annual landings (1000$)	Estimated personal income (1000$)
Dungeness crab - trap	$40,890	**$71,633**
Hagfish - trap	$515	**$1,117**
Pacific Halibut - longline	$887	**$1,428**
Petrale Sole - trawl	$2,046	**$3,569**
Pink Shrimp - trawl	$8,296	**$19,256**
Rockfish - hook & line (dead)	$156	**$303**
Rockfish - hook & line (live)	$726	**$1,066**
Rockfish - longline (dead)	$10	**$20**
Rockfish - longline (live)	$79	**$116**
Rockfish - trap	$27	**$39**
Sablefish - longline	$2,739	**$4,344**
Sablefish - trap	$2,288	**$3,628**
Salmon - troll	$5,356	**$8,218**
Sardine - seine	$5,345	**$34,890**
Seaward RCA - trawl	$11,450	**$25,882**
Shelf Bottom - trawl	$1,992	**$4,503**
Tuna - troll	$9,800	**$17,265**
Urchin - dive	$173	**$268**
Whiting - midwater trawl	$7,061	**$31,177**
Total	**$99,837**	**$228,721**

Source: Authors' estimates using data from ODFW and The Research Group (2011)

6.5.3. Charter Fishing: Estimated Economic Output

The estimated economic impacts of charter fishing revenues by port group and in total for the state of Oregon in 2010 are displayed in Table 44. The 1.55 multiplier is the Oregon statewide economic multiplier for “for-hire” recreational fisheries estimated by Gentner and Steinback (2008) in their analysis for NOAA of the total national economic impacts of ocean recreational fishing expenditures for the U.S. The total estimated economic output of charter fishing revenues for the state of Oregon was approximately $10.9 million in 2010.

Table 44. Estimated economic output of charter fishing, 2010

Port Group	GER from charter (1000 $)	Economic Multiplier	Estimated economic output (1000 $)
Astoria	$2,570	1.55	**$3,983**
Depoe Bay	$1,229	1.55	**$1,904**
Newport	$1,788	1.55	**$2,771**
SOORC Ports	$869	1.55	**$1,347**
Gold Beach	$235	1.55	**$364**
Brookings	$314	1.55	**$486**
Total	**$7,004**		**$10,855**

Source: Authors’ estimates using data from Steinback et al. (2010) and Gentner and Steinback (2008)

6.5.4. Recreational Fishing: Estimated Personal Income

The Research Group maintains a West Coast recreational fishing computer model called the RecFEAM (Recreational Fishery Economic Assessment Model). The RecFEAM generates economic contribution factors measured by total personal income per angler day for several target fisheries and for different modes of fishing. The economic factors are calculated using itemized recreational fishing trip expenditures and the associated income multipliers from IMPLAN. For more information on the RecFEAM model, please see Appendix G or The Research Group (2009).

It is important to note that no differentiation is made between anglers (recreational fishermen) that are residents and non-residents; non-resident spending in regional economies generates new income while local resident fishing trip spending may or may not have been spent anyway in the regional economy, so the economic contribution cannot be considered calculations of basic economic contribution arising from recreational fishing activities.

Table 46 presents the economic contributions, as expressed in terms of estimated personal income (EPI), per angler day for target recreational fisheries in specific port groups (Table 45) and the state of Oregon for 2009. Number of angler days are from the Oregon Recreational Boat Survey (ORBS) results. It is interesting to note that among port groups, the difference between the economic contributions of the target fisheries is not large, ranging between approximately $30–$39 per angler day in 2009. At the state level economic contributions are greater as the associated region is larger.

Table 45. RecFEAM Oregon port groups

Astoria	Tillamook	Newport	Coos Bay	Brookings
Astoria	Garibaldi	Salmon River	Florence	Port Orford
Hammond/Warrenton	Tillamook	Depoe Bay	Winchester Bay	Gold Beach
Gearhart	Netarts	Newport	Coos Bay	Brookings
Seaside	Pacific City		Charleston	
Cannon Beach			Bandon	

Source: The Research Group (2011)

Table 46. Estimated personal income contributions per angler day for ocean recreational fisheries, 2009

Target Fishery	Astoria	Tillamook	Newport	Coos	Brookings	Oregon
Bottomfish	$39.42	$36.61	$36.87	$37.47	$36.67	$45.93
Halibut and tuna	$39.42	$36.61	$36.87	$37.47	$36.67	$45.93
Salmon	$32.56	$30.24	$30.46	$30.95	$30.29	$37.93

Source: The Research Group (2011)

Table 47 presents the total estimated economic contributions of ocean recreational fishing as expressed in terms of personal income for the state of Oregon, at approximately $5.1 million in 2009. The salmon fishery is the largest contributing target fishery at an estimated $2.7 million in personal income contributions. It must be noted, however, that the recreational shellfish fishery (e.g., crab and clams), a popular and likely economically significant fishery, was not included in this analysis, therefore the final statewide estimates are likely conservative.

Table 47. Total estimated personal income contributions from ocean recreational fishing in Oregon, 2009

Target Fishery		# of Trips	Estimated personal income (1000 $)
Bottomfish	Bottomfish	34,117	$1,567
	Dive	443	$20
Halibut and tuna	Halibut	8,671	$398
	Tuna	7,671	$352
Salmon	Salmon	61,473	$2,332
	Combo	10,377	$394
	TOTAL	**122,752**	**$5,063**

Source: The Research Group (2011)

6.5.5. Summary

Table 48 displays the total estimated economic output from Oregon's commercial ($189.3 million) and charter ($10.9 million) fishing activities and the total estimated personal income contributions from commercial harvesting and processing activities in Oregon ($228.7 million). Table 49 displays the estimates of estimated personal income from ocean recreational fishing and the estimated total expenditures associated with coastal visitation primarily focused on non-consumptive recreation for Oregon. Recreational fishing and coastal visitation related expenditures cannot be aggregated as the coastal visitation economic data includes some trips where recreation was not the primary purpose, and some trips with participation in consumptive activities.

Table 48. Total economic output and personal income estimates from marine fishing revenues, Oregon

Activity	Revenue (millions $)	Estimated economic output (millions $)	Estimated personal income (millions $)
Commercial fishing	$99.8	$189.3	$228.7
Charter fishing	$7.0	$10.9	n/a

Source: Current study, summarized from above

Note: EEO and EPI estimates derived using separate multiplier sources, as noted above, and EPI estimate includes contributions from the commercial seafood processing industry.

Table 49. Estimated ocean recreational contributions and expenditures, Oregon

Activity	Expenditures (millions $)
Estimated personal income contributions from ocean recreational fishing	$5.1
Coastal visitation including non-consumptive recreation	$2,423.3

Source: The Research Group (2011) and LaFranchi and Daugherty (2010)

Again, it must be noted that the revenue and expenditure estimates should not be summed together as noted above. Examining strictly fishing activities, revenues to commercial fishing were larger than both charter revenues and recreational fishing expenditures. Furthermore, it must be noted that there are additional marine associated revenues accruing to Oregon's shoreside economy in the commercial seafood processing, wholesale, distribution, and retail sectors.

7. OREGON MARINEMAP

Oregon MarineMap is a web-based decision support tool customized for open and participatory marine spatial planning in Oregon. Developed by technologists at Ecotrust, UC Santa Barbara, and The Nature Conservancy, MarineMap offers a simple, flexible and powerful means of gathering expertise from resource managers, scientists, stakeholders, and the public. The tool facilitates assessment of new and existing uses, and encourages collaborative decision making by enabling stakeholders to visualize geospatial data layers and draw a, or several,

prospective 'Area of Interest' boundaries (e.g., a potential wave energy site). For these 'areas of inquiry', MarineMap then generates statistics to evaluate the features contained in each 'Area of Interest' such as the type and amount of habitats contained in the area, the value of the area to fishing and other human uses, and several other environmental and human attributes and features of interest. MarineMap does not require users to be familiar with Geographic Information Systems (GIS) to be able to utilize the tool, and the MarineMap code is open source and adaptable to situations and environments around the world.

7.1. Datasets Developed for Oregon MarineMap

Through the work of Steinback et al. (2010), MarineMap was built for Oregon, containing commercial, charter, and recreational fishing data collected by Ecotrust and additional data layers describing environmental attributes, other human uses, spatial management measures, and other spatial data of importance and interest.

Through the efforts of this project, the data layers displayed in Table 50 have been incorporated into Oregon MarineMap.

Table 50. Description of datasets developed for Oregon MarineMap

Name of Data Layer	Description	Data used to inform dataset development
State-wide Commercial Fishing Economic Dataset	A spatial dataset depicting the estimated economic value of ocean areas to specific commercial fisheries at the state level	Steinback et al. 2010; ODFW landings data
State-wide Charter Fishing Economic Dataset	A spatial dataset depicting the estimated economic value of ocean areas to specific charter fisheries at the state level	Steinback et al. 2010
State-wide Recreational Fishing Economic Dataset	A spatial dataset depicting the estimated economic value of ocean areas to specific recreational fisheries at the state level	Steinback et al. 2010; The Research Group 2011; ODFW Oregon Recreational Boater Survey Data (ORBS)
County Level Non-Consumptive Human Use Trip Expenditure Summary	A spatial dataset depicting the estimated expenditures spent on coastal recreational trips at the county level	Steinback et al. 2010; LaFranchi and Daugherty 2011
Shoreside Infrastructure	Includes several spatial datasets displaying the location of consumptive (e.g., bait and tackle and marine supply store) and non-consumptive (e.g., surf/kayak shop or dive store) human use businesses. Please see section 5.1 for more information	See section 5.1.

Source: Current study

7.2. MarineMap Dataset Development Methodology

This section describes the methodology used to develop spatial economic value datasets for the commercial fishing, charter fishing, recreational fishing, and non-consumptive recreation information available on MarineMap.

7.2.1. State-wide Commercial Fishing Economic Dataset

To represent the spatial importance of commercial fishing in Oregon, we developed datasets that depict the average annual gross economic revenue (GER) for the commercial fisheries across Oregon on a state-wide level. These datasets were summarized to the state marine planning unit grid (one square mile blocks) and displayed on Oregon MarineMap . For this project, as an added feature, in MarineMap, a user can query or click on each planning unit and an information box will appear displaying:

1. The value (reported as average annual GER) of that planning unit to each commercial fishery in Oregon;
2. The larger shoreside economic contribution (reported as estimated economic output (EEO) using NOAA Oregon state multipliers (see section 6.5)) of that planning unit to each commercial fishery in Oregon; and
3. The larger shoreside economic contribution (reported as estimated personal income (EPI) using FEAM economic factors (see Section 6.5) of that planning unit to each commercial fishery in Oregon.

To develop these datasets we first developed economic datasets for each port-fishery combination. There were 78 datasets representing the various fisheries across eight port groups. The ports include Astoria, Garibaldi/Tillamook, Depoe Bay, Newport, Florence, SOORC Ports (Winchester Bay/Reedsport, Charleston, and Bandon), Port Orford, and Gold Beach & Brookings (combined). It should be noted that the commercial fishing fleet in Pacific City did not participate in the survey and thus could not be represented. These data were originally collected by Ecotrust as part of our work supporting the Oregon Territorial Sea Plan Revision process (Steinback et al., 2010) (see section 6.1 and Appendix F for details).

To create these datasets the spatial data collected were re-processed at the port-fishery level to spatially distribute and display the average annual GER (taken from 2004–2008 ODFW ex-vessel landings data) from commercial fishing in Oregon. To create a state level gross economic revenue data layer, these port-fishery datasets were simply combined together and then summarized to the state marine planning unit grid.

The preliminary summary product was then presented to the fishing community for review. After reviewing the data, fishermen suggested refinements to more accurately delineate the fisheries. The suggested edits centered on reducing the extraneous areas that artificially extended the footprint of some fisheries, which caused an inappropriate overlap between spatially discreet fisheries such as Dungeness crab and some trawl fisheries. These extended areas were an artifact of some of the surveyed fishermen providing very general areas to avoid giving away private information. To refine the data to the appropriate footprint we trimmed the datasets to the seventy-five percent value area based on Percent Volume Contours (PVC) developed for each port/fishery combination. The PVCs were calculated using the original extent of the fishery dataset. A polygon was created using the 75% PVC line. Each raster dataset was then clipped with the appropriate polygon and the total port-fishery revenue was redistributed within the 75% value area. To calculate the redistribution, an index of values was created by converting all of the planning unit cell values to a percentage. The appropriate dollar amount was then applied to the dataset. The resulting spatial dataset captures all of the gross economic revenue for each port-fishery combination refined to a smaller footprint. The final datasets for each port-fishery were then combined at the state level, summarized to the state marine planning unit grid, and displayed on Oregon MarineMap.

7.2.2. State-wide Charter Fishing Economic Dataset

To represent the spatial importance of charter fishing in Oregon, we developed datasets that depict the estimated annual gross economic revenue (GER) for charter fisheries across Oregon on a state-wide level. This dataset was summarized to the state marine planning unit grid (one square mile blocks) and displayed on Oregon MarineMap . For this project, as an added feature in MarineMap, a user can query or click on each planning unit and an information box will appear displaying:

1. The value (reported as estimated annual GER) of that planning unit to each charter fishery in Oregon; and
2. The estimated economic contribution (reported as estimated economic output (EEO) using the Oregon statewide economic multiplier for “for-hire” recreational fisheries by Gentner and Steinback (2008)-see Section 6.5) of that planning unit to each charter fishery in Oregon.

To develop this dataset we first developed economic datasets for each port-fishery combination. There were 23 datasets representing the various fisheries across six port groups. The ports include Astoria, Depoe Bay, Newport, Florence, SOORC Ports (Winchester Bay/Reedsport, Charleston, and Bandon), Gold Beach & Brookings (combined). It should be noted that the charter fishing operations in Garibaldi/Tillamook did not participate in the survey and thus could not be represented. The GER value of Oregon charter fishing applied to this dataset was calculated from data originally collected by Ecotrust as part of our work supporting the Oregon Territorial Sea Plan Revision process (Steinback et al., 2010) (see section 6.1 and Appendix F for details). The GER value collected, however, was compiled as the GER for an entire port, and was not fishery specific. Therefore, in order to distribute the GER to specific fisheries in a port we created a percentage for each fishery that was based on the price customers paid and the percentage of trips a charter operation targeted a specific fishery. Both were questions asked during our initial survey for the Oregon Territorial Sea Plan Revision (Steinback et al., 2010). Table 51 below shows the percentages that were used to distribute the GER to each port-fishery dataset. Once the GER for each port was properly split between each fishery, the GER value was then distributed across each port-fishery dataset. These port-fishery datasets were then summarized or combined together to create a state-wide level dataset which was then summarized to the state marine planning unit grid and displayed on Oregon MarineMap.

Table 51. Percentages used to distribute estimated charter GER to each port-fishery

Port	Dungeness crab	Pacific halibut	Rockfish	Salmon	Tuna
Astoria	1.5%	9.7%	14.9%	60.2%	13.6%
Depoe Bay	11.2%	30.3%	41.3%	17.2%	–
Newport	10.4%	34.4%	33.9%	10.7%	10.6%
Florence	7.4%	73.1%	4.7%	14.8%	–
SOORC Ports	12.6%	26.2%	26.1%	26.3%	8.8%
Gold Beach & Brookings	7.7%	14.3%	54.1%	14.5%	9.5%

Source: Current study

7.2.3. State-wide Recreational Fishing Economic Dataset

To represent the spatial importance of recreational fishing in Oregon, we developed datasets that depict the economic contribution, as expressed in personal income, from saltwater recreational fishing across Oregon on a state-wide level. This dataset was summarized to the state marine planning unit grid (1 square mile blocks) and displayed on Oregon MarineMap. For this project, as an added feature in MarineMap, a user can query or click on each planning unit and an information box will appear displaying the value (e.g., economic contribution expressed as estimated personal income) of that planning unit to each recreational fishery in Oregon.

To develop this dataset we first developed economic datasets for each port-fishery combination. There were 33 datasets representing various fisheries across eight port groups. The ports include Astoria, Garibaldi/Tillamook, Salmon River, Depoe Bay, Newport, Florence, SOORC Ports (Winchester Bay/Reedsport, Charleston, and Bandon), Gold Beach & Brookings (combined). The economic value, expressed as estimated personal income (EPI), applied to the datasets is derived from the Fisheries Economic Assessment Model (FEAM) produced by The Research Group (2005) (see section 6.5.4). This FEAM model provided an estimate of the economic contribution for several saltwater recreational fishing activities at the port level. However, it should be noted that the FEAM model did not report out on the economic contribution of recreational Dungeness crab fishing and thus was excluded from this analysis.

To distribute the estimated economic contribution across the various fisheries and ports in Oregon, we created a matrix of percentages for each port-fishery combination by summarizing the anglers days in a each port-fishery combination from 2000-2009 as provided by the Oregon Department of Fish and Game Oregon Recreational Boater Survey (ORBS). Table 52 below shows what percent of the overall value was distributed to each port-fishery combination. Once the percentage for each port-fishery combination was properly calculated, we then distributed the estimated economic contribution for each fishery across these percentages and distributed that value across the spatial datasets developed for each recreational port-fishery combination. These port-fishery datasets were then summarized or combined together to create a state-wide level dataset which was then summarized to the state marine planning unit grid and displayed on Oregon MarineMap.

Table 52. Percentages used to distribute total recreational expenditure to each port-fishery

Port	Flatfish	Pacific Halibut	Rockfish	Salmon
Astoria	0.6%	15.6%	4.3%	0.5%
Garibaldi	12.5%	14.9%	13.0%	4.8%
Salmon River	2.5%	3.7%	3.4%	7.9%
Depoe Bay	3.8%	5.1%	14.5%	4.0%
Florence	1.1%	2.5%	0.4%	0.0%
Newport	67.9%	14.1%	25.6%	10.9%
SOORC Ports	9.3%	31.9%	29.9%	16.7%
Gold Beach & Brookings	0.1%	12.2%	7.6%	52.8%

Source: Authors' estimates using ODFW ORBS data

7.2.4. County Level Non-Consumptive Human Use Trip Expenditure Summary

To represent the spatial importance of coastal visitation and non-consumptive recreational use in Oregon, we developed a dataset that displays the estimated total expenditures spent by visitors to the Oregon coast . This dataset was developed by applying the relative percentages of county trips to total expenditures as estimated by LaFranchi and Daugherty (2011), and assuming that trips in separate counties result in similar expenditures (see section 6.4). In MarineMap a user can query or click on a county and an information box will appear displaying the estimated amount of trip expenditures spent in that county on coastal recreation. This dataset is readily available in MarineMap.

7.3. Oregon MarineMap Economic Evaluation Module

The datasets developed as a part of this project and described above may be used in MarineMap to help explore areas of economic importance to coastal human uses in Oregon. This knowledge may then be used to inform marine spatial planning options and decisions, such as locating potential wave energy sites that minimize the impact on existing human uses.

To further facilitate the use of these datasets and support marine spatial planning decision-making, for this project we also developed an Economic Evaluation module in MarineMap. This module essentially allows MarineMap users to draw an 'Area of Interest' such as a potential wave energy site and MarineMap then evaluates the maximum potential economic impact to each consumptive use sector (e.g., commercial, charter, and recreational fishing) if that area were no longer available to existing human uses.

Built upon the analytical method developed and used in the California Marine Life Protection Act process (see Scholz et al. 2008 and Scholz et al. 2006) to evaluate the economic impact of spatial planning scenarios, MarineMap conducts the Economic Evaluation analysis by simply overlaying the user drawn 'Area of Interest' with each sector's economic dataset and calculates the economic value contained in that area. MarineMap then reports out on both the first level economic value contained in the 'Area of Interest' and also the Estimated Economic Output for the commercial and charter sectors, which incorporates associated multipliers to estimate the potential shoreside economic impact.

It should be noted that a key assumption of this analysis is that each 'Area of Interest' eliminates all the human use opportunities and thus value in area. In other words, the analysis assumes that all commercial fishing in an 'Area of Interest' would be lost completely, when in reality it is more likely that effort would shift to areas outside the area in which some value may be regained. The effect of such an assumption is most likely an overestimation of the impacts, or a "worst case scenario."

Incorporating these additional datasets and developing the Economic Evaluation module in MarineMap allows stakeholders to better explore marine spatial planning scenarios which account for potential economic impacts to existing human uses. This leads to more informed decision-making and improved outcomes for Territorial Sea Planning in Oregon.

7.4. Community Outreach for MarineMap Economic Datasets and Evaluation Module

FISHCRED is an Oregon statewide commercial fishing nonprofit organization focused on data management and support of marine spatial planning. FISCHRED was formed to serve as a central decision-making entity to act on behalf of the fishing industry and to guide, review, and approve of how fisheries data will be presented, utilized, or applied in the Territorial Sea Plan (TSP) and other planning/policy processes. In creating a statewide coalition of fishermen FISHCRED seeks to reduce conflicts associated with marine spatial planning.

To help facilitate reviewing and approving commercial fishing economic datasets, in January 2011, Ecotrust assisted FISHCRED board members to administer the hiring of an Executive Director to help develop and manage the FISHCRED group. After an initial call for applicants and interviews, Laura Anderson was hired and Ecotrust staff have been working closely with her to coordinate outreach efforts and assist in the development of a more geographically representative board or directors. Since then, in February 2011, Ecotrust staff and Laura Anderson travelled together to a SOORC meeting to discuss Ecotrust's work on submitting additional data products to DLCD and to support FISHCRED's effort to initiate discussions on forming a coast-wide fisherman group. These discussions with the SOORC and FISHCRED are ongoing and Ecotrust will continue to provide support as needed. Further achievements on developing FISHCRED's board member composition and membership base were made during FISHCRED's annual board meeting, which was held on March 10, 2011 in Newport, Oregon. During the meeting, it was clear a major goal of the FISHCRED is to develop a more geographically balanced board of directors. As a result, several board members from Newport stepped down—allowing more seats to open up for board members to join from other ports along the coast, including Port Orford, Depoe Bay, and Garibaldi. Since the March board meeting several new board members (e.g., from SOORC, Port Orford, Brookings/Gold Beach, etc) have been added to now include representation from each commercial fishing port community on the Oregon coast. As coast-wide representation in the FISHCRED Board of Directors was being established Ecotrust worked with the Oregon commercial fishing community to review several iterations of commercial fishing economic datasets.

In the first iteration, Ecotrust developed economic datasets for each fishery at the state-level, loaded them onto Oregon MarineMap, and presented these datasets to FISHCRED board member. Board members reviewed these 'heat maps' and confirmed their accuracy, however, suggested modifications to display the economic value of fishing areas (e.g., dollar value) as opposed to the 'heat maps' which displayed in color the relative importance of areas. Specifically, FISHCRED felt that the maps in their current form do not indicate economic dollar values of specific areas to each fishery and the maps could be misinterpreted as each fishery being of equal value.

Ecotrust worked to incorporate these suggestions by developing the planning unit economic datasets as detailed in the work to complete Objective 1. This method of visualizing the dollar economic value of ocean areas to specific fisheries will not only address FISHCRED's concerns but also provide a foundation in which to utilize these data in the Goal 19 analytical framework and support subsequent economic analyses—such as a shoreside economic impact analysis. In April 2011, Ecotrust reviewed the second iteration of economic value datasets with FISHCRED board members and SOORC group members. Upon reviewing the datasets, fishermen suggested refinements to more accurately delineate the fisheries. The suggested edits centered on reducing the extraneous areas that artificially extended the footprint of some fisheries, which caused an inappropriate overlap between spatially discreet fisheries such as Dungeness crab and some trawl fisheries. These extended areas were an artifact of some of the surveyed fishermen providing very general areas to avoid revealing private information. To refine the data to the appropriate spatial footprint of each commercial fishery we trimmed the datasets to the seventy-five percent value area based on Percent Volume Contours (PVC) developed for each port/fishery combination (as detailed in Section 7.2.1).

In May 2011, Ecotrust staff travelled to a SOORC meeting to present the third iteration of the economic value datasets summarize to planning units. The datasets were well received, their accuracy confirmed, and discussions were had on the pros and cons of releasing the datasets. Overall the group was concerned about confidentiality issues with utilizing these datasets in the planning process and preferred to engage in conversations with DLCD and ODFW staff to explore options in which data products (state-wide and/or port-level) could be utilized to support TSP analyses yet are shielded from public use/access.

As stated from FISHCRED's final report to OWET, FISHCRED has worked with Ecotrust to make considerable progress in developing potential spatial data products to inform the TSP process and will continue to be engaged in zoning for wave energy planning:

In terms of developing mapping products for use in the Territorial Sea Plan (TSP) process, we have made considerable progress. The evolution of maps from their original form to the current state has provided a platform for a robust and informed discussion about the potential for wave energy development in Oregon. While the size and scope of wave energy development is being worked out by the Territorial Sea Plan Working Group (TSPWG) the commercial fishing industry has developed tools that will allow it to be active and informed in the discussion.

As of the writing of this report, additional mapping products have not been fed into the TSP process. It is envisioned that the existing data layer(s) on fishing areas, when combined with ecological data and existing uses data, will produce draft options that FISHCRED will be able to make informed responses to. We are scheduling a strategic planning session in mid November wherein we will discuss more proactive approaches to zoning for wave energy.

Anderson, 2011

8. ADDITIONAL METHODS AND EVALUATIONS

In the following sections, we address some issues identified through stakeholder meetings that affect the shoreside economy that were designated to be only partially or minimally considered in this study. These are: 1) coastal attitudes and perceptions related to wave energy and marine reserve sites; 2) motivations and reasoning behind people's decisions to reside in coastal areas, property value impacts; and 3) the contribution of ecosystem services and non-market values to shoreside economies. While these topics are of significance to the larger picture of shoreside economies, they require additional research and study efforts outside the time frame and budget of this project. In the following sections, we raise some key issues of concern and propose some ideas for additional research and study in the future.

8.1. Attitudes and Perceptions: Wave Energy and Marine Reserves

As cited in the literature review (Appendix A), there are a handful of relevant studies regarding the attitudes and perceptions of Oregon residents to developing wave energy of the Oregon coasts.[14] In 2007, Oregon Wave Energy Trust (OWET) put out a request for proposals to better understand the environmental and human aspects of wave energy development. Stefanovich (2009) conducted an extensive survey across the state of Oregon to determine both the familiarity with, and level of support for or opposition to, wave energy development. She found that while coastal residents were generally the most informed group of Oregon citizens about wave energy development, they were simultaneously the most supportive group *and* the group most likely to have negative attitudes.[15]

This observation is corroborated by Hunter (2009) who found that coastal residents in particular were the most divided on this issue; their perceptions of wave energy development ranging from 'distinct economic opportunity' to 'distinct economic threat'. Hunter finally concluded that, "until communities experience the full spectrum of wave energy development on the ground, it remains to be seen who will be proven correct as to how community well-being will actually be impacted" (2009, p. 18). The research of Stevenson (2009) observed that while there was generally overall support for wave energy development in Oregon, the fishing and conservation groups were more likely to indicate less overall support than other stakeholders and interest groups.

It is likely that the coastal residents who are most likely to feel negatively about wave energy development are also concerned about potential negative effects on marine resources. To address this, Stevenson (2009) strongly recommends actual on-site wave energy testing through a cooperative stakeholder process, citing the Reedsport Settlement Agreement as a positive example.[16] This type of approach would include the input of interested fishing and conservation groups, allowing them to engage directly with the wave energy industry and development process. Furthermore, the testing would provide valuable, localized scientific data, and a specialized focus on impacts to economically significant fisheries, such as Dungeness crab, would be invaluable to concerned fishermen. This science based approach would likely be most effective as Stevenson's (2009) study revealed that

[14] Namely, Stefanovich (2009), Stevenson (2009), and Hunter (2009).

[15] The majority, however, did feel positively about it: 59% felt positive or very positive, while 6% felt negative or very negative.

[16] In the Reedsport Settlement Agreement, wave energy developers met extensively with stakeholder groups eventually signing a settlement agreement with eleven government and three non-government entities to develop the nation's first commercial-scale wave energy project. The parties to the settlement agreement participated in a three-year process to develop consensus on aspects of project design, required monitoring, and contingencies for adaptive management.

people tend to trust technical experts more than industry representatives when it comes to wave energy development. But industry outreach is important too, and a localized testing initiative would allow wave energy proponents direct opportunities to engage with coastal communities, where socioeconomic and climate benefits could also be emphasized to garner more support.

The efforts described above would also assist in reaching the remaining 23% of coastal residents who do not feel informed on wave energy development in general, and could perhaps give those with neutral opinions (12%) enough information to be better able to form opinions (Stefanovich, 2009). A post-project feedback study could be conducted to analyze the impact of the test studies on coastal residents and local stakeholders to further inform better policy and planning for future wave energy development. Finally, with a better informed, and possibly more supportive, public, studies and efforts focusing on the optimal cost structure of developing wave energy would be critical (Hunter, 2009).

In regards to marine reserves, at the time of this study, ODFW is developing a process to assess the attitudes and perceptions of coastal residents. The state of Oregon began a process in 2008 to designate and implement a limited system of marine reserve sites within state waters. ODFW is the lead organization responsible for the implementation and continuing monitoring and evaluation of Oregon's marine reserves. As such, the organization is in the process of developing a survey with the precise goal of capturing the attitudes and perceptions of coastal residents. The upcoming research will be conducted as part of ODFW's Human Dimensions Monitoring Program; one of the core objectives of which is to, "determine if size, configuration, and location of marine reserve sites, and the system as a whole, avoid significant adverse social and economic impacts to ocean users and coastal communities" (ODFW, 2011).

ODFW plans to conduct mail and telephone surveys and interviews to assess the level of knowledge a person has regarding particular marine reserves, from where they obtain their information, how they expect the marine reserve to effect them, what they think of the policy guiding implementation, and their opinions on managing the reserve. This information will allow us to address any potential management issues early on in the process and better serve the public interest. Through these efforts, ODFW will engage, educate, and learn from stakeholders, likely enhancing the overall implementation and monitoring process.

8.2. Real Estate Values

The health and availability of marine resources are reflected in coastal real estate values. The questions of interest to this study regarding real estate are the following: What motivates people to move to the coast? What is their willingness to pay to live in a coastal community? How do and would different marine ecosystem services and scenarios, such as increase in alternative ocean energy facilities or marine reserves, factor into their location decisions? Why do some communities support these options and others do not?

The factors which motivate people to move to the coast can best be revealed through surveys of the residents themselves. Factors to address in survey instruments could include: basic demographic characteristics (age, race, education, etc); socioeconomic status (income, employment, etc.); previous residency; primary factors for relocation to the coast; and more. Survey results could then be analyzed to determine the typical profile of a coastal resident; the factors motivating relocation to the costs; and the most common attractors and detractors to coastal living. The results of such studies can then be used by coastal communities to better understand what helps to support property values in their area and what is likely to attract new residents.

It can be hypothesized that wave energy development or implemented marine reserves will affect real estate values. There are no studies thus far, however, that explore this relationship in greater detail. There are some studies that analyze the impacts off-shore wind farms on nearby properties, though the results are conflicting. It will be instructive to observe any resulting change in real estate values after implementation of the Reedsport Wave Power Station in Reedsport, Oregon. A repeat sales analysis may be appropriate for measuring these values.

Hedonic pricing analysis is the most comprehensive and accurate way to measure changes in real estate values following changes in marine (or other natural) resources. This method, however, depends on the availability of time series data on property transactions before and after the proposed change in marine resources. By controlling for all other factors that can affect property values, hedonic regression allows researchers to attribute the portion of the

observed change in property values to the change in marine resources. Since wave energy development is still in its infancy, the data necessary to support hedonic analysis will not be available anytime soon.

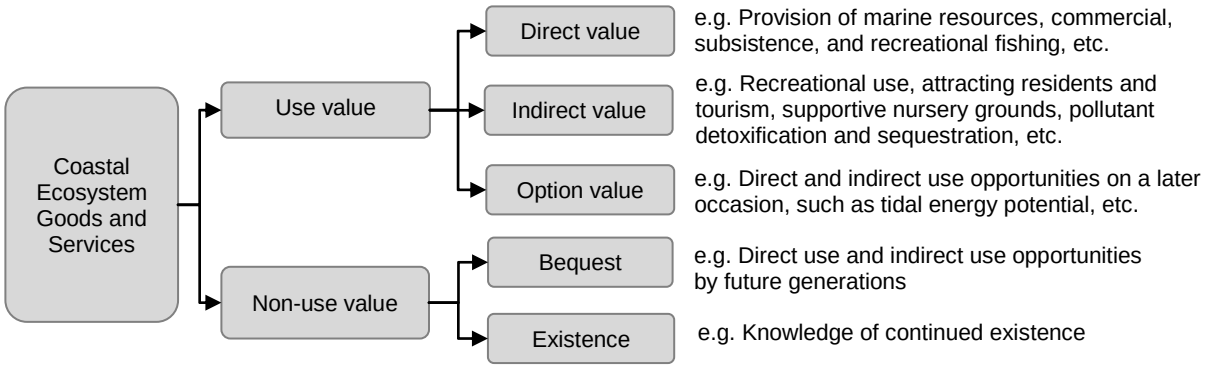
Repeat sales analysis is an alternative that can be completed sooner, once installation of wave energy machines in Reedsport is complete. This approach would involve gathering data on sales prices for properties in the Reedsport area before and after the development of the wave power station. Only sales of the same properties in both time periods would be selected for the analysis. The methodology consists of simply taking the difference between the two prices, adjusting for inflation, and subtracting the change in price that would be expected in the absence of the wave power station. To estimate the expected, 'business as usual' change in price, a similar analysis would be undertaken in economically similar coastal and inland towns without wave power development or any other large residential changes. The appropriateness of these communities could be ascertained by examining the historical similarities in price change proportions over time. The remaining price change then could be attributed to the power station.

Marine reserves do not have the same visibility as wave power stations, and they may even enhance wildlife viewing. Just as proximity to national parks is often considered a selling point by real estate agents, it is foreseeable that marine reserves may have the same effect on neighboring coastal properties.[17] Notable wildlife viewing would likely increase tourist activity to the area, implying associated increases in vacation rental demand; which may increase property values. Similarly, these effects can be examined in a survey and or repeat sales analysis technique as described above, possibly focusing on the coastal towns bordering California's first marine protected area (MPA), located on the central coast. Perhaps after a period of approximately ten years a substantial enough database would be built up to conduct a proper hedonic pricing regression analysis to better understand the MPA's effects on property values.

8.3. Ecosystem Services and Non-Market Valuation

As outlined by Daily (1997), coastal ecosystems supply a vast array of vital ecosystem goods and services which provide direct and indirect support of shoreside economies. The total value of ecosystem goods and services can be broken apart into use and non-use values, see Figure 7. Use values consist of direct use, indirect use, and option value. Non-use values are more difficult to quantify, they represent the value placed on the basic existence of natural resources, and the ability to bequest these values to future generations.

Figure 7. Values of ecosystem goods and services



Source: Current study

The most transparent and easily valued coastal ecosystem values are the direct and indirect human use values, as extensively analyzed in section 6. These include direct consumption, namely fishing, and other non-consumptive uses (see Figure 4 for a list of examples). While some of these values are assigned value by market transactions, such as commercial fishing, many others are not, such as fresh air. Assigning these non-market goods and services a monetary value is notoriously complicated and controversial. Though such an effort is beyond the scope

[17] Similar to how a fisherman may be able to sell his catch for a higher price capitalizing on the positive ecological image of the neighboring marine reserve (Charles, 2001).

and budget of this project, several stakeholders emphasized the importance of Oregon's coastal ecosystem services.

Some stakeholders thought it necessary and worthwhile to monetize these values to emphasize their importance, and so they do not receive a default zero-value in decision making processes. Others were concerned that any estimate would be conservative at best, and may even cause valued ecosystem goods and services to lose out in a direct economic cost-benefit analysis comparison with marketable goods and services. Fortunately, Oregon has adopted a strict protection stance on Oregon's territorial sea ecosystem services as outlined in Goal 19 of Oregon's Statewide Planning Goals and Guidelines, regardless of monetary valuation:

> *…all actions by local, state, and federal agencies that are likely to affect the ocean resources and uses of Oregon's territorial sea shall be developed and conducted to conserve marine resources and ecological functions for the purpose of providing long-term ecological, economic, and social values and benefits and to give higher priority to the protection of renewable marine resources—i.e., living marine organisms—than to the development of non-renewable ocean resources.*
>
> *DLCD, 2010*

Common approaches to estimating non-market values include hedonic pricing (see discussion on property values above), contingent valuation (i.e., asking people what they are willing to pay), travel cost models (i.e., examining people's time and money expenditures), and/or benefit transfer (i.e., borrowing estimates from other studies if primary data collection constraints apply and relevant data already exist). Current work regarding non-market ecosystem service values in Oregon is described below along with suggestions for further research.

Researchers at Oregon State University (OSU) recently completed Phase 1 of an analysis for ODFW to assess the nonmarket socioeconomic costs and benefits—in the form of ecosystem services—of marine reserves in Oregon. The Phase 1 report, titled, "*A Bioindicator-Based Method for Evaluating Marine Ecosystem Services*", will be included in the baseline socioeconomic monitoring plan developed by ODFW. The goal of Phase 1 was to derive candidate indicators of long-term ecological change related to the creation of the "pilot" marine reserves (i.e., at Redfish Rocks in Port Orford, Oregon, and at Otter Rock near Newport, Otter Rock, and Depoe Bay, Oregon), which serve as a starting point for development of a survey to assess trade-offs associated with the nonmarket socioeconomic costs benefits resulting from the creation of marine reserves in Oregon. These survey indicators integrate ecological models with the knowledge and preferences of stakeholders in order to allow the use of easily understandable indicators within survey scenarios (the economic component), while providing ecological linkages among these indicators and the assessment endpoints that determine values (the ecological component). Research methods included the use of community focus groups and the expert opinion of researchers at OSU and ODFW. The Phase 1 report presents detailed methods, results, and recommendations on the further development and implementation of indicator-based valuation models and strategies for long-term ecological and social monitoring of marine reserves in Oregon.[18]

Indirect uses often provide value beyond what can be estimated by market transaction (i.e. expenditure) data. For example, Pendleton (2005) examines estimates of the high non-market values provided by wildlife viewing in California, which represent a large part of the total value that people place on the opportunity to see marine and coastal wildlife. These values can be described as consumer surplus, which quantifies the net benefit to an individual from consuming a resource or engaging in an activity. It is measured by the difference between what the individual must pay and what he or she was willing to pay for every unit of the activity pursued. The methodologies mentioned in Pendleton (2005) may be useful to estimate such values in Oregon.

Another example of coastal indirect use values includes the transformation, detoxification, and sequestration of wastes. Modern secondary sewage treatment injects large amounts of synthetic organic and inorganic nutrients into aquatic systems, which can then, in moderation, be removed or sequestered through the uptake of plants, etc. One way to monetize this critical service would be to estimate the cost of having to mechanically perform this service ourselves. A few scientific studies have been done evaluating nutrient sources in the Alsea, Yaquina, and Tillamook Bay estuaries which could be used to inform such an analysis (see Colbert and McManus, 2003 and Sigleo et al., 2010).

[18] Information on this project provided by personal communication with Peter Freeman of Oregon State University, August 8th 2011.

Further non-market values include the option value, bequest value, and existence value. An example of the option value is the potential for wave energy development, as discussed in section 8.1. These values can be estimated by using contingent valuation or willingness-to-pay studies.

9. DISCUSSION

We believe the data collected and presented in this report offer a comprehensive profile of shoreside economies and their associated varying marine resource uses. By capturing and estimating the value of commercial landings revenues, charter revenues, recreational expenditures, and non-consumptive recreational expenditures made and realized on Oregon's coast, we have valued an important and sizeable portion of the coastal contribution to shoreside economies, please see Figure 1 again. Through these efforts we have indentified data gaps and learned several lessons, which we discuss in this section, as well as making suggestions for future research on Oregon's shoreside economy.

9.1. Lessons Learned

This section reflects on several methodological and process lessons learned in the hope of informing future iterations and/or applications of the approaches included here.

Infrastructure List:
Because there is not a central or comprehensive database of shoreside infrastructure, the next best available method was to compile one based primarily by web searches. However, the original infrastructure list yielded some results, revealed through the coastal business survey efforts, with incorrect information, outdated addresses, and some without a mail receptacle. During field work undertaken to increase business survey responses, staff noticed duplicates on the infrastructure list, and that many of the businesses on the list were not at the addresses noted in the database or appeared to be closed down.

Instead, a more effective method may be to cross reference a web-generated list with immediate personal phone calls to businesses to confirm current operation and location. Additionally, the local chamber of commerce in targeted regions may be best-suited to review a draft infrastructure list, or perhaps even supply a business list to begin with. Physically reviewing the list in the field is likely not the most time or cost effective method.

Coastal Business Survey
The question that asked participants to, "please estimate what percentage of your business' gross revenue for 2010 *came from* human activities related to the Oregon coast and/or marine resources" may be best split into two questions. Our intentions were to assess business owners' stated importance of coastal activities to their business. However, a question explicitly asking about the influence of the coast/marine resources in terms of their suppliers and their final consumers may be more useful information. Additionally, as we did ask businesses what percentage of their revenues were spent in coastal counties in Oregon, it may also be helpful to inquire more about their reliance and impact on the local economy.

In order to determine trends and changes in the shoreside economies which may potentially be correlated with management measures and other environmental changes, it would be best to develop quarterly or annual rapid economic assessment survey. Should future coastal business surveys be deployed, we would also suggest surveying additional business types that rely heavily on coastal tourism, such as restaurants/food and beverage and lodging establishments. This is discussed more in section 9.2.

Recreational Survey
Examining recreational expenditure data from Gentner and Steinback (2008), LaFranchi and Daugherty (2011), NOAA (2011), and The Research Group (2011) revealed the common practice of separating trip expenditures from expenditures made on equipment/durable goods. Our recreational survey, while providing insight to the total budget of recreational fishermen, did not do this and was therefore difficult to compare with these others. Should this or a similar survey be repeated in the future, we recommend redesigning the survey to make this distinction. Because our survey had originated as a secondary component in a separate project (and been stopped halfway through), attaining a representative sample size to allow state-wide extrapolations was not prioritized, which would have been preferable.

Commercial data:
Due to difficulties in compiling landings data and establishing non-disclosure agreements with neighboring states, Ecotrust (Steinback et al., 2010) was only able to obtain landings data for currently registered vessels and vessels registered in Oregon. This posed a challenge in cases where fishermen indicated they previously fished from a particular vessel that is no longer in commission, as landings from decommissioned boats could not be represented in this study. Also, many out-of-state vessels fish in Oregon waters but land their catch in their home state. By only using Oregon landings data, the value of out-of-state vessels was not represented in this study. This is particularly problematic in the port of Astoria where many Astoria-based vessels fish in Oregon waters and land their catch in Ilwaco, Washington. Since this study was only able to obtain Oregon landings data, landing estimates almost certainly under-represent the dollar value of fishing areas for Oregon-registered vessels. In the future, a complete and comprehensive history of landings data and, if possible, landings data from adjacent states or ports in close proximity to state borders will be obtained before project work begins.

Non consumptive data:
The coastal visitation and non-consumptive recreational findings from the Surfrider Foundation's (2010) study were plenty and significant, largely thanks to their extensive and detailed survey. However, we had three questions which could not be answered by the collected data. These were: 1) which expenditures can be associated with exclusively non-consumptive recreation; 2) what was the primary recreational activity for each respondent's trip to the coast; and 3) which respondents were, and thus which data were supplied by, coastal residents themselves. The ability to determine a primary activity or some kind of activity preference to tie to expenditure data would be useful information. So too would being able to filter (and compare) all results by coastal residents and non-residents. Should this survey be repeated again the future, these additions appear relatively simple to insert.

In summary:
This project presented many challenges which serve both as opportunities to improve this project and as a means to inform and improve similar efforts in the future. As stated in the introduction, we believe that this project has made a substantial contribution to better understating the importance of marine resources to shoreside economies, and can hopefully inform marine planning efforts and future research initiatives.

9.2. Data Gaps and Future Research

We have already suggested and addressed three areas of significance to the shoreside economy for which data is not readily available, these are: 1) attitudes and perceptions of wave energy and marine reserves; 2) coastal property values; and 3) ecosystem goods and services and non-market values. These data gaps were anticipated, and thus only minimally considered in this study; section 8 outlines proposed methodologies for future research in these areas. However, in the course of researching our core topics to be considered for this study, additional data gaps were revealed which may warrant future research.

First, more information could also be attained about Oregon's seafood processors and seafood retailers and how they impact coastal communities. For example, in Oregon in 2008, the commercial seafood industry that employed the most people was the retail sector (NOAA, 2011). It would be informative to know more about these seafood retail establishments, such as where they are located, typical products sold, their average size, employment, sales statistics, and associated local impacts.

Additionally, we were surprised to learn that seafood importers were responsible for just under half of total economic output of the commercial seafood industry in Oregon in 2008 (NOAA, 2011). It would be useful, to better understand how 'imports', foreign seafood and harvests from other states, affect the state's processing, wholesale and distribution, and retail sectors. An overall examination of Oregon's commercial seafood from harvest to consumption would be greatly beneficial to better understanding how Oregon's marine resources contribute not only to shoreside economies, but to the state as a whole.

As evidenced the Surfrider Foundation (LaFranchi and Daugherty, 2011) recreational trip expenditure data, a large amount of spending goes towards lodging and food combined. The coastal business survey conducted in this study did not target hotels, restaurants, or food stores, etc. Should the coastal business survey be repeated, we recommend it be expanded to include these types of businesses which attract large amounts of coastal spending by both residents and non-residents. Similarly, as a significant amount is spent on car/boat fuel by recreational

fishermen relative to other categories, fuel stations may also be considered as an area for future research on their contribution to shoreside economies.

Additional areas of value, income, and economic activity not considered in this study are non-resident non-consumptive recreational expenses, taxes generated by coastal economic activity, tribal uses, marine shipping and transport industries, marine construction, and offshore mineral extraction.

A dynamic model:
While the data and analyses presented in this report paint an informed picture of the shoreside economy, it is a relatively static portrayal. It is our hope that the data and methods presented in this report could inform a more comprehensive dynamic model of the shoreside economy, integrating and connecting the various shoreside sectors and enabling total impact estimates resulting from a direct change in one industry. For example, such a model could be used to address questions pertaining to the economic effects of marine reserve implementation or wave energy development on various sectors of the overall shoreside economy.

This study provides insight into the type of data necessary for a dynamic model; those like the ones supplied in this study, but which are constantly and consistently updated. However, the various data presented in this study span over a seven year period, 2004-2010, see Table 38; this is not optimal for the type of dynamic model suggested. Synchronizing collection efforts to a single year would be most advantageous to such a model. Commercial landings are counted annually by ODFW, and NOAA publishes annually adjusted data from their national marine recreational survey which occurs every five years. These datasets could feed directly into the model.

Interviews similar to those presented in this study, conducted at regular intervals, would provide specific and detailed profiles and spending patterns. The suggested 'rapid economic assessment' surveys could also feed into the model, representing coastal businesses and characterizing the shoreside infrastructure profile. Coastal visitation and non-consumptive recreational surveys like the efforts carried out by the Surfrider Foundation (LaFranchi and Daugherty, 2010) could be consistently repeated/adjusted to feed into the model as well. So too could any other data from the various, ongoing and upcoming non-market/ecosystem services studies for the Oregon coast. An initial form of this model may be drawn from the conceptual model, Figure 1. A dynamic model of the shoreside economy would be invaluable to the various stakeholders and decision makers.

10. CONCLUSION

The overarching goal of this project was to begin to estimate the value and economic contribution of marine resources to the shoreside economy of Oregon and its coastal communities. More specifically, the objectives were to examine, in detail, patterns of income, expenditures, and employment to marine related industries such as commercial fishing, charter fishing, and recreation and tourism. Fulfilling these objectives resulted in a literature review, coastal outreach and education, many stakeholder focus groups, primary data collection, analysis and evaluation of existing datasets, and updates and improvements to the decision support tool Oregon MarineMap. The resulting products and lessons learned from these efforts provide a substantial foundation for further research on Oregon's shoreside economies.

REFERENCES

Anderson, L. FISHCRED: Fishermen's Information Service for Housing, Confidential Release and Essential Distribution. FISHCRED on behalf of the Oregon Wave Energy Trust (OWET).

Charles, A.T. 2001. Sustainable Fishery Systems. Madden, MA: Blackwell Science.

Colbert, D. and J. McManus. 2003. "Nutrient Biogeochemistry in an Upwelling-Influenced Estuary of the Pacific Northwest (Tillamook Bay, Oregon, USA)." Estuaries and Coasts 26(5): 1205-1219.

Daily, G. 2007. Nature's Services: Societal Dependence on Natural Ecosystems. Washington, DC: Island Press.

Department of Land Conservation and Development (DLCD). 2010. Goal 19: Ocean Resources OAR 660-015-0010(4). Oregon's Statewide Planning Goals & Guidelines.

Gentner, B., Steinback, S. 2008. The Economic Contribution of Marine Angler Expenditures in the United States, 2006. U.S. Dep. Commerce, NOAA Tech. Memo. NMFSF/SPO-94. Available online at: http://www.st.nmfs.noaa.gov/st5/publication/marine_angler.html

Hunter D. 2009. Addressing Perceived Community Impacts of Wave Energy in Coastal Oregon Communities. In Science and Knowledge Informing Policy and People: The Human Dimensions of Wave Energy Generation in Oregon: Final Report to the Oregon Wave Energy Trust.

LaFranchi, C. and C. Daugherty. 2011. Non-consumptive Ocean Recreation in Oregon: Human uses, Economic Impacts & Spatial Data. Portland, OR: Surfrider Foundation, NaturalEquity, Ecotrust. Available online at: http://surfrider.org/images/uploads/publications/OregonNonconsumptiveStudy_comp-1.pdf

National Marine Fisheries Service (NMFS). 2011 A User's Guide to the National and Coastal State I/O Model. Available online at: http://www.st.nmfs.noaa.gov/documents/commercial_seafood_impacts_2007-2009.pdf

National Oceanic and Atmospheric Administration (NOAA). 2011. Fisheries Economics of the United States, 2009: Economics and sociocultural status and trends series. NOAA technical memorandum NMFS-F/SPO-118. Silver Spring, MD: U.S. Department of Commerce, NOAA, NMFS. Available online at http://www.st.nmfs.noaa.gov/st5/publication/fisheries_economics_2009.html.

Oregon Department of Fish and Wildlife (ODFW). 2011. Oregon Marine Reserves: Human Dimensions Monitoring & Research. Newport, OR: Oregon Department of Fish and Wildlife, Marine Resources Program.

Pendleton, L. 2005. Understanding the Potential Economic Value of Marine Wildlife Viewing and Whale Watching in California. California Marine Life Protection Act Initiative.

Scholz, A. J., C. Steinback and M. Mertens. 2006. Commercial Fishing Grounds and Their Relative Importance off the Central Coast of California. Report submitted to the California Marine Life Protection Act Initiative.

Scholz, A. J., C. Steinback, S. Kruse, M. Mertens and M. Weber. 2008. Commercial Fishing Grounds and Their Relative Importance off the North Central Coast of California. Report submitted to the California Marine Life Protection Act Initiative.

Sigleo, A.C., Frick, W.E., and L. Prieto. 2010. "Red Alder (Alnus rubra) Distribution Influences Nitrate Discharge to Coastal Estuaries: Comparison of Two Oregon Watersheds." Northwest Science 84(4):336-350.

Stefanovich M. 2009. Wave Energy and Public Opinion in Oregon: Summary of Results from The Oregon Energy Policy Survey, 2008. In Science and Knowledge Informing Policy and People: The Human Dimensions of Wave Energy Generation in Oregon: Final Report to the Oregon Wave Energy Trust.

Steinback, C., Kruse, S., Chen, C., Bonkoski, J., Hesselgrave, T., Lyman, N., Weiss, L., Scholz, A. and E. Backus. 2010. Supporting the Oregon Territorial Sea Plan Revision: Oregon Fishing Community Mapping Project. Submitted to The David & Lucile Packard Foundation, Oregon Department of Land Conservation and Development, Oregon Wave Energy Trust and Oregon Coastal Zone Management Association.

Stevenson J. 2009. Mapping the Political Landscape of Wave Energy Development in Oregon. In Science and Knowledge Informing Policy and People: The Human Dimensions of Wave Energy Generation in Oregon: Final Report to the Oregon Wave Energy Trust.

The Research Group. 2005. Nearshore Species Commercial Fishing Economic Analysis. Prepared for Oregon Department of Fish and Wildlife and Oregon Coastal Zone Management Association. The Research Group.

The Research Group. 2009. Oregon Marine Recreational Fisheries Economic Contributions in 2007 and 2008. Prepared for Oregon Department of Fish and Wildlife and Oregon Coastal Zone Management Association. The Research Group.

The Research Group. 2011. Economic Contribution Factors for the Oregon Fishing Community Mapping Project. Prepared for Ecotrust. The Research Group.

APPENDIX A: Shoreside Literature Review

Shoreside Economic Analysis and Model for the Oregon Territorial Sea Plan
Literature Review

Report to Oregon Department of Fish and Wildlife
2 November 2010

Authors: John Stevenson, Sarah Kruse, PhD, Taylor Hesselgrave

1. Introduction

As stated in the Request for Proposals, the overarching question this project will address is: What is the value and economic contribution of marine resources to the coastal economy of Oregon and its coastal communities?

A core component of this project is to provide a comprehensive review of literature and inventory of existing analyses and datasets so that we can begin to evaluate what information could be used to help answer the questions in this study. It should be noted that this review presents the analyses and datasets 'as is', meaning we report the findings as they are available and do not limit our efforts to only identifying comparable or relevant datasets as may be expected in a traditional or peer reviewed literature reviews. Definitions for referenced analytical methods and terms are also provided in the appendix at the end of this document. With that in mind, our search included (a) direct contact with state/regional/federal government agencies; (b) direct contact with academic and research institutions; and (c) targeted searches of public and commercial websites and databases.

The general objectives of this task were to:

- Identify studies and efforts to conduct socioeconomic analyses related to marine resources, coastal communities and/or shoreside impacts associated with changes in fisheries/coastal management;
- Annotate key findings and include a full list of citations and relevant data sets, including methods, models, and/or data sets to which project partners currently have access and/or ownership that relate specifically to the overarching goal of this project; and
- Leverage existing data sets, methods and protocols in the design and execution of this project

In addition, we sought to:

- Identify and summarize areas of scientific consensus (or lack thereof);
- Identify existing data for use in this study;
- Identify data gaps; and
- Identify approaches and methods for filling these data gaps.

More detail on these additional goals is provided in the form of a revised, prioritized work plan (submitted as a separate document.

The remainder of this document is organized by focal area—each section presents a basic summary of existing literature on the topic, data gaps and proposed methods/approaches for use in this project.

2. Consumptive Activities
For the purpose of this project, consumptive activities are defined as three fishing sectors off the Oregon coast including: commercial fishing, charter (commercial passenger) fishing, and recreational, or sport, fishing. Sector specific discussions are below.

2.1. Commercial Fishing
Value estimates for Oregon's commercial fishing sector are frequently reported by The Research Group, a consultant for the Oregon Department of Fish and Wildlife. The most recent of these studies estimated that the commercial sector generated $214 million in personal income for 2008 and up to $399 million when accounting for income from distant water fleets—i.e., fisheries Oregonians participate in but do not land in state, such as Alaskan

pollock or halibut (The Research Group 2009a). These figures accounted for a variety of ports, target fisheries and gear types, the greatest portion of which was from distant water fleets (46.3%), followed by groundfish species (12.7%) and Dungeness crab (12.5%) (The Research Group 2009a). Sardines and pink shrimp (9.3% and 6.5%) were the next most valuable species, followed by Pacific whiting (5.3%) and Albacore tuna (4.4%) (The Research Group 2009a). NOAA's National Marine Fishery Service also provides economic estimates for Oregon's commercial fisheries. In *Fishery Economics of the United States 2008: Status and Trends Series*, Oregon's commercial fishing industry is reported to have contributed $960 million in regional sales, $517 million in personal income, and 19,000 jobs (NMFS 2010).

Another valuable data source comes directly from the Oregon Department of Fish and Wildlife (ODFW), which tracks landings data (i.e., estimated pounds and ex-vessel value) by vessel. This information also includes data on landing port and species targeted. Currently Ecotrust has possession of ex-vessel landings data from ODFW at the individual level for 2004–08. While these data cannot be reported out at the individual level, they can be used to provide aggregate summaries of permit holders and landings by both fishery and landing port. ODFW is also in the process of interviewing commercial (as well as charter and recreational) fishermen to assess fishery impacts associated with potential marine reserve and marine protected area (MPA) designations along the Oregon coast. This information could be available for this analysis if the interviews are completed in time (Murphy M., personal communications August 25, 2010).

Ecotrust is also in the process of collecting data to compile a comprehensive map of commercial fishing use patterns along the Oregon coast using the expert knowledge of fishermen. To date, within the Oregon commercial fishing sector, Ecotrust has completed interviews in the ports of Depoe Bay, Florence, Newport, Winchester Bay, Coos Bay/Charleston, Port Orford, Gold Beach, and Brookings and a total of 185 commercial fishermen interviewed to date (as of July 31, 2010).

Table A.1 reports the number of fishermen who have been interviewed for each fishery in each port. It should be noted that Ecotrust is still conducting interviews with commercial fishermen in the ports of Astoria and Garibaldi/Tillamook. These interviews will complete a comprehensive state-wide survey of Oregon's commercial fleet. It is anticipated that interviews in these ports will be completed by the end of August 2010.

Table A.1. Number of commercial fishermen interviewed in each port or port complex

Port	Number interviewed
Brookings	24
Coos Bay/Charleston/Winchester Bay	70
Depoe Bay	6
Florence	7
Gold Beach	8
Newport	49
Port Orford	21
TOTAL	**185**

The potential to combine ODFW data and Ecotrust data allow ex-vessel landings data to be reported and viewed in a spatially explicit format—helping us better understand how specific areas in the ocean support specific commercial fisheries.

It should be noted that while the sources described above provide a solid dataset for commercial fisheries values, they do not include information on indirect and induced impacts associated with commercial fisheries landings. Traditional input-output multipliers focus on backward linkages – or the flow of goods and services between a business and its suppliers - associated with a specific industry. Oregon commercial fisheries not only create economic value through direct output, jobs, wages and taxes, but also generate additional economic value because of relationships with directly and indirectly related industries such as fuel supplies, seafood transporters, etc. in which additional output, jobs, wages and taxes occur.

We focus our efforts here on examining commercial fishery multipliers found in existing studies to estimate a range economic output associated directly with the commercial fishing industry. The majority of existing studies and models reviewed focus on state level multipliers.

Seung and Waters (2006) published 'A review of regional economic models for fisheries management in the US.' In addition to providing a general overview of the characteristics of regional economic models, they also provide reviews of both economic impact studies for fisheries and fishery input-output studies.

Other sources are available for estimating these multipliers, most notably from the Fisheries Economic Assessment Model (FEAM). As described by Seung and Waters (2006), FEAM is a model to assess regional impacts – or impacts to associated industries – resulting from changes in recreational and commercial fishing sectors and, unlike IMPLAN models, uses disaggregated data so that assessments can be made by vessel, gear type, and species (Seung and Waters 2006). The disadvantage of FEAM is that is supply oriented, requiring it to rely on IMPLAN multipliers[19], to account for final demand of processed seafood (ibid). Currently, FEAM relies on 2008 fisheries landings data, and 2003 IMPLAN data but is under contract to update with 2010 and 2005 data respectively (Davis, S., personal communication July 27, 2010). Lastly, ODFW has also contracted an economic assessment to use current landings data and logbook analysis to identify and predict potential impacts on income, employment, and distributional effects among community segments by measuring the impacts of a closure on local fishermen and related businesses to local communities. This analysis is expected to be completed by June, 2011.

A recent study by Hackett et al. (2009) focused on creating a modified input-output model for California commercial fisheries. Multipliers are available by region and by operational configuration. Given that California commercial fisheries, in many cases, are similar to those in Oregon, the multipliers derived in this study are likely relevant to this analysis. Details on the model development and gear configurations considered can be found in the report.

Other potentially relevant studies come from outside Oregon and include a range of multipliers from 1.45–1.92. Hodges et al. (2000) estimated an output multiplier of 1.58 for commercial fishing in Florida. Another 2001 study entitled "The Economic Contribution of the Sport Fishing, Commercial Fishing and Seafood Industries to New York State" estimated an output multiplier of 1.92 for New York commercial fisheries (TECHLAW 2001). Finally, Crosson (2009) conducted an analysis of ocean going commercial fisherman in North Carolina and estimated an output multiplier of 1.45 for these fisheries. While the fisheries in these three states almost certainly vary from commercial fisheries in Oregon, these multipliers can provide a rough range of estimates for total economic output (all else being equal).

Two studies also were found that include multiplier estimates that account for both backward and forward linkages, that is, the impacts associated not only with the commercial fishery, but also with processing, distribution and retail/food service. Kirkely et al. (2005), using a customized IMPLAN model, estimated a multiplier of 2.24 for Virginia commercial fishery harvesters. This multiplier accounts for not only commercial harvesting, but also processing, wholesale, grocer and restaurants impacts in the state of Virginia.

Southwick and Associates (2006), leveraging the Kirkely et al. study, conducted a study to estimate the relative contributions of US recreational and commercial fisheries to the US economy. While there are substantial limitations to the study based on the assumptions made, the one aspect of this study that makes it appealing in the context of this research effort is that the multipliers estimate backward and forward linkages at both the state and national level (Southwick 2006).

Combining these estimates with the ex-vessel values estimates for Oregon commercial fishery harvests, we could estimate the total economic output associated with the key commercial fisheries being considered in this analysis.

2.2. Charter Fishing

Similar to the commercial sector, estimates for the value of charter and other recreational fishing on the Oregon coast are also reported by The Research Group. The most recent study estimated the total economic contribution

[19] IMPLAN (IMpact analysis for PLANning) Pro software, is a widely-used economic input-output model developed by The Minnesota IMPLAN Group, Inc. Input-output analysis depicts the inter-industry relations of an economy (i.e., the linkages among businesses, households, and the government in terms of sales, spending, and employment). It is based on the premise that when new money enters an economy, a portion of it is re-spent, thereby creating additional economic impacts. For more information on IMPLAN, please see http://www.implan.com.

of recreational fishing, including chartered trips, at $33.5 million and $29.8 million in 2007 and 2008, respectively (The Research Group 2009b). Of these, Salmon and Steelhead were the most valuable recreational fisheries in 2008, contributing nearly 45% of total economic value. A challenge with these figures, however, is that they do not estimate the specific impact of charter fishing in Oregon. Another study, by Dean Runyan Associates (2009), estimates paid expenses for charter/guide services for salt water fishing in Oregon at nearly $8.1 million, but remaining estimates for related travel cost expenditures are not differentiated from those of other private recreational fishing trips (Dean Runyan Associates 2009). To address these, we must rely on additional datasets.

Ecotrust obtained from the Oregon Marine Board a list of all registered charter vessels in Oregon for 2009. Although this dataset includes all vessels (freshwater and marine), it still provides baseline information on the number and location of registered charter vessels.

Ecotrust also obtained ODFW recreational fishing data, which provides data for Weeks 25–38 (roughly mid-June to mid-September) when most recreational fishing effort and sampling occurs. These data are summarized annually from 2001–09 and include information on the number of anglers and boat trips, including charter boat trips, recorded for each fishery in each port. It should be noted that for one of our focus ports, Port Orford, sampling only occurred in 2001 and 2003 and thus the remaining years of data are extrapolated based on the average relationships of Port Orford data to the other ports in the sampled years.

Another source of information on the charter sector comes from another Ecotrust data collection effort. Along with project partners, Ecotrust is currently processing data to compile a comprehensive map of charter fishing use patterns along the Oregon coast using the expert knowledge of fishermen. In addition to collecting information on fishing grounds, the study is also collecting non-spatial information on the charter operations, including estimates of earnings and costs. The study goal is to achieve 100% representation for the charter sector that fishes in the Territorial Sea. To date, over 40 charter operator interviews have been completed, which represents all charter operations in each port community listed (see Table A.2), with the exception of one refusal from Depoe Bay and another from Gold Beach. Interviews are still being conducted in Astoria and Garibaldi/Tillamook. The fisheries of interest in the charter sector are rockfish (includes lingcod), salmon, Pacific halibut, Albacore tuna and Dungeness crab.

Table A.2. Number of charter operators interviewed in each port

Port	Number Interviewed
Brookings	2
Bandon	2
Charleston	2
Depoe Bay	15
Gold Beach	3
Newport	11
Winchester Bay	5
TOTAL	**40**

2.3. Recreational Fishing

Recreational fishing is a popular activity on the Oregon coast, with fishing commonly occurring from shore, private vessels and kayaks (charter operations are discussed in the previous section). Some dive fishing also occurs, primarily for shallow water species including nearshore rockfish.

Our literature review yielded several sources of information on recreational fishing in Oregon. This includes The Research Group's (2009b) study on recreational fishing discussed in the charter section as well as the 2009 report by Dean Runyan Associates. In the latter study, recreational saltwater fishing was estimated at over $69 million on the Oregon coast (Dean Runyan Associates 2009). Similar to The Research Group (2009b) this figure accounts for expenses paid for charter services, but does not include expenditures made for catching marine species in freshwater (e.g. fishing salmon in a river) making it difficult to compare the two studies directly. In short, we did not find any existing studies specifically estimating the value of non-charter recreational fishing on the Oregon coast, and have sought other data sources to address this gap.

Other data sources include ODFW, which collects annual data on the number and type of permits (e.g., out of state, resident, yearly, shellfish, one-day, etc) purchased and the contact information for those individuals. Ecotrust obtained from the Oregon Marine Board a limited database of registered private vessel owners who have indicated they would be willing to receive mailings. This database includes the boat type, length, and contact information for registrants. The Oregon Marine Board also has summary statistics available on boat registration available on their website. Unfortunately, these data include both freshwater and saltwater permits holders and, furthermore, we are not able to estimate what percentage of total permit holders those willing to receive mailings represent. The ODFW recreational landings data, which was previously described in the external sources of data for the charter sector may also be helpful in this analysis.

In addition, Ecotrust currently is conducting a primary data collection effort, similar to those described for commercial and charter fishing, for the recreational fishing community. Within the recreational sector, Ecotrust has networked with port communities to interview key recreational fishermen within sub-sectors: 1) motorized powered private vessel ("sport boats"); 2) kayak fishing; and 3) dive. In addition to these in-person interviews, Ecotrust has launched an online tool (http://oregonfishing.ecotrust.org) designed to collect data from recreational fishermen across the entire state of Oregon. This data collection method was added to the project in order reach out the large population of recreational fishermen who may not be able to conduct in-person interviews in port towns.

Within the recreational sector, the fisheries of interest are rockfish, Dungeness crab, Pacific halibut, salmon, Albacore tuna, flatfish, shrimp/prawn, and abalone. To date, Ecotrust has interviewed 126 recreational fishermen through in-person and online surveys (see Table A.3).

Table A.3. Number of recreational fishermen interviewed in each port or online

Port	Number Interviewed
Bandon/Charleston/Winchester Bay	40
Depoe Bay	5
Florence	8
Newport	11
Port Orford/Gold Beach/Brookings	11
Online	51
TOTAL	**126**

Again, as mentioned for the other fishing sectors, estimates of participation and the value associated with that participation only account for one component of the total value of recreational fishing. The Money Generation Model 2 (MGM2) was developed at Michigan State University (by Daniel Stynes and Dennis Propst) as an updated version of the original MGM developed by the National Park Service (National Park Service 2010). Functionally, MGM2 is a Microsoft Excel based model used to assess the impact of visitor spending on the surrounding economic region; relying primarily on visitor use and disaggregated expenditure data (Rosenburger R., personal communications July 23, 2010). This model can potentially be used to generate estimates for total economic impacts for recreational fishing activities, assuming participation and expenditure data are available.

2.4. Data Gaps

Information on the commercial fishing sector is relatively plentiful, both in our understanding of primary, or direct, values for ex-vessel landings, but also in estimates of methods for estimating total economic impact. One challenge with The Research Group study (2009a) is its omission of the specific multipliers used to estimate indirect and induced impacts, which make it difficult to compare to multipliers from other studies that are available and discussed in this section. The greatest information gaps for this section lie with the charter and recreational fishing sectors. Again, estimates of total value are provided from two different studies, but neither provides the sector specific estimates desired, nor states the multiplier values that were used to estimate total value.

3. Non-Consumptive Recreation

The literature search on non-consumptive recreation in Oregon yielded several sources that provide a number of relevant results, but these studies have varying scopes and methods making it challenging to piece together a comprehensive understanding of these activities. Noting that, we focused the review for this section on three key areas: 1) key types of activities; 2) the location of key activities; and 3) the economic value of these activities.

3.1. Key Types of Non-Consumptive Activities

A comprehensive list of non-consumptive recreational activities can be found in Table A.4.

Table A.4. Oregon coast non-consumptive activity categories

Leeworthy (2001) *20 activities*	**Surfrider (forthcoming)** *24 activities*	**Oregon Parks and Recreation Department (2003)** *24 activities*	**Shelby and Tokarczky (2002)** *34 activities*
- Beaches	- Beach going	- Day hiking	- Relaxing
- Waterside besides beach	- Biking or hiking	- Horseback riding	- Walking
- Swimming	- Beachcombing	- Backpacking	- Stationary relaxing
- Snorkeling	- Free diving/ snorkeling	- Four wheel driving	- Scenic enjoyment
- Scuba diving	- Hang gliding/ parasailing	- ATV Riding	- Exercising dog
- Surfing	- Kayaking	- Motorcycling	- Beachcombing
- Wind surfing	- Kite boarding	- Dune buggy	- Tide pooling
- Saltwater fishing	- Photography	- Snow-play	- Kite flying
- Motorboating	- Power boating	- Power boating	- Exercise
- Sailing	- Sail boating	- Waterskiing	- Playing in sand
- Personal watercraft use	- Scenic enjoyment	- Non-motorized boating	- Camping
- Canoeing	- Scuba diving	- Sailing	- Surfing
- Kayaking	- Skim boarding	- Windsurfing	- Bogie boarding
- Rowing	- Storm watching	- Swimming in outdoor pool	- Swimming
- Water-skiing	- Surfing	- Beach activities	- ATV
- Bird watching	- Surfing (tow-in)	- Nature/ wildlife viewing	- Boogie boarding
- Viewing wildlife	- Swimming	- Outdoor photography	- Fishing
- Photography	- Tide pooling	- RV camping	- Wind surfing
- Hunting waterfowl	- Off-road driving on beach	- Car camping	- Family
- Any coastal activity	- Personal watercraft	- Boat camping	- Crabbing
	- Bird/other watching (shore)	- Horseback camping	- Biking
	- Whale/other watching (boat)	- Pleasure driving	- Clamming
	- Windsurfing	- Picnicking	- Photography
	- Other	- Train/bus touring	- Birding
			- Skim boarding
			- Paragliding
			- Hang gliding
			- Jet skiing
			- Kite boarding
			- Horseback riding
			- Fireworks
			- Ranger-led programs
			- Fires
			- Visitor exhibits
			- Picnicking

The first list is taken from Leeworthy (2001) and draws on the coastal module for the 2000 National Survey on Recreation in the Environment survey, which was administered to over 27,000 household nationwide. Of the 19 activities listed, two are consumptive in nature - saltwater fishing and hunting waterfowl – while another, windsurfing, had no responses. Similarly, a current study by the Surfrider Foundation lists 24 non-consumptive activities. In a study for the Oregon Parks (OPRD) and Recreation Department, Shelby and Tokarczky (2002) identify 34 activities that take place on state owned beaches. More recent participation data is available from the Oregon Outdoor Recreation Survey, which lists 24 non-consumptive activities from the Oregon coast (OPRD 2007).

Both Leeworthy (2001) and Shelby and Tokarczky (2002) provide participation for each activity; the Surfrider study is forthcoming.

3.2. Location of Activities

Overall, information on the location of these activities is inconsistent. More information appears to exist for whale watching, wildlife viewing, beach use and recreational boating than for other non-consumptive activities. The Oregon Parks and Recreation Department indicates that shore-based whale watching occurs along the entire Oregon coast in 26 locations through their "Whale Watching Spoken Here" program (OPRD, 2009). Charter whale watching trips are more concentrated along the central coast with O'Connor et al. (2010) indicating that 95% of all trips originate from either Newport or Depoe Bay (O'Connor et al. 2010).

In a study of Oregon wildlife viewing by Dean Runyan Associates, the North Coast had the greatest frequency of trips (797,000 per year) followed by the Central Coast (632,000 per year) and the South Coast (237,000 per year). Similar trends were found for beach use in the studies for the Oregon Parks and Recreation Department. Their data suggest that beach use was greatest in the North Coast between Astoria and Seaside (2371–1281 people per day), followed by the North/Central coast between Newport and Lincoln City (1998–996 people per day) (Shelby and Tokarczyk 2002).

In a study of recreational boating use of Oregon's port facilities, Chang and Jackson (2002) found that the South Coast received the most trips per year, particularly in Brookings (108,000 trips per year) and the Port of Umpqua (67,866 trips per year). Garibaldi (46,078 trips per year) and Newport (42,179 trips per year) were the next most frequently visited ports, followed by Coos Bay (28,781 trips per year), Siuslaw (19,797 trips per year) and Astoria (19,017 trips per year). Overall, recreational boating occurs most frequently in the South Coast.

That said, there are still numerous other activities for which no data appear to be readily available. Furthermore, for the four activities describe above, with the exception of whale watching, the relevant studies are at least eight years old.

In the last year, Oregon Sea Grant has conducted a survey of non-consumptive participants to characterize socio-cultural profiles of Oregon coastal users, but as of this writing findings from that study are not available (Eardley, C., personal communication August 19, 2010).

Most recently, the Surfrider Foundation in partnership with Natural Equity and Ecotrust have begun collecting information on recreational uses on Oregon's coast (see Table A.4). The study will provide spatial data on these activities from an opt-in internet based survey, as well as, travel cost expenditure data from a standing panel provided by Knowledge Networks. It is anticipated that this recreational study will be completed by November 1, 2010 and preliminary results can be included our final report.

It is also worth noting that the Department of Energy has recently released a draft paper aimed at identifying and providing methods for assessing impacts to recreation as a result of new hydrokinetic projects. This paper offers seven categorical impacts including access restrictions; changes in aesthetics; changes in wave/hydraulics; wreckage and salvage impacts; displacement to other areas; effects on fish/wildlife recreation; and cumulative impacts (Hydrokinetics and Recreation Work Group 2010).

3.3. Value of Activities

Information on the value of these activities is the least comprehensive of all information found on non-consumptive recreation. Chang and Jackson (2003) provide a range of estimates based on their study of expenditures for recreational boating on the Oregon coast and inland water ways. Expenditures for day trips and overnight trips were estimated at $54.20–$155.14, and $459.14–$557.41, respectively. The total number of trip days was estimated at 588,000 for 2002 (Chang and Jackson 2003). It should be noted here that these figures include boating trips for the purpose of fishing so are not a perfect assessment of non-consumptive boating.

For wildlife viewing, the United Nations Environment Program estimates that wildlife viewing generates $32 billion in direct expenditures (Trapper 2006). Though the timeframe is not stated, it is assumed that this estimate is for annual expenditures. In Oregon, total generated expenditures on the coast were estimated at nearly $160 million according to Dean Runyan Associates (2009), while per trip expenditures for the entire state of Oregon were

estimated at $32 per day (U.S. Fish and Wild Service 2006). For whale watching alone, O'Connor et al. (2009) reported that more than 375,000 tourists participated in whale watching on the Oregon coast in 2008, resulting in nearly $1.6 million in direct expenditures and an additional $28.2 million in indirect expenditures. This was more than a two-fold increase in direct expenditures from ten years earlier (O'Connor et al. 2009).

Loomis (2005) also reviews averages for consumer surplus estimates per person per day for a number of activities in Oregon and Washington, but these are not specific to the coastal region of either state. These include swimming ($6.06); mountain biking and hiking ($49.68 and $23.98); power boating ($12.48); off-road driving ($40.37); wildlife viewing ($35.00); camping ($92.72); and picnicking ($34.74). Finally, Leeworthy (2001) provided participation estimates for a number of the above activities and accounted for in-state and out-state participation.

As mentioned previously in the recreational fishing section, the Money Generation Model 2 (MGM2) could potentially be used to generate estimates for total economic impacts for non-consumptive activities that have participation and expenditure data.

3.4. Data Gaps

There a number of data sources for recreational activities on the Oregon coast, but to date, none provide a comprehensive account of participation and economic impact across the range of activities. In part, this is a result of available data sources not disaggregating consumptive from non-consumptive information.

More broadly, data gaps are a result of studies that focus on a particular activity and region or address participation rates but not expenditures. For example, Shelby and Tokarczyk (2002) provide estimates for a number of recreational activities on the coast, but only if they take place on state property beaches. More specially, this review could not identify value estimates for 11 out of the 32 activities identified, leaving a significant gap in our understanding of non-consumptive recreation values for the Oregon coast.

4. Shoreside Infrastructure

In this study, we focus on shoreside infrastructure directly related to commercial fishing and consumptive and non-consumptive recreational activities on the coast (as requested by the RFP). More specifically, we focus on 1) types infrastructure; 2) location of this infrastructure; and, when possible, 3) the estimated value of this infrastructure.

4.1. Existing Literature

Several existing studies provide information on the Oregon's shoreside infrastructure. These include *A New Strategic Business Plan for Oregon's Statewide Port System* (Brinckerhoff, 2010), which provides a qualitative review of Oregon's port facilities and infrastructure supporting cargo shipping, commercial fishing, and recreation, but does not offer specific counts of existing shoreside infrastructure or estimates of its economic value.

The Army Corps of Engineers' survey of port dock facilities in a 2003 report titled, *Ports on the Oregon Coast* details 79 facilities from Charleston; Coos Bay; Isthmus Slough; Siuslaw River; South Slough; Umpqua River; Upper Coos Bay; and Yaquina Bay; yet, remaining ports on the Oregon Coast are not available in this report nor are estimates of the economic value of these facilities (USACE, 2001).

Navigation and Other Activities on Oregon Coastal and Columbia River Waterways and Harbors in 2001 provides a more complete listing of shipping terminals, fish processing, and moorage facilities, as well as, estimates of value. This study reports the total assessed property value of all Oregon's Coastal and Columbia River ports at over $22 billion, when combining real and personal property, manufacturing structure, and public utilities.[20]

The same study estimates personal income generated directly from ports in 1996 (including those on the Columbia River except Portland) at a total of $293.6 million with $93.4 million from shipping and $186.7 million for fishing (OCZMA, 2002). Associated and related income generated from ports is estimated at $860 million and $181 million, respectively, though it is not specified what specific industries constitute these values (OCZMA, 2002). More recently, *A Demographic and Economic Description of the Oregon Coast: 2006 Update* estimates the commercial fishing industry alone to have generated $294 million in personal income across the state from harvesting and processing seafood in 2003 (Research Group, 2006). Similarly, *Economic Impacts of Recreational Activities at*

[20] "Assessed values shown are not adjusted for nonprofit housing, State fish and wildlife, or urban renewal excess value. Assessed values shown do not include $23.3 million of unallocated utilities."

Oregon Coastal and River ports, identifies over 4,100 recreational marina slips and 40 launch ramps in 18 coastal and river ports. This study does not assess the direct value of these facilities, but does estimate the total economic impact of visitor's port trip spending (boating and non-boating) at $109 million in sales and $42 million in personal income generated in 2002 (Chang and Jackson, 2003).

While not directly relevant to the focus of this study, the *Wave Energy Infrastructure Assessment in Oregon* study (Lavarakas and Smith, 2009) commissioned by the Oregon Wave Energy Trust to identify Oregon's capacity to manufacture, deploy, and maintain wave energy conversion devices off its coast, may be broadly relevant in the context of the Oregon Territorial Sea Plan.

In addition to the studies cited above, those listed below may provide additional information on shoreside infrastructure:

- *Oregon Property Tax Statistics, Supplement, Fiscal Year 2009-2010, Oregon Department of Revenue*. Provides tax statistics by governmental district including assessed property value by port.
- National Ocean Economics Program Coastal Economy Data (1990-2008). Includes all establishment, employment, wages, and/or GDP for coastal states and industries reported by the Bureau of Labor Statistics. Available at http://www.oceaneconomics.org/ Market/coastal/coastalEcon.asp.

4.2. Data Gaps

As mentioned previously, the primary question this study attempts to answer with respect to shoreside infrastructure is: What and where are the commercial fishing and recreational (consumptive and non-consumptive) infrastructure?

A major shortcoming in the studies identified above is the time elapsed since they were first published. For example, the OCZMA (2002) study relies on data from 1996 to estimate personal income generated directly from ports, which may not be an accurate measure of current values. It also remains uncertain which activities are coded as *direct, indirect, and induced* sources of port income, making it difficult to combine results across various studies or understand if other literature will complement or duplicate these efforts.

Lastly, an added challenge with these studies is the applicability of respective study scopes to understanding Oregon's shoreside infrastructure directly related to commercial fishing and recreation associated with the Oregon coast. Also problematic, neither study includes Depoe Bay, a focus port for this study, in their estimated values and it is unclear if Chang and Jackson 2003 include Salmon Harbor (Winchester Bay) in their estimates of the Port of Umpqua.

Overall, a number of studies provide varying high-level, aggregate estimates on the number of facilities and infrastructure counts for Oregon's ports. Only OCZMA (2002) provides an estimated value of these port infrastructures, which it places at over $22 billion in assessed property value and $293.6 million in generated personal income for 1996. The OCZMA study also provides port level estimates. Chang and Jackson 2003 assess the recreational value of 18 Oregon ports at $42 million in generated income in 2002. Neither of these studies provided sufficient detail; however, to answer the specific question being asked by this study.

Missing from these studies are updated estimates of these facilities to reflect changes over the last 7−14 years, respectively, as well as, assessments specific to Oregon's coastal ports, when looking at coast-wide values. Specific to the focus ports for this study, the lack of data on Depoe Bay is significant, as is the possible omission of Winchester Bay in Chang and Jackson (2003).

5. Non-Market Values

As Pendleton et al. (2007) point out, non-market literature is becoming increasingly important to improving ocean and coastal management decisions, but there remain many topical and geographical gaps in the current body of literature. More specially, they found that non-market literature has declined overall in recent years and has focused primarily on beach and recreational fishing valuation (Pendleton et al. 2007). The literature is also geographically skewed, with Oregon and Washington being noted as some of the least studied coastal states for all topic areas (ibid). Our literature review on these topics reaffirms this conclusion.

'Non-market' is a general phrase covering an almost inexhaustible list of goods for which markets do not exist. For the purposes of this study, we focus on three categories that broadly cover key focus areas request in the RFP: (a) view sheds; (b) marine protected areas; and (c) beach access. These areas were chosen because they provide an opportunity to contextualize the focus questions from the RFP[21], which are generally too narrow given the limited nature of coastal and ocean non-market literature, but still afford a topical understanding even if they do not apply directly to the Pacific Northwest.

5.1. View Sheds

The hedonic pricing method, a common method for assessing the value of view sheds (or other characteristics) to property values, is derived from the characteristics theory of value (Lancaster 1966, Griliches 1971, and Rosen 1974) and uses market prices to estimate the marginal value associated with a particular characteristic (e.g., environmental services or quality) of a good. While there are limitations to the model (see Hanley and Spash 1993), hedonic pricing in the context of the TSP could be useful to assess whether property owners place additional value on proximity to certain environmental characteristics or ecosystem services (e.g. beach access, ocean view, marine reserves) or place a negative value on changes to these characteristics (e.g., wave energy park, etc.).

Benson et al. (2000) found that 1993 property values in Bellingham, Washington with views of the ocean were on average 25% higher than those without (Benson et al. 2000), but this study focused simply on currently value and did not investigate how values might be influenced by changes in view (e.g., the construction of offshore infrastructure).

Though physically much larger, there is literature about the impact of wind energy farms on view sheds, but these studies present somewhat conflicting results. Sterzinger et al. (2003) compared property values of 10 communities with views of wind farms (non-coastal) to nearby communities without views of these facilities. In all but two cases, property adjacent to wind farms increased in value faster than reference communities, leading the authors to reject a hypothesis that views of wind farms decrease property values.

In contrast, Haughton et al. (2003) and Krueger (2006) both estimate willingness to pay to move proposed wind farms further offshore of Massachusetts and Delaware, respectively. Haughton et al. (2003) found that homeowners in the Cape Cod area were willing to pay $245 per household to 'keep the wind farm away', but balanced with tourists willingness to pay ($14.26) for developing a wind farm, the total net effect was a willingness to pay nearly $2.3 million to not have the wind farm (Haughton et al 2003). In a study of Delaware's residents, Krueger (2006) estimated ocean residents' willingness to pay at a maximum of $91 per month for three years to move a hypothetical wind farm 20 miles offshore and out of sight (Krueger 2006).

An additional dataset that may be useful is:

- *Oregon Property Tax Statistics, Supplement, Fiscal Year 2009-2010, Oregon Department of Revenue*, which provides tax statistics by governmental district including assessed property value by port.

5.2. View Shed Data Gaps

As applies to the Oregon's ocean view sheds, the literature indicates that private properties in Washington with views of the ocean have a greater value than those without, yet, that conclusion is based on data more than 15 years old, limiting its usefulness for benefit transfer. Similarly, the studies from New England wind farm developments using contingent valuation suggest a positive willingness to pay to move renewable energy farms further offshore, but this seems at odds with the revealed preference study offered by Sterzinger et al. (2003). There is also the challenge of transferring the values from the contingent valuation studies for wind energy developments to wave energy development in Oregon because of the differences in height and visual impact of the technologies. Overall, the literature may help assess the value of the Oregon coast view shed by borrowing from Benson et al. 2000, but otherwise provides few, if any, opportunities for benefit transfer of existing values to assess

[21] 1) What and where are key visual and aesthetic scenic resources (this includes wildlife viewing and bird watching). What is the willingness to pay (WTP) to conserve, protect, and/or enhance, these resources? 2) What motivates people to move to the coast? What is their willingness to pay to live in a coastal community? How do and would different marine ecosystem services and scenarios, such as increase in alternative ocean energy facilities, or marine reserves, factor into their location decision? 3) Do real estate values increase or decrease in relation to any of these key ecosystem services? If so where, and by how much?

either the additional value associated with properties having ocean views or the impact of wave energy facilities on these values.

5.3. Marine Protected Areas

Generally, a Marine Protected Area or MPA is a 'special [ocean] area established for conservation but also allowing for recreation, and sometimes commercial use, much like national parks' (NOAA 2010). A marine reserve is also an MPA but generally more restrictive. Oregon defines a marine reserve as 'an area closed to fishing and other extractive activities and managed to conserve marine habitats and biodiversity and to provide opportunities for scientific research (Oregon Ocean Information 2010). Several studies provide estimates of non-market values of MPAs. Some of these focused on the Florida Keys, most notably Bhat (2003), who estimated the value of designating a marine reserve in the Florida Keys National Marine Sanctuary. Using travel cost and contingent valuation methods, Bhat found that the new marine reserve increased the per trip (i.e., snorkeling, SCUBA, and glass bottom boat trips) value to coral reefs by $320 per person (a 69% increase) and 43–80% in the number of visitor trips (Bhat, M.G. 2003).

In Southern California, Hall et al. (2002) used contingent valuation to estimate a willingness to pay of $6 per family visit to stop illegal collecting in marine protected area (MPA) intertidal zones (Hall et al. 2002). In *Socioeconomic Impact Analysis of Marine Reserve Alternatives for the Channel Islands National Marine Sanctuary*, Leeworthy et al. (2005) estimated the value of the proposed marine reserve network in the Channel Island based on non-use and non-consumptive recreational values and loss of consumptive value, which is based entirely on recreational fishing and assumes no negative impacts to commercial fishing. Here, non-use willingness to pay per household per year was estimated at $3, $5, and $10, which they derived from a review of non-use value estimates in Desvouges et al (1992) and Carson et al. (2003), while non-consumptive values were estimated based only on charter trips to the Channel Islands and were valued at $1.2–1.4 million per year (Leeworthy et al. 2005).

More recently, Wallamo and Edwards (2007) conducted a choice experiment study among Northeast residents to estimate willingness to pay for protecting species and habitats on the seafloor. Their results suggest that smaller areas allowing multiple uses provided the greatest welfare. For example, willingness to pay per year for 4.02% of the Northeast's EEZ to be set aside as a no-take reserve was estimated at $23 per person per year, while allowing for science and education, recreation and leisure, and limited fishing activities yielded willingness to pay estimates of $86, $97 and $106 per year, respectively (Wallamo and Edwards 2007). Their findings also suggest that smaller MPAs are utility increasing with willingness to pay estimates for setting aside 2.27% of the Northeast's EEZ at $26, $89, $100, and $109 for the same activities (ibid). In addition to these studies, the Oregon Department of Fish and Wildlife has also funded a study that will focus primarily on the non-market value of ecosystem services. The study is expected to be concluded by June of 2011 and will provide additional insights into the non-market value of MPAs in Oregon.

Additional datasets that may be of relevance include:

- National MPA Center, Data and Analysis (Updated March 2010) In addition to online mapping tools and GIS layers, this site provides tabular data on over 1,600 sites listed in the MPA center inventory. Available in Microsoft Excel.
- NOEP Environmental and Recreational Non-market Values (Updated September 2008) Provides more than 100 non-market value estimates and bibliographic references from the 1970s to 2008.

5.4. MPA Data Gaps

Overall, relatively limited information exists on the non-market value of MPAs in the US, generally, and Oregon, more specifically. Of the literature reviewed, no studies appear to be directly applicable to Oregon or even the Pacific Northwest region. Travel cost values related to MPAs for California and Florida are available; however, these values do not capture non-use values. Similarly, the Wallamo and Edwards (2007) study is relevant in both study scope and substance, but limited in application to Oregon because of differences among the Northeast and Pacific Northwest regions of the US.

5.5. Beach Access

Beach valuation studies are one of the more frequently studied areas in the non-market literature, with 34 studies listed on the National Ocean Economic Program database (none applied specifically to MPAs or view sheds), but for the most part, these studies appear to have limited relevance for the Pacific Northwest context. Most recently,

Oh et al. (2010) used a stated preference model and found that non-resident tourists in South Carolina were willing to pay $12.80 and $15.60 for one and two additional beach access points, respectively, while residents were willing to pay $7.90 and $9.40, respectively (Oh et al 2010).

Bin et al. (2005), using the travel cost method, estimated day trip and overnight beach trips in North Carolina between $11-$80 and $11-$41, respectively (Bin et al. 2005). This is somewhat lower than findings from Whitehead et al. (2008), who estimated a value of $90 per trip to North Carolina beaches with increases of $25 per trip for improved beach access, and an additional $7 for improved beach width (Whitehead et al. 2008); however, it was noted that survey respondents in this last study may be more active beachgoers than the general population, which may explain the higher per trip value.

West Coast studies to date have focused primarily on California (seven in the NOEP database), including Lew and Larson, who used a travel cost method and a random utility model. They estimated per trip values in San Diego County of $21–$28 per day (Lew and Larson 2005; Lew and Larson 2008). While there are no studies estimating per trip values for Oregon, Leeworthy et al. (2001) estimated that nearly 2.1 million American's visit Oregon beaches every year (See Section 3 more full discussion of these activities and available data).

In addition, there is other information available that relates to tourism, more generally, on the Oregon Coast. In a study for the Oregon Coastal Zone Management Association (OCZMA), The Research Group estimated the impact of coastal tourism at $297.9 million in personal income, but did not further break down this estimate into values associated with particular sectors/activities such as beach going (The Research Group 2006). Similarly, Dean Runyan Associates maintain a database of travel expenditures in Oregon, which estimates travel expenditures on the Oregon coast for several activities, but again, not for beach access.

Overall, our review of literature did not find beach access valuation estimates specifically for Oregon. Some data are available to help estimate beach value in Oregon, including number of trips (~2.1 million Americans annually) and economic impact estimates of Oregon tourism, in general.

Additional datasets that may be of relevance include:

- NOAA Ocean and Coastal Economics Benefit Transfer Database (1999) National Recreational and the Environment (2000)
- Dean Runyan 2009 State and County Travel Impacts (2009)National Survey of Hunting, Fishing and Wildlife Viewing (2006) – see Table 26 of that study for some information on marine related wildlife viewing

5.6. Beach Access Data Gaps

As noted above, no formal studies valuing beach access were found for Oregon or the Pacific Northwest in this review. Several studies were found from other states, most notably the Carolinas and California, but it is likely that because of regional differences these figures may not be appropriate for use in a benefit transfer. Similarly, there are estimates for the number of trips to Oregon beaches, but approximating value for these trips is difficult without expenditure data that relates specifically to these beach use estimates.

6. Ecosystem Services

Ecosystem services broadly encompass a variety of resources and processes provided by ecosystems. The definition of ecosystem services was formalized by the United Nations 2004 Millennium Ecosystem Assessment (MEA 2005). As part of the definition, ecosystem services were divided into four categories: provisioning; regulating; supporting; and cultural. These categories apply to both terrestrial and marine ecosystems.

Literature in the coastal context is somewhat limited, but some estimates are provided for marine systems and methods for valuing, particularly in Oregon. Marine ecosystem services include, among others: water quality; marine biodiversity; coastline and beach stabilization; fish breeding grounds and habitat; and seafood for consumption. A potential future service, already starting to be used, will likely be renewable offshore energy. We discuss here relevant literature focused on marine ecosystem services in Oregon and elsewhere.

In Oregon, most research on the value of marine ecosystem services centers on salmon habitat. Bell et al. (2003) estimated willingness to pay for enhanced Coho salmon habitat based on a survey of residents from Tillamook Bay,

Yaquina Bay, and Coos Bay. They estimated that individuals were willing to pay $20.88–$120.50. The low end of this range was the calculated willingness to pay for levels of 'high enhancement' among Coos Bay residents with lower levels income, where the high end of this range was from Tillamook residents with higher levels of income for 'high enhancement' (Bell et al. 2003). In another study, Garber-Yonts et al. (2004) estimated that Oregonians are willing to pay up to $144 per household per year to increase protect salmon habitat from 15% to 60% (Garber-Yonts et al. 2004)

Another important source comes from Swedeen et al. who do not offer specific valuations estimates but do characterize a number or coastal habitats in Oregon. Nine ocean and coastal ecosystems and respective acreage in Oregon are identified in this paper. These include: beaches and dunes (52,000 acres); headlands and rocky islands (9,000 acres); bays and estuaries (173,000 acres); nearshore habitat (223,000 of non-estuarine acres from high tide line to 66 ft); territorial waters (640,000 acres from low tide to 3 miles offshore); and the marine shelf (66 ft to 667 ft)(Swedeen et al. 2008). Oceana recently released a report identifying 31 Oregon coastal regions for consideration as ecologically important areas. Included in this report are summary characterizations of Oregon's nearshore marine environment, habitats and species related to these areas (Oceana 2010). Lastly, Professor Chris Goldfinger from Oregon State University has collected bathometric data to characterize seafloor habitat in Oregon's Territorial Sea, but as of this writing, that information is still being analyzed and not available for this review (Pakenham A., personal communication August 6, 2010). Once released, it will provide substantially improved understanding of Oregon's nearshore ecosystem.

It should also be noted that Oregon State University has developed a list of indicators that could be used identify a significant ecosystem services derived from Oregon's marine resources. Findings from this study will be presented by June, 2011 (Murphy M., personal communication August 25, 2010).

In Washington, a recent study estimated per hectare values for 10 coastal landcover types for Maury Island in King County. The study found that grasslands were the least valuable landcover type per hectare ($117), followed by saltwater wetlands ($1,413), freshwater streams ($1,594), forests ($1,826), coastal riparian ($9,395), nearshore habitat ($16,282), freshwater wetlands ($72,786), beaches ($88,203) and beaches near dwellings ($117,254) (King County 2004). It should be noted that each land cover type likely supports multiple ecosystem services. Similarly, Raheem et al. (2010) summarizes existing literature on estimated values for a number of marine ecosystem types across various geographies (see Table A.5 for a summary of the literature cited by Raheem et al (2010).

Table A.5. Summary of ecosystem service values from Raheem et al. (2010)

Ecosystem Service	Estimated Value	Geography	Citation
Marshes	$2,094 per acre	Bay of Fundy	DeMaio Sukic 2001
Marshes	$263,000 per acre	Rhode Island	Bauer et al. 2004
Beaches	$17,000 -31,000 per acre per year	New Jersey	Costanza 2006
Lagoons	$45-$69 per person (time interval unknown)	Rhode Island	Anderson 1986
Estuaries	$421 per acre per year	Los Angeles, CA	Costanza 1989
Estuaries	$817 per acre per year	New Jersey	Costanza 1989
Rocky Intertidal	$6 per family trip	Southern CA	Hall et al. 2002

A last consideration is the marine ecosystem service of hydrokinetic electricity production (also known as wave energy production). In their report to the Oregon Wave Energy Trust (OWET), EcoNorthwest (2009) estimated the total economic impacts for construction of wave energy devices during the research and development, commercial, and industrial stages at $2.7–$888.8 million for all of Oregon, while figures for the coast (i.e., Lincoln, Douglas, and Coos counties) were estimated at $2.1–$306.6 million (EcoNorthwest 2009). Total operational impacts for the same stages were estimated at $13.5 million–$2.4 billion for all of Oregon and $11.3 million–$1.9 billion for the coast (EcoNorthwest 2009). It should be noted that these estimates are not only for the value of the ecosystem service, but also economic activity associated with it. This study also estimated the economic impacts of commercial and recreational fishing but did not model how these activities might interact with wave energy generation.

Additional datasets on marine ecosystem services that may be of value include:

- Beneficial Use Values Database (2001). Hosted by UC Davis. Contains over 2000 valuations of water from studies ranging from 1975 to 2001. Dataset available in Microsoft Access.
- ENVALVUE (2004) provides reference from national and international studies on environmental valuation. Has reference to studies on beaches, coasts, wetlands and rivers and lakes. Cursory looks yields many studies prior to 2000.

6.1. Data Gaps

Overall, this review found the most relevant valuations studies in Oregon focused primarily on salmon habitat and wave energy, with other studies characterizing marine habitats but not offering respective values. The King County study (2004) does provide a number of estimates for Pacific Northwest coastal landcovers, but is limited in its estimates of ocean habitats. The same is true for other studies listed above, which tend to focus on terrestrial coastal habitats including marshes, lagoons, beaches, and intertidal zones, but do not necessarily offer estimates for nearshore, shelf, of slope ecosystem services.

In addition, to transfer any of these values to the Oregon coast, information on marine habitat and coastal landcover type along the Oregon coast, especially in our focus port areas, would be required. Swedeen et al. (2008) provide a useful account of coastal habitats but ocean environments are only described by their proximity to shore rather than composition or bottom type (sandy, gravel, rock, etc.).

7. Attitudes and Perceptions

Another area of interest expressed in the RFP is community level attitudes and perceptions of alternative ocean energy development and siting of marine reserves in Oregon state waters. In this section, we explore existing literature on these topics.

While there are only a few studies on attitudes and perceptions related to wave energy and marine reserves in Oregon, those that do exist appear directly relevant to the goals of this study. As part of the *Human Dimensions of Wave Energy*, Stefanovich (2009) conducted a state-wide survey of Oregon households and found that Oregonians, as a whole, generally exhibited positive attitudes towards wave energy development off the Oregon coast. This was also true of coastal residents, 59% of whom were either ‘positive’ or ‘very positive’. Only 6% of coastal residents responded that their attitude towards wave energy development was ‘negative’ or ‘very negative’ (Stefanovich 2009). It was also found; however, that both state-wide and coastal respondents did not ‘have enough information to form an opinion’ in 35% and 23% of cases, respectively (Stefanovich 2009. This latter figure may suggest that it is too early for a sizeable portion of Oregonians to form an opinion.

In a study designed to identify areas of policy consensus and division among individuals directly engaged in decision making for wave energy, Stevenson (2009) suggests that until wave energy devices are tested, policy positions of respondents were still largely unformed. Greatest agreement among these individuals was found on the concept of testing to learn more about wave technology, while division was found on the concept of developing wave energy on a commercial scale (Stevenson 2009). It was also found that scientists were the most trusted sources of information among these individuals, while industry representatives were the least trusted (Stevenson 2009).

Hunter’s (2009) in-person study of community well-being found coastal residents to have more dichotomized views, with individuals typically seeing wave energy development as either a distinct threat or opportunity. This was particularly true for questions on economics, where some saw industrialization of the ocean as threatening to commercial and recreational fishing and others viewed it as an opportunity to grow the coastal economy (Hunter 2009). Views on the environment were similarly split between concerns that wave energy development would negatively impact the coastal ecosystem and optimism that wave energy could lower carbon dioxide emissions (Hunter 2009). Overall, the three studies note above suggest positive attitudes toward developing wave energy off the Oregon coast, but indicate a need for more information about the technology to understand potential environmental and social impacts. Of the individuals who had formed stronger opinions, this research suggests they did so based on perceptions that wave energy was a threat or opportunity to community well-being on the coast.

Attitudinal research related to siting marine reserves in Oregon appears more limited, despite the high profile the issue has assumed within Oregon's marine policy context. Connor (2007) found support among policy makers for increasing opportunities for public participation in Oregon's marine reserve process, but did not collect data on general attitudes or perceptions among the public. A forthcoming study funded by Oregon Department of Fish and Wildlife (ODFW) will present community profiles of Depoe Bay and Port Orford, the two ports located adjacent to the pilot marine reserve sites, and will provide additional data on perceptions of marine reserves in Oregon (Murphy M., personal communications August 25, 2010). A profile will also be available for the Garibaldi.
Other potentially relevant literature on the topic is available from California, where Weible (2006) identified two opposing coalitions on the issue of expanding marine protected areas (MPAs) in California waters because of differences in perceptions of marine resource problems. MPA supporters generally cited habitat destruction as the most serious problem and perceived MPAs as an appropriate solution, while opponents perceived fisheries reductions as the most serious marine resource problem with MPAs as an inappropriate solution (Weible 2006).

7.1. Data Gaps

In general, attitudes toward wave energy development in Oregon are relatively well researched, but do lack port specific information. Somewhat less research is available on attitudes and preferences related to MPAs. The forthcoming study from ODFW will help fill some of these gaps, but others will remain, particularly on statewide perceptions of marine reserves and in other locations on the coast, including the three focus ports in this study.

REFERENCES

- Anderson G.D, and Edwards S.F. 1986. Protecting Rhode Island's coastal salt ponds: an economic assessment of downzoning. Coastal Zone Management Journal 14:67–91.
- Bauer D.M., Cyr N.E., and Swallow S.K. 2004. Public preferences for compensatory mitigation of salt marsh losses: a contingent choice of alternatives. Conservation Biology 18:401–411.
- Bell K.P., Huppert D., and Johnson R.L. 2003. Willingness to pay for local Coho salmon enhancement in coastal communities. Marine Resource economics 18:15–31.
- Benson E.D., Hansen J.L., and Schwartz A.L. 2000. Water Views and Residential Property Values. The Appraisal Journal, July: 260–271.
- Bhat M.G. 2003. Application of non-market valuation to the Florida Keys marine reserve management. Journal of Environmental Management 67:315–325.
- Bin O., Landry C.E., Ellis C.L., and Vogelsong H. 2005. Some Consumer Surplus Estimates for North Carolina Beaches. Marine Resource Economics 20:145–161
- Boehlert G.W., McMurray G.R., and Tortorici C.E. (eds.) 2007. Ecological Effects of Wave Energy Development in the Pacific Northwest: A Scientific Workshop October 11–12, 2007. US Department of Commerce. National Oceanic and Atmospheric Administration, National Marine Fisheries Service.
- Carson R.T., Mitchell R.C., Hanemann M., Kopp R.J., Presser S., and Ruud P.A. 2003 Contingent Valuation of Lost Passive Use: Damages from the Exxon Valdez Oil Spill. Environmental and Resource Economics 25:257–289.
- Chang W., and Jackson S.R. 2003. Economic Impacts of Recreational Activities at Oregon Coastal and River Ports. Environmental Laboratory, US Army Corps Research and Development Center.
- Connor D. 2007. MPA Planning in Oregon: A Framework for Addressing Social & Economic Factors. Surfrider Fondation.
- Costanza R., Farber S.C., and Maxwell J. 1989. Valuations and management of wetland ecosystems. Ecological Economics 1:335–361.
- Costanza R., Wilson M., Troy A., Voinov A., Liu S., and D'Agostino J. 2006. The value of New Jersey's ecosystem services and natural capital. New Jersey Department of Environmental Protection.
- Crosson, S. 2009. A Social and Economic Analysis of Commercial Fisheries in North Carolina (Atlantic Ocean). North Carolina Division of Marine Fisheries
- Dean Runyan Associates, 2009. Fishing, Hunting, Wildlife Viewing, and Shellfishing in Oregon: 2008 State and County Expenditure Estimates. Dean Runyan Associates
- DeMaio Sukic A., 2001. Landowners' willingness to accept compensation for selling saltwater marshes to a conservation program: a multiple bounded discrete choice approach. Ph D. Dissertation, McGill University.
- Desvouges, William H., Johnson, F. Reed, Dunford, Richard W., Boyle, Kevin J., Hudson, Sara P. and Wilson, Nicole K. 1992. Measuring Nonuse Damages Using Contingent Valuation: An Experimental Evaluation of Accuracy. Research Triangle Institute Monograph 92-1. Exxon Corporation.
- EcoNorthwest 2009. Economic Impacts of Wave Energy to Oregon's Economy: A Report to Oregon Wave Energy Trust Final Report.
- Garber-Yonts B., Kervliet J., and Johnson R. 2004. Public Values for Biodiversity Conservation Policies in the Oregon Coast Range. Forest Science 50(5):589–602.
- Griliches, Z. 1971. Price Indexes and Quality Change, Cambridge, MA: Harvard University Press.
- Hackett, S. C., et al. 2009. The Economic Structure of California's Commercial Fisheries. Contract No. P0670015, California Department of Fish and Game. Humboldt State University Department of Economics and King and Associates, Inc.

- Hall D.C., Hall J.V., and Murray S.N. 2002. Contingent Valuation of Marine Protected Areas: Southern California Rocky Intertidal Ecosystems. Natural Resource Modeling 15(3):335–368.
- Hanley, N., and C.L. Spash. 1993. Cost-Benefit Analysis and the Environment, England: Edward Elgar Publishing Ltd.
- Haughton J., Giuffre D., and Barret J. 2003. Blowing in the Wind: Offshore Wind and the Cape Cod Economy. The Beacon Hill Institute at Suffolk University.
- Hodges, A., Mulkey D., Philippakos E., and Adams C. 2000. Economic Impact of Florida's Commercial Fisheries and Aquaculture Industries. Included in Economic Impacts of Florida's Agricultural and Natural Resource Industries. Economic Information Report EI-00-4, Department of Food and Resource Economics, University of Florida, 2000
- Hydrokinetics and Recreation Work Group 2010. Hydrokinetic Energy Projects and Recreation: A Guide to Assessing Impacts. Prepared for the National Park Services Hydropower Assistance Program, Department of Energy and Hydropower Reform Coalition.
- Hunter D. 2009. Addressing Perceived Community Impacts of Wave Energy in Coastal Oregon Communities. In Science and Knowledge Informing Policy and People: The Human Dimensions of Wave Energy Generation in Oregon: Final Report to the Oregon Wave Energy Trust.
- King County. 2004. Ecological Economic Evaluation: Maury Island, King County, Washington. King County, Department of Natural Resources and Parks, Water and Land Resources Division.
- Kirkley, J. E., Murray T. J., and Duberg J. 2005. Economic Contributions of Virginia's Commercial Seafood and Recreational Fishing Industries: A User's Manual for Assessing Economic Impacts. Virginia Institute of Marine Science and the Virginia Marine Resources Commission.
- Krueger A.D. 2007. Valuing Public Preferences for Offshore Wind Power: A Choice Experiment Approach. Ph.D Dissertation, University of Delaware.
- Lancaster, K.J. 1966. A New Approach to Consumer Theory. Journal of Political Economy, 74: 132-157.
- Leeworthy V.R., Wiley P.C., and Stone E.A. 2005. Socioeconomic Impact Analysis of Marine Reserve Alternatives for the Channel Islands National Marine Sanctuary. US Department of Commerce. National Oceanic and Atmospheric Administration. National Ocean Service. Special Projects. Silver Spring, Maryland.
- Leeworthy, V.R. 2001. National Survey on Recreation and the Environment 2000. Preliminary Estimates for Versions 1–6: Coastal Recreation Participation. US Department of Commerce, National Oceanic and Atmospheric Administration National Ocean Service, Special Projects. Silver Spring, MD.
- Leeworthy, V.R. and P.C Wiley. 2001. Preliminary Estimates from Versions 1-6: Coastal Recreation Participation" National Survey On Recreation And The Environment 2000. US Department of Commerce. National Oceanic and Atmospheric Administration. National Ocean Service. Special Projects. Silver Spring, Maryland.
- Lew D.K. and Larson D.M. 2008. Valuing a Beach Day with a Repeated Nested Logit Model of Participation, Site Choice, and Stochastic Time Value. Marine Resource Economics 23:233–252
- Lew D.K., and Larson D.M. 2005. Valuing Recreation and Amenities at San Diego County Beaches. Coastal Management 33:71–86.
- Loomis J. 2005. Updated outdoor recreation use values on national forests land and other public lands Report PNW-GTR-658: 26 pp
- Millennium Ecosystem Assessment (MEA). 2005. Ecosystems and Human Well-Being: Synthesis. Island Press, Washington. 155pp.
- National Marine Fisheries Service. 2010. Fishery Economics of the United States 2008: Economics and Sociocultural Status and Trends Series. Technical Memorandom NMFS-F/SPO-109. US Department of Commerce. National Oceanic and Atmospheric Administration. National Marine Fisheries Service. Office of Science and Technology. Silver Spring, MD.
- NOAA National Marine Protected Area Center *MPA Definitions*, March 30, 2010, Web 25, August 2010 < http://mpa.gov/aboutmpas/definition/>
- Oceana 2010. Identifying and protecting important ecological areas off the Oregon coast. August 30, 2010, Web 3, September 2010 < http://na.oceana.org/sites/default/files/Oceana_Identifying_Protecting_IEAs_Oregon.pdf>
- O'Connor, S., Campbell, R., Cortez, H., and Knowles, T. 2009. Whale Watching Worldwide: tourism numbers, expenditures and expanding economic benefits, a special report from the International Fund for Animal Welfare, Yarmouth MA, USA, prepared by Economists at Large.
- Oh C., Draper J., and Dixon A.W. (DATE). Comparing resident and tourist preferences for public beach access and related amenities. Ocean and Coastal Management 53:245–251.
- Oregon Ocean Information *Marine Reserves FAQs* August 10, 2010, Web 25, August 2010 <http://www.oregonocean.info/index.php?option =com_content&view=category&id=181&Itemid=114>
- Oregon Parks and Recreation Department. 2003. Chapter Four Outdoor Recreation Trends. In 2003-2007 Oregon Statewide Comprehensive Outdoor Recreation Plan
- Oregon Parks and Recreation Department, *Whale Watching Sites*. November 9, 2009. Web 04, August 2010. <http://whalespoken.org/OPRD/PARKS/WhaleWatchingCenter/watch_sites.shtml>
- Pendleton L., Atiyah P., and Moorthy A. 2007. Is the non-market literature adequate to support coastal and marine management? Ocean and Coastal Management 50:363–378.
- Raheem N., Talberth S., Colt S., Fleishman E., Swedeen P., Boyle K.J., Rudd M., Lopez R.D., O'Higgins T., Willer C., and Boumans R.M. Working Paper. The Economic Value of Coastal Ecosystems in California. http://www.nceas.ucsb.edu/news/economicvaluereport. Accessed July 21, 2010

- Rosen, S. 1974. Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition. Journal of Political Economy, 82: 34-55.
- Seung, C.K. and Waters E.C. 2006. A review of regional economic models for fisheries management in the U.S. Marine Resource Economics. 21:101–124.
- Southwick Associates. 2006. The Relative Economic Contributions of U.S. Recreational and Commercial Fisheries. Prepared for Theodore Roosevelt Conservation Partnership.
- Stefanovich M. 2009. Wave Energy and Public Opinion in Oregon: Summary of Results from The Oregon Energy Policy Survey, 2008. In Science and Knowledge Informing Policy and People: The Human Dimensions of Wave Energy Generation in Oregon: Final Report to the Oregon Wave Energy Trust.
- Sterzinger G., Beck F., and Kostiuk D. 2003. The Effect of Wind Development on Local Property Values. Renewable Energy Policy Project.
- Stevenson J. 2009. Mapping the Political Landscape of Wave Energy Development in Oregon. In Science and Knowledge Informing Policy and People: The Human Dimensions of Wave Energy Generation in Oregon: Final Report to the Oregon Wave Energy Trust.
- Swedeen P., Batker D., Radtke H. Boumans R., Willer C. 2008. An Ecological Economics Approach to Understanding Oregon's Coastal Economy and Environment. Audubon Society of Portland. Portland, OR.
- TECHLAW. 2001. The Economic Contribution of the Sport Fishing, Commercial Fishing and Seafood Industries to New York State. Prepared for New York Sea Grant.
- The Research Group. 2006. A Demographic and Economic Description of the Oregon Coast: 2006 Update. Prepared for the Oregon Coastal Zone Management Association. The Research Group.
- The Research Group. 2009a. Oregon's Commercial Fishing Industry Year 2007 and 2008 Review. Prepared for the Oregon Department of Fish and Wild Life and The Oregon Coastal Zone Management Association. The Research Group.
- The Research Group. 2009b. Oregon Marine Recreational Fisheries Economic Contributions in 2007 and 2008. Prepared for the Oregon Department of Fish and Wild Life and The Oregon Coastal Zone Management Association. The Research Group.
- Trapper, R. 2006. Wildlife Watching and Tourism: A study on the benefits and risks of a fast growing tourism activity and its potential impacts on species. Produced by United Nations Environment Program Convention on Migratory Species.
- USFWS. 2006. National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. US Department of Interior, Fish and Wildlife Service, and US Department of Commerce, US Census Bureau.
- Utech D. 2000. Valuing Hawaii's Humpback Whales: The Economic Impact of Humpbacks on Hawaii's Ocean Tour Boat Industry. In The Economic Contribution of Whale Watching to Regional Economies: Perspectives from Two National Marine Sanctuaries. Marine Sanctuaries Conservation Series MSD-00-2. US Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Sanctuary Program, Silver Spring, MD
- Wallamo K., and Edwards S. 2008. Estimating Non-market Values of Marine Protected Areas: A Latent Class Modeling Approach. Marine Resource Economics 23: 301-323.
- Weible C. 2006. An Advocacy Coalition Framework Approach to Stakeholder Analysis: Understanding the Political Context of California Marine Protected Area Policy. Journal of Public Administration Research and Theory. 17: 95–117.
- Whitehead J.C., Dumas C.F., Herstine J., Hill J., and Buerger B. (2008) Valuing Beach Access and Width with Revealed and State Preference Data.

APPENDIX A.1: Definitions for Literature Review

- **Benefit transfer**: The method of transferring estimates or results from past valuation studies to the present study, in order to reduce study costs, time and or effort. The applicability of the approach depends on the degree of similarity between the various studies.
- **Consumer surplus**: A measure of the net benefits or savings accruing to consumers of a good or service estimated by the excess of what they are willing to pay over what they actually pay. (E.g., if it costs an individual up $75 to participate in that activity, the consumer surplus is estimated at $25).
- **Cost-benefit analysis**: An analysis method monetarily quantifying as many present and future costs and benefits as possible of a proposed policy or project. This method is often used to compare multiple projects in an effort to determine the most cost effective option.
- **Contingent valuation**: A method used to determine the value of a non-market good/service based on what people are willing to pay to for a set of benefits associated with those goods/services. This is typically estimated through the use of a structured questionnaire that presents a hypothetical situation about possible changes to that good/service.
- **Economic benefits**: Benefits quantifiable in terms of money, such as revenue, net cash flow, net income.
- **Economic impact**: A measure of any resulting increase or decrease in the productive potential of the economy, usually stated in monetary terms or changes in employment.
- **Economic impact assessment**: An estimated prediction of the overall economic impact of a proposed project or policy.
- **Expenditures**: Amounts paid for goods or services received or services rendered.
- **Gross**: The total amount before any deductions have been made.
- **Hedonic pricing**: A non-market valuation method to determine the value or demand that is associated with a certain set of characteristics. This is done by comparing the prices of goods with a number similar characteristics (e.g., three-bedroom houses) and associating differences in value to differences in remaining characteristics (e.g., ocean view/no ocean view).
- **IMPLAN model**: A micro-computer-based, input-output modeling system providing or generating economic multipliers to estimate potential economic impacts associated with an increase or decrease in spending in certain economic sectors.
- **Input-output analysis**: A systematic method that both describes the financial linkages and network of input supplies and production which connect industries in a regional economy (however defined), and predicts the changes in regional output, income, and employment.
- **Long run**: A period of time in which all prices, including wages, are flexible, and have achieved their equilibrium levels. This is one of two macroeconomic time designations; the other is the short run. Long-run wage and price flexibility means that all markets, including resources markets and labor markets, are in equilibrium, with neither surpluses nor shortages.
- **Net**: The total amount once all expenditures and revenues have been accounted for.
- **Non-market valuation**: A methodology attempting to assign monetary values to goods and services which do not currently have a market assigned value such as healthy wildlife populations or strong cultural traditions.
- **Profit**: The difference between revenue and production cost; that which is earned in the sale of goods or services that is in excess of the cost of producing the good or service.
- **Revenue**: The entire, or gross, amount of income for goods or services before costs have been accounted for.
- **Short run**: A period of time in which some prices, including wages, are rigid, inflexible, or otherwise in the process of adjusting. This is one of two macroeconomic time designations; the other is the long run. Short-run wage and price rigidity prevents some markets, especially resources markets and most notably labor markets, from achieving equilibrium.
- **Tax revenue**: The total amount of income the government collects due to taxation.
- **Travel cost**: A non-market valuation method that seeks to estimate a monetary value based on the amount people pay (in money and time) to participate in an activity (e.g., go sport fishing or gain access to beautiful sites).

APPENDIX B: Stakeholder Focus Groups

During the week of September 13, Ecotrust facilitated four focus groups to solicit feedback on our proposed research approach for the Shoreside Economic Analysis and Tool for the Territorial Sea Plan. These focus groups were held in Portland, Newport, Coos Bay and Port Orford. Overall, focus group participants indicated that Ecotrust's general research approach seemed reasonable given the time and funding constraints, but emphasized the following:

- Data collection should identify expenditure flows rather than relying on multiplier estimates.
- The study needs to account for benefits from scientific research activities in the ocean.
- The study should develop a method for administering a cost-effective 'rapid assessment' to update the datasets.
- The research team should ensure that study topics are balanced and pursued without bias.

Portland themes:

- This data will be helpful, but not necessary, for decisions about ecosystems and fishing because these considerations are already protected under Goal 19. The data could also be helpful in the federal planning processes.
- Understanding non-markets values should be a 'next topic' with additional time and funding.
- Attitudes and perceptions are important, but perhaps not appropriate in this study given the focus on economics.

Newport themes:

- A preference to identify expenditure flows instead of relying on multipliers.
- Economic benefits from scientific research need to be accounted for.
- Both assets and liabilities of an industry should be accounted for (e.g., fishery permits and debt/subsidies).
- The study should provide a method for administering a rapid economic assessment in the future.
- There is a need for continued outreach and opportunity for additional input as this study goes forward.

Port Orford themes:

- The study needs to provide accurate data for the value of ocean access and shoreside infrastructure.
- Economic benefits from scientific research need to be accounted for.
- Attitudes and perceptions are important and should be a core topic.
- Need to track financial flows. Multipliers are only good if you validate them with updated figures.
- Study should provide a way to update data on regular basis.

Coos Bay themes:

- Research approach as presented does not satisfactorily account for maritime commerce.
- Some study topics are too 'green' (e.g. non-market values, ecosystem services).
- Generally do not trust attitudes and perceptions because questions can be too subjective.
- Need to track expenditures flows in community.
- Current study design may be too ambitious.

The four community focus groups took place in:

- Portland, September 14, 2010
- Newport, September 15, 2010
- Port Orford, September 16, 2010
- Coos Bay, September 17, 2010

Portland, September 14, 2010
Participants in attendance
- David Allen – OPAC
- Jason Busch – OWET
- Jena Carter – TNC
- Onno Husing – OCZMA
- Taylor Hesselgrave – Ecotrust
- Paul Klarin – DLCD
- Sarah Kruse – Ecotrust
- Pete Stauffer – Surfrider Foundation
- Charles Steinback – Ecotrust
- John Stevenson – Ecotrust

Newport, September 15, 2010
Participants in attendance
- Bob Eder – Commercial fisherman
- Dean Fleck – Englund Marine
- Walter Chuck – Recreational fisherman
- Dave Wright – Pacific Shrimp Seafoods
- David Allen – Ocean Policy Advisory Council
- Don Mann – Port of Newport
- Laura Anderson – Local Ocean Seafoods
- Terry Thompson – Lincoln County
- Katie Hildenbrand – Oregon Sea Grant
- Maggie Summer – ODFW
- Paul Klarin – DLCD
- Onno Husing – OCZMA
- Caleb Price – MRM student
- John Stevenson – Ecotrust

Participants via comment
- Loran Godard – Charter fisherman
- Jack Craven – Charter fisherman
- Dan Hasselschwert – Ossies surfshop
- Lorna Davis – Chamber of Commerce

Port Orford, September 16, 2010
Participants in attendance
- Susan Brown - Curry County Economic Development
- Dixie Boley - Fisherman's Direct Seafoods
- Suzanna Stoike - POORT
- Leesa Cobb - POORT
- Stephanie Web – POORT
- Chris Aiello - Commercial Fisherman, POORT Board
- Jeff Miles - Commercial Fisherman, POORT Board
- Aaron Longton - Commercial Fisherman, POORT Board
- Caleb Price - MRM student
- Onno Husing - OCZMA
- Andy Lanier - Oregon DLCD
- John Stevenson – Ecotrust

Participants via comment
- David Smith – Chamber of Commerce
- John Hewitt – City Council
- Mark Lottis – 5 Star Charters
- Gary Anderson – Port of Port Orford

Coos Bay, September 17, 2010
Participants in attendance
- Wayne Butler - Charter fisherman
- Matt LaDoux – Coos Bay Chamber of Commerce
- Hugh Link - OR Dungeness Crab Commerce
- Katherine Hoppe – Coos Bay Visitor Bureau
- Mark Fleck – Englund Marine
- Kathy Wall – Intnl. Port of Coos Bay
- Onno Husing – OCZMA
- Andy Lanier - Oregon DLCD
- John Stevenson – Ecotrust
- Caleb Price – MRM student

Participants via comment
- Nick Furman – OR Dungeness Crab
- Rick Goche – Commercial Fisherman
- Scott Adams – Hallmark fisheries
- Marty Giles - Wavecrest Discoveries
- Timm Slater – Chamber of Commerce

Please reference the document entitled, "*Shoreside Economic Analysis and Model for the Oregon Territorial Sea Plan: Notes from Stakeholder Focus Groups,*" submitted to ODFW on November 2, 2010, for additional details on these meetings.

APPENDIX C: Frequently Asked Questions

What are the goals of this study?

The overarching question this study will address is: What is the value and economic contribution of marine resources to the coastal economy of Oregon and its coastal communities?

Who is the project team?

The Oregon Department of Fish & Wildlife (ODFW) awarded the contract for the study to Ecotrust in June 2010. Dr. Sarah Kruse of Ecotrust serves as the project lead. Ecotrust also has three project partners: the Oregon Coastal Zone Management Association (OCZMA); Natural Equity; and Surfrider. OCZMA will assist with community outreach-education and methodology development. NaturalEquity and Surfrider will help with methods development and data analysis, primarily for non-consumptive use activities.

Who funded this study? Tell us about that process.

The Oregon Department of Fish and Wildlife (ODFW) is responsible for administrating this study and providing project oversight, having received funding to carry out this analysis from the David & Lucile Packard Foundation. ODFW developed the original request for proposals (RFP) and all responses to the RFP were reviewed by an independent economic advisory team selected by ODFW. This team was comprised of members from the academic community and various state agencies. After a robust evaluation process, Ecotrust and its partners were chosen by ODFW to do the work. ODFW, their expert advisory team, and various stakeholders will provide input along the way to ensure this funding supports these important public purposes.

Why are you collecting shoreside economic information? How will that information be used?

The State of Oregon is amending its Territorial Sea Plan (TSP) to find sites that are appropriate for renewable energy development. This effort, called "marine spatial planning," will also potentially guide the siting of other new uses to the territorial sea. This process is being done by identifying ***the location*** of existing ocean uses (where they take place in the ocean) and ***the location*** of important marine ecosystems. Under Goal 19, the state's Ocean Resources planning goal, renewable energy development and other potential new uses of the ocean will be steered away from sensitive marine habitats and ***places*** where existing ocean uses occur.

How does the shoreside economic data relate to the offshore maps?

When the TSP amendment process began in 2009 the focus was on gathering "***spatial*** information" about ***the location*** of important fishing grounds (recreational and commercial), shipping lanes, and other key features of the marine environment. Those "maps" of marine ecosystem resources and the existing uses of the ocean are the cornerstone of Oregon's ocean planning process.

But, again, under Goal 19, information needs to be gathered about the ***economic value*** of those ocean resources. This study will seek to establish initial estimates of the economic worth of ocean resources and coastal and marine human use activities to Oregon's shoreside economy.

Under this study, every effort will be made to establish ***explicit connections*** between certain ***economic activities onshore*** and the ***location of these areas offshore***. Presently, we do not have datasets documenting those economic connections. And, until very recently, maps identifying the location of existing ocean uses of the ocean off the Oregon Coast were not available.

What will be studied? Who made that determination?

From the beginning, this has been a collaborative process. The process began when ODFW issued their Request for Proposals (RFP) for this study. In the RFP, ODFW staff provided an ambitious outline of potential "economic" topics to consider in documenting the economic value arising from the use of ocean resources. It was clear, to many of us, that it was ***not*** possible to address all topics in this one study given the ***time*** (completion by the spring of 2011) and the ***dollars*** available (approximately $225,000).

Ecotrust's first task was to initiate a conversation—with stakeholders—to determine ***what kinds of shoreside economic information*** is most immediately needed for the TSP planning process (the first priority), and, ***which methodologies*** would be used to gather that information.

Ecotrust carried out a "literature search" to determine what datasets are currently available on Oregon's shoreside economy. Using that information, the project team and ODFW staff assessed what we believed was possible to achieve given the time and resources available. Ecotrust then convened four stakeholder focus group meetings in Portland, Newport, Port Orford, and Coos Bay to get feedback on our preliminary study approach. The focus groups recommended the study gather several "core" data sets. Among these are: (a) documentation of the value of ***ocean-related human use activities***; and (b) documentation of the ***dollar flows*** through the shoreside economy originating from these ocean-related activities.

Other study topics included in the original RFP from ODFW, primarily related to non-market values and ecosystem services, will ***not*** be core topics in this study. Ecotrust will, however, provide a research framework for use as a springboard for future discussions to attract resources to carry out that important work.

What specific types of data will you need to collect?

This study will leverage many existing data sets. We also will focus on the collection of data to address critical information gaps including: 1) identify the 'type and location' of shoreside infrastructure and business supporting existing ocean uses (e.g., fishing and recreation); 2) implement a limited 'business survey' to identify important aspects of shoreside businesses (including number of employees, annual gross revenue, and where they spend their money); and 3) conduct a recreational fishing cost survey to estimate yearly expenditures related to saltwater angling.

Will the data be made public for anyone to see?

We take confidentiality of information ***very*** seriously. When Ecotrust recently did the fishing ground mapping project, fishermen provided confidential data about their fishing grounds during one-on-one interviews. Then that information was ***aggregated*** into one larger map. That is how this information will be collected from shoreside businesses — the data will be ***aggregated***. This means the study may provide information such as the expenditures of ***an average*** recreational fisherman in Oregon, or the number of employees ***an average marine supply stores*** might have. Again, we will ***not*** report figures as they relate to specific persons or individual businesses (to protect the confidentiality of study participants).

For additional information, please contact:

Onno Husing
Email: onno_husing@class.orednet.org

APPENDIX D: Business Owner Survey

January 7, 2011

Dear Oregon Business Owner:

As part of an ongoing study to conduct a shoreside economic analysis in support of the Oregon Territorial Sea Plan, we are asking for your assistance in completing a survey about your business.

Project Information - Goal 19 of Oregon's Statewide Planning requires the state "to conserve marine resources and ecological functions for the purpose of providing long-term ecological, economic, and social value and benefits to future generations." Oregon is developing a comprehensive Territorial Sea Plan to guide uses of the nearshore marine environment, including the potential siting of renewable ocean energy projects. The territorial sea extends three miles from the coast.

Oregon Department of Fish and Wildlife has contracted with Ecotrust to conduct a project to help inform the Oregon Territorial Sea Plan revision process by providing a baseline understanding of the economic contribution of marine resources to Oregon's shoreside economy. One key component of this project is to better understand the economic contributions of shoreside businesses to coastal communities and their economies. Your information will help us do that.

You may complete the survey by filling out the enclosed form and returning it to Ecotrust in the enclosed pre-stamped envelope. The form asks you to provide information on your business for 2010. We are only asking for estimates—you do not need to record exact dollar values or percentages. Please complete and return the survey by January 21, 2011.

You may be assured of complete confidentiality. The questionnaire has an identification number for mailing purposes only. This is so that we can check your name off of the mailing list when your questionnaire is returned. By completing the survey, you agree to participate under the following conditions:

Only Ecotrust staff (operating under a strict confidentiality protocol) will handle the raw data generated during the interviews. All information collected in the interviews is anonymous and confidential on the individual level. All analyses and results will be presented only in aggregate form. The information will be used to create a profile of shoreside businesses related to coastal and marine activities along Oregon's coast. If appropriate, there may be the opportunity for release of aggregated study results for uses other than the Oregon Territorial Sea Planning process, but in line with the purposes of this research.

Your willingness to participate is not only appreciated, but indeed vital to the success of this project. If you have any questions or know someone else who would like to participate, please contact lweiss@ecotrust.org or call Leanne Weiss at 503.467.0809.

Thank you for your time and participation,

Sarah Kruse
Senior Economist, Ecotrust

OREGON SHORESIDE ECONOMIC CHARACTERIZATION: COASTAL BUSINESS SURVEY

Waiver: I understand that neither my name nor the name of my business(es) will ever be associated with my responses and survey information will only be presented in an aggregated format. By completing this survey, I am stating that I am over 18 years of age and that my participation in the survey is voluntary.

In your opinion, how much is the success of your business related to the well-being of Oregon's coast and associated natural resources, such as fisheries, beaches, etc. (please check one):

- ☐ Extremely influenced
- ☐ Very influenced
- ☐ Somewhat influenced
- ☐ Not very influenced
- ☐ Not at all influenced

Please estimate what percentage of your business' gross revenue for 2010 came from human activities related to the Oregon coast and/or marine resources (please make sure total equals 100%):

Activity Type	Percent (%)
Commercial fishing	%
Charter activities (e.g. fishing, whale watching, etc.)	%
Recreational fishing	%
Shore or ocean recreation (e.g. beach going, surfing, etc.)	%
General beach town tourism (e.g. shopping, etc.)	%
Other, please specify:	%
TOTAL	100 %

Please estimate what percentage of your business' gross revenue for 2010 came from tourism (i.e., visitors coming from outside Oregon coastal counties): _____%

How many of your employees work year round (2010): Part-time: _____ Full-time: _____

How many of your employees work seasonally (2010): Part-time: _____ Full-time: _____

Please estimate what percentage of your 2010 gross revenues (including tips) went to wages: ___%

Please estimate what percentage of your 2010 gross revenues were spent in coastal counties in Oregon on other expenses (not including wages): _____%

Please estimate your business' gross revenue for 2010 (check one):

- ☐ Less than $100,000
- ☐ $100,001-500,000
- ☐ $500,001-1,000,000
- ☐ $1,000,001-$2,500,000
- ☐ $2,500,001-$5,000,000
- ☐ $5,000,001-10,000,000
- ☐ More than $10,000,000

THANK YOU FOR YOUR TIME AND PARTICIPATION.

APPENDIX E: Recreational Expenditure Survey

January 5th, 2011

You are receiving this letter because you participated in the Oregon Fishing Community Mapping Project. As part of the survey you completed, you indicated that you might be willing to participate in an additional survey related to recreational fishing expenditures.

You may complete the survey by filling out the enclosed form and returning it to Ecotrust in the enclosed pre-stamped envelope.

The form asks you to estimate your 2010 recreational fishing related expenditures. If you are unsure of your expenditures for 2010, you may estimate a yearly average. We are only asking for estimates—you do not need to record exact dollar values or percentages.

Please complete and return the survey by January 21, 2011.

Project Information
Ecotrust is currently conducting a project to address longstanding questions about the economic contribution of marine resources to Oregon's shoreside economy. One key component of this project is to better understand the economic contributions of recreational fishermen to coastal communities and their economies. Your information will help us do that.

By completing the survey, you agree to participate under the following conditions:

Only Ecotrust staff (operating under a strict confidentiality protocol) will handle the raw data generated during the interviews. All information collected in the interviews is anonymous and confidential on the individual level. All analyses and results will be presented only in aggregate form. The information will be used to create a profile of the recreational fishing expenditure patterns along Oregon's coast. If appropriate, there may be the opportunity for release of aggregated study results for uses other than the Oregon Territorial Sea Planning process, but in line with the purposes of this research.

Your willingness to participate is not only appreciated, but indeed vital to the success of this project. If you have any questions or concerns, contact the Ecotrust team at lweiss@ecotrust.org or call Leanne Weiss at 503.467.0809.

Thank you for your time and participation,

Sarah Kruse
Senior Economist, Ecotrust

OREGON SHORESIDE ECONOMIC CHARACTERIZATION: RECREATIONAL EXPENDITURE SURVEY

Waiver: I understand that my name will never be associated with my responses and survey information will only be presented in an aggregated format. By completing this survey, I am stating that I am over 18 years of age and that my participation in the survey is voluntary.

Please estimate your recreational fishing related expenditures for the year 2010. $_____

Please estimate how your recreational fishing related expenditures in 2010 compared to previous years.

- ☐ Significantly higher
- ☐ Somewhat higher
- ☐ Average
- ☐ Somewhat lower
- ☐ Significantly lower

Please estimate the percentage of your total **2010** expenditures used in each of the following categories – note that the **sum should equal 100%**. If you did not spend money or make purchases in a category, **please leave it blank**.

Category	Percent (%)
Private or public transportation	%
Food – restaurants	%
Food – grocery stores, other	%
Lodging and camping	%
Boat/car fuel	%
Heating and cooking fuel	%
Party/charter/guide fees	%
Land access/boat launch fees	%
Equipment rental	%
Bait and ice	%
Gear and tackle	%
Processing/taxidermy	%
Membership and club dues	%
Moorage/storage	%
License, stamps, tags, etc.	%
Boat maintenance/expenses	%
Power boat purchase	%
Non-power boat purchase	%
Electronics	%
Miscellaneous	%
TOTAL	**100%**

APPENDIX F: Commercial, Charter, Recreational Survey Methods

Cited from Steinback et al., 2010.

The overarching goal of this project was to compile the first-ever comprehensive map (or series of maps) illustrating the commercial, charter, and recreational fishing use patterns and values along the entire Oregon coast, from Astoria to Brookings, capturing the expert knowledge of fishermen.

The objectives of this project were five-fold:

1. Comprehensively describe Oregon's commercial, charter, and recreational fishing community and incorporate fishermen's knowledge into the deliberations of the Oregon Coastal Management Program and Ocean Policy Advisory Council on the development of future amendments to the Oregon Territorial Sea Plan;
2. Develop accurate maps depicting the extent of the local fishing grounds and their stated and economic importance to the local fleets (just stated importance for the recreational fishing fleet);
3. Analyze areas of high or valuable use in relation to existing or prospective alternative ocean uses;
4. Collect baseline data for future analyses of economic contribution of the recreational fishing sector to the shoreside economy;
5. Integrate data into Oregon's Coastal Atlas and Oregon MarineMap to inform the Territorial Sea Plan revisions and other marine spatial planning processes.

Based on ODFW landings data, port groups were defined (from north to south) as Astoria, Pacific City, Garibaldi, Depoe Bay, Newport, Florence, Winchester Bay/Reedsport, Coos Bay/Charleston/Bandon, Port Orford, Gold Beach, and Brookings. Our analysis included data from the same port groups for commercial fisheries, with the exclusion of Pacific City . Charter port fisheries analysis also used the same port groups as commercial with the further exclusion of Garibaldi and Port Orford . Recreational fisheries analysis included the same port groups as commercial with the addition of Salmon River. It should be noted that not all user groups or fisheries are represented in all ports.

Funding availability necessitated that data collection was staggered both by port and by user group. Ecotrust conducted outreach meetings with key fishing community members and fishing organizations/associations (i.e., SOORC, FACT, Oregon Trawl Commission, Dungeness Crab Commission, POORT, NSAT, and FACT) prior to beginning interviews. The objectives of these meetings were to provide a project overview, answer questions, raise general awareness, and solicit potential interview participants. Several members of the fishing community served as community liaisons, communicating the project to other fishermen and providing Ecotrust with additional contacts.

In addition, Ecotrust staff made follow-up phone calls to key individuals identified during outreach efforts and provided information (i.e., handouts, map examples, and Frequently Asked Questions [FAQs]) for fishing groups to use at meetings and/or post on websites, send out to email lists, newsletters, and discussion boards. We also described the project on a webpage (http://www.ecotrust.org/tsp), which included a FAQ page and a link to the DLCD Territorial Sea Plan website (http://www.oregon.gov/LCD/OCMP/Ocean_TSP.shtml).

Given the expert nature of the information needed for this project, the use of a random sample for the commercial fisheries was not the most desirable sampling method. Instead, we constructed a purposive, proportional quota sample designed to be representative of the spatial value of commercial fisheries overall. To create our sample, we used PacFIN ex-vessel revenue landings data to identify fishermen in each target commercial fishery so that respondents for each fishery would represent (by port and region wide):

- At least 50% of the total landings and/or ex-vessel revenue from 2004–2008; and
- At least five fishermen, except in cases where the sample population was fewer than five.

After target commercial fishermen were identified, port liaisons and Ecotrust staff initiated contact with individual fishermen to ask for their participation in the process and to schedule interview times. During the interviews, commercial fishermen were asked if they knew other commercial fishermen who they felt either should be interviewed or would be interested in being interviewed.

Ecotrust identified charter operators by networking in each port. Because of advertising and marketing, charter operations are often highly visible in a harbor and widely known. Using this method, Ecotrust field staff compiled a list of charter operations in each port, and later confirmed and added to this list as each charter operator was interviewed. Because the charter owner/operator population is small, we were able to interview almost 100% of the state-wide coastal charter fleet.

Within the recreational sector, Ecotrust staff networked with port communities to interview recreational fishermen within three recreational sub-sectors: 1) motorized, powered private vessel ("sport boats"); 2) kayak fishing; and 3) dive. In addition to these in-person interviews, Ecotrust also launched an online tool designed to collect data from recreational fishermen across the entire state of Oregon. This is a supplementary strategy we added to our project in order to reach out to the large population of recreational fishermen not able to participate in face-to-face interviews in coastal towns.

To conduct outreach for in-person interviews and the online survey tool, Ecotrust staff conducted a series of outreach meetings, worked with key leaders in the recreational community, met with port and sector liaisons, posted information to online fishing forums, contributed to fishing association newsletters such as the Coastal Conservation Association, sent information to email listservs, and disseminated flyers at bait-and-tackle stores and ODFW field offices, etc.

To further reach out to the coastal recreational fishing community, Ecotrust conducted a mailing to 3,253 individuals. This list of individuals was created by obtaining two sets of contact data. One set was obtained from ODFW, which listed the contact information of individuals who bought an annual recreational fishing permit in 2009. The other dataset was obtained from the Oregon Marine Board, which lists the contact data of all individuals who have a registered boating vessel in Oregon. Cross-referencing these two datasets, Ecotrust created a list of individuals who both had an annual recreational fishing permit and own a boat. This list was then further stratified by zip codes into regions: coastal, valley/coastal, valley, and east of the cascades. In order to target coastal recreational fishermen, we sent mailings to 100% of the individuals who had coastal zip codes, 75% of those who had valley/coastal zip codes, and 50% of those who had valley zip codes.

Given that the same fishing license and boat registration process is used by the state for individuals who fish in freshwater or salt water, we included a preaddressed, stamped postcard with each mailing asking the recipient to mail it back after checking one of the following options:

- I plan to participate in the Oregon Recreational Fishing Survey.
- I plan to participate in the survey, but prefer to do it either in person or over the phone. Please contact me about one of these options at this phone number: _____
- I do not recreationally fish (private vessel, dive, or kayak) in Oregon coastal waters.
- I do recreationally fish in Oregon coastal waters, but am not interested in participating in the survey because _____

Of the 2,926 information packets sent out, only 232 individuals (7.9%) returned the response card. Of those responding, the rate of intent to participate in the survey was greatest from respondents in coastal counties (64.3%), then coastal/valley counties (50.0%), and finally valley counties (32.8%). These rates of intent generally corresponded with levels of participation in saltwater fishing by geographic region—the region with the highest rate of participation in saltwater fishing had the highest intent to participate. Table F.1 also shows the percentage of respondents who fish in coastal waters by geographic area of residence.

Table F.1: Summary of responses

	Fish in coastal waters	Don't fish in coastal waters
Coastal	82.1%	17.9%
Valley	54.8%	45.2%
Valley/coastal	44.3%	55.7%
East of Cascades	—	—
Total	58.6%	41.4%

A number of factors, such as the time constraints imposed on the project and the unknown overall size of the Oregon coastal recreational fishing community by mode, geography, and demographics made the use of this sampling methodology the most practical.

INTERVIEWS

The interview process varied by sector; commercial fishermen were interviewed in person using a desktop version of a custom-built Geographic Information System (GIS) application known as Open OceanMap[22], as were charter operators. Interviews with recreational fishermen were done either in person or using a web-based version of Open OceanMap (http://oregonfishing.ecotrust.org). The majority of surveys with recreational fishermen were completed in person with field staff; approximately 31% of the surveys were completed online. Data collection occurred in two stages: March-May 2009 and December 2009–September 2010. We compiled these data in a geographic information system (GIS) that we delivered to the Oregon Department of Land Conservation and Development (DLCD).

Interviews were conducted in person using one-on-one or small group formats. Field staff used Open OceanMap to map areas representing participants' fishing grounds and collect other non-spatial attributes, including demographics, basic operations (gear types, crew size/composition, operating costs and revenues), and other descriptive characteristics.

All interview data were entered directly into a spatially enabled, Open Source GIS database using Open OceanMap, which is programmed to allow fishermen to draw fishing areas in their natural sizes (polygons) rather than confining responses to a statistical grid or to political boundaries. We are then able to standardize this information across respondents or fisheries. Although data are later summarized to a variety of different raster outputs for the subsequent analysis, the raw data are entered in natural shapes and at a spatial scale that makes sense to respondents. Base information (nautical charts, 1:185,236) are used to guide their responses.

All interviews followed a shared protocol:

1. Maximum extent: Using electronic and paper nautical charts of the area, fishermen are asked to identify, by fishery, the maximum extent north, south, east, and west that they would forage or target a species.
2. Scaling: They are then asked to identify, within this maximum forage area, which areas are of critical economic importance, over their cumulative fishing experience, and to rank these using a weighted percentage—an imaginary "bag of 100 pennies" that they distribute over the fishing grounds.
3. Non-spatial information pertaining to demographics and basic operations was also collected.

The first step establishes the maximum extent of the fleet in each fishery. This differs for all fisheries, some of which range far along the entire West Coast, while others are confined to inshore waters. In the subsequent analysis this allows us to distinguish between fisheries that take place wholly in the Oregon Territorial Sea from others that take place both inside and outside. When respondents provide the extent of their fishing grounds they are not constrained to just state waters or any other political or management boundary. This allows for further analysis regarding which fisheries occur wholly or partially in a given area regardless of its designation.

[22] For more information on Open OceanMap, see http://www.ecotrust.org/ocean/OpenOceanMap.html.

The second step serves to scale respondents' reporting of the relative importance of the fishing grounds to a common scale. This is important for making inter- and intra-fishery comparisons. We chose 100 pennies as an intuitive common sum scale for scoring the relative importance of subareas identified within the larger fishing grounds. It also provides us with a convenient accounting unit for aggregating the stated importance per unit area in the intermediary steps of the various analyses performed.

The non-spatial information related to demographics and basic operations is helpful in creating summary statistics and estimating basic operating costs.

Throughout the project, strict measures were taken to ensure and protect the confidentiality of the information provided by fishermen. Interviews were conducted under individual non-disclosure and consent forms. Measures also included data collection and analysis protocols that mask all names and identifying characteristics of an individual's fishing grounds, as well as new functions in Open OceanMap used to conduct the interviews. In line with this effort, data for ports or fisheries with three or fewer respondents have been withheld from publication to protect the confidentiality of the survey respondents[23]. Fishermen own the original knowledge (fishing trade secrets) as protected under the non-disclosure agreement documents.
Quality assurance and quality control (QAQC) involved a four-step process:

1) editing of spatial data by Ecotrust staff based on notes from interviews and when required to standardize the data (e.g. clipping a shape to the shoreline);
2) review by each participant of his/her individual maps and information;
3) review by fishing communities, through group meetings, to verify aggregated results; and
4) coordination with fishing communities to ensure confidentiality of any publicly displayed information.

[23] An asterisk denotes such instances in the following summary statistics tables, and should not be confused with the dash, which indicates "no data collected". Data may be unavailable because either a particular fishery does not occur in a particular port, or because survey respondents declined to answer. A double asterisk appears in Table 2 only and indicates that while the data are withheld for confidentiality reasons, the survey representation met or surpassed our 50% sampling goal.

APPENDIX G: FEAM and RecFEAM Methods

The following is an excerpt from the final report, "Economic Contribution Factors for the Oregon Fishing Community Mapping Project", prepared for Ecotrust by The Research Group in September 2011. For more detailed information on FEAM and RecFEAM please see The Research Group (2005) and The Research Group (2009).

I. INTRODUCTION

The Research Group, Corvallis, Oregon maintains a West Coast commercial fishing industry computer model called the Fishery Economic Assessment Model (FEAM) and a recreational fishing computer model call RecFEAM. The Oregon portion of the FEAM is a fishing industry detailed sectoral model based on 19 vessel operation classifications and five processor operation classifications. Expenditures by the operations are tracked through five regional coastal economies and the State's economy. The five regional economies' input-output multipliers are from the IMPLAN system. Both models' results show average and marginal regional economic contribution estimates that arise from the two fishing sectors. The results have been used by government agencies for fisheries descriptions projects (for example see The Research Group 2009) and for management and policy analysis (for example see PFMC 2003).

Ecotrust's (2010) Oregon Fishing Community Mapping Project (FCMP) commercial fishing survey results are itemized by fishing strategies. The FEAM also uses a fishery classifications system, but the two structures are incongruent with each other. It was necessary to use imputation and scaling to arrive at a common set of itemized fisheries that could be associated with economic factors. The translation rules are shown on Table G.1. It was also necessary to aggregate FCMP identified ports in order to arrive at common and appropriate regions. First-order estimates for the more detailed strategies and ports can assume the rolled-up category economic factors are applicable. The FCMP uses an Ecotrust survey of charter customers and boat owners to determine recreational trip characteristics while the RecFEAM depends on the ODFW Oregon Recreational Boater Survey Program for trip counts.

The FEAM is based on the universe of vessels making onshore landings in Oregon and the FCMP for the commercial fisheries component is about a 25% vessel sample size. It is assumed the FCMP survey results are unbiased for universe representation.[1]

This report provides a summary description of the FEAM and RecFEAM methods and application. Procedural steps are described to show how FEAM and RecFEAM fisheries classifications are translated to Ecotrust fishing strategies. Procedural steps are also described for applying the economic contribution factors to new base data. The provided economic contribution factors can be adjusted to new data years when ex-vessel prices and trip counts might be different than the base period for which the summary results apply. Finally, total economic contribution summary tables are included in the respective commercial and recreational model description sections.

1. The FCMP fishing strategies are not complete for all onshore landings and do not include any offshore landings. Also, there are other recreational ocean fisheries modes besides charter and private boat fishing. Therefore, the sum of economic contribution originating from FCMP survey results will not express total economic contribution from ocean fisheries.

Table G.1
Translation Rules for Associating FEAM Species/Gear Group Categories with Ecotrust Fishing Strategies

Ecotrust Fishing Strategy	FEAM Fisheries
1.0 Dungeness crab	Dungeness Crab
2.0 Salmon troll	Troll Coho
3.0 Halibut longline	Pacific Halibut
4.0 Albacore tuna troll	Albacore Tuna
5.0 Pink shrimp trawl	Pink Shrimp
6.0 Hagfish trap	Smelt/Shad/Mack $
7.0 Sardine net	Herring/Sardine
8.0 Urchin dive gear	Sea Urchin
9.1 LE GF trawl gear	
a. Petrale sole	Sole/Flounder
b. Other non-whiting	weighted average on revenue for: Cod/Rockfish Blackcod Trawl Shark/Skates Sole/Flounder
c. Pacific whiting	weighted average on revenue for: Whiting-Surimi/shore 75% Whiting H&G/shore 25%
9.2 LE and OA GF fixed gear	
9.2.1 Sablefish fishery	Blackcod Fixed Gear
9.2.2 Non-sablefish fishery	
9.2.2.1 Live fishery	Cod/Rockfish
9.2.2.2 Other condition fishery	Blackcod Fixed Gear
Offshore Pacific whiting	Whiting Surimi/(ms)$

Notes: 1. Excludes fish meal and distant water.

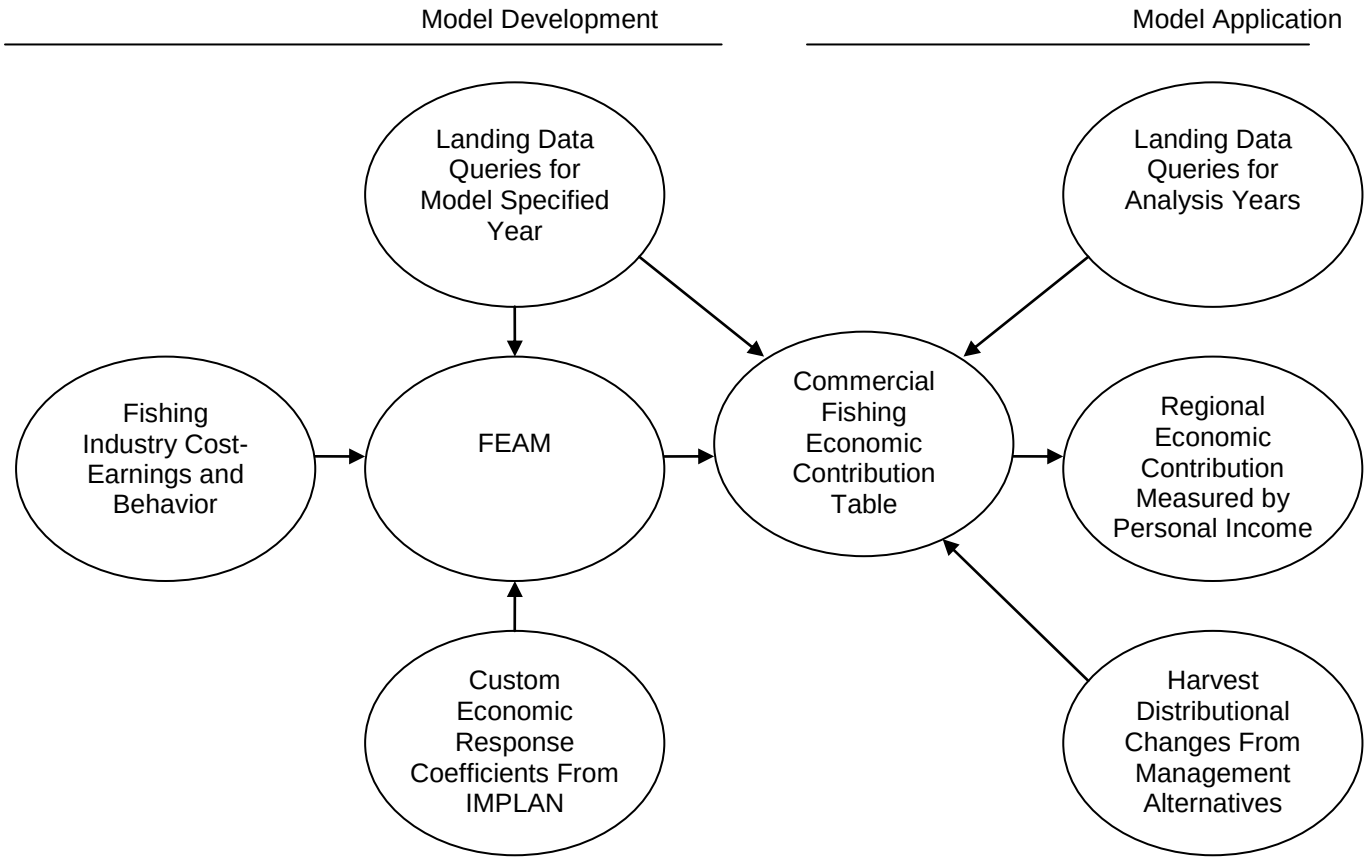
II. COMMERCIAL FISHING ECONOMIC CONTRIBUTION MODEL DESCRIPTION

A. Background

1. Commercial Fishing Economic Contribution Intermediary Table

A typical analysis use of the FEAM is to determine the incremental changes in economic contribution from altering harvest or processing production factors. The incremental changes are then incorporated into a spreadsheet application for showing analysis results. This cumbersome two stage shortcoming is because the FEAM output is not structured for convenient application to the management or policy parameters being analyzed. It is more suitable to have an intermediary table created that is generalized for application to any envisioned analysis of management or policy alternatives. We describe below how this intermediary table is created. We use the term "commercial fishing economic contribution table" for the intermediary table. Figure G.1 is a schematic of the analytical pathways for developing and using the table. We then describe how intermediary table is adapted for showing economic contribution factors associated with Ecotrust fishing strategies.

Figure G.1
Schematic of Analytical Pathways Used to Develop and
Apply the Commercial Fishing Economic Contribution Table



The FEAM was developed by Hans Radtke and William Jensen for the West Coast Fisheries Development Foundation in 1984, resulting from a need to utilize existing data on fisheries to estimate the economic contribution of the fishing industry to regional economies. The PFMC first utilized this model as a result of a threatened lawsuit brought by the Small Business Administration that contended the PFMC had not considered the economic and social impact of their salmon management decisions on small businesses.

The FEAM utilizes the basic framework of a secondary input/output model combined with local industry information to create economic analysis descriptions relating to fishery resource use.[1] The FEAM relies on factors from IMPLAN to estimate total personal income generated from harvester and processor activities. The IMPLAN generated response coefficients are applied to specific business expenditure categories to calculate personal income contributions. The FEAM results have been useful because much of the commercial fishing industry information is not described in published employment data.

Commercial fishing landings data is a model input and is received from the Pacific Coast Fisheries Information Network (PacFIN) data system. PacFIN contains a standardized compilation of selected information from state fish ticket databases maintained by West Coast states. Landing volume and value data flows through the model from harvesting methods (boat and gear type) and intermediate use (buyers and processors). The resulting economic activity from these dollars creates economic contribution to the local economy as measured by household personal income. The IMPLAN derived response coefficients translate direct business spending into the household personal income. The FEAM model is a menu driven computer program that easily allows the analyst to change data and key assumptions about harvesting and processing activities. The model results when subtracted from baseline conditions show the economic impacts of fishery and fishing industry changes.

The personal income estimates can be made for any single or multiple of counties. It is assumed that county boundaries surrounding a port-of-landing define economic regions. To the degree that processing activities, the vessel home port, and the homes of workers and owners in the industry are located in the port of landing, the personal income generated is more likely to occur in the community associated with the port of landing than in other areas of the county. To the degree processing activities, the vessel home port, and the homes of workers and owners in the industry are located outside of the county, the person income estimates likely overestimate income generated in the county. Where landings are made in one port and a vessel is home located in another port or the workers live in another port, or where processors transfer product from one port to another, there are likely some cross-impacts between ports that are not measured or are attributed to the wrong geographic area. Some of the cross impacts may cancel each other out.

The key elements of the FEAM model are:

- Response coefficients (applied to expenditures of the firms and income earned by those employed and owning fishing enterprises).
- Inventories of vessels (number of fishing vessels of different types by port). Harvester fixed costs and expenditures per pound landed.
- Inventories of processors and buyers (number of processors/buyers of different types by port). Processor/buyer variable costs, processor margins and recovery rates, by product form and species, and processor/buyer fixed costs.
- Inventories of the species, weights, and value of fish landed. Distribution of fish among harvesters and processors.

With the exception of the coefficients each of these segments requires input by the model user. Inventories and distribution information was derived largely from PacFIN data. Information on processor and buyer inventories (counts of firms by type and community) was augmented by a prior knowledge of the industry. The processor margins and harvester and processor budgets were based on interviews and numerous studies.

Three types of income are included in the income impact estimates:

- Direct (earnings of labor and owners in the harvesting and processing sectors).
- Indirect (earnings of labor and owners in firms supplying harvesters and processors, e.g. wages paid by a gear manufacturer).

1. Basic economic impact analysis attempts to sort out the driving economic activities in regional economies (Scott 1984). Local industries with markets outside of the region bring new money into the region and are called basic industries. Industries with markets within the region are called secondary or support industries. Thus, when there is an increase in spending in basic industries, there is a resultant increase in secondary industries. Trade leakage occurs when spending and respending for labor, supplies, and services occurs outside the region. The relationship between an activity's total impact on the region's economy that includes the effect from the secondary industries, and the basic industry, is known as the multiplier effect. In the vernacular of input-output modeling terminology, the total impact on an economy included the direct, indirect, and induced effects of the activity.

- Induced (earnings of labor and owners that occur when those earning direct and indirect income spend their income, e.g. income earned by the owner of a grocery store).

Modeling results can be extended to other years based on processor and harvester marginal impacts per pound. Per pound processor margins and expenditures are assumed constant and harvester impacts are adjusted based on changes in ex-vessel price. Species and port specific ratios per pound are multiplied by the price for a particular year to get an income impact estimate for that year. A concern in using this approach is the more the ex-vessel price deviates from the range of prices used to develop the estimate in the base year, the more the estimate of harvester related income impacts is likely to be inaccurate and the more likely that processor margins will change.

2. Assumptions

There are several major simplifying assumptions:

- The model relies on response coefficients generalized from IMPLAN. Several studies have evaluated the overall performance of IMPLAN, and although results are inconclusive, IMPLAN's outcomes have been shown to be plausible (Crihfield and Campbell 1991; Rickman and Schwer 1995). In addition to the problems of modeling input-output, IMPLAN implicitly assumes national average production coefficients and margins, and uses a set of econometric equations to predict interregional trade flows. Users of IMPLAN must be willing to accept these assumptions and estimation methods or have the ability to incorporate user-supplied data to improve the accuracy of their impact estimates.

- The inter-industry dollar flows from the adopted IMPLAN data year apply to the analysis year.

- The type of processing and fleet mix is uniform and the state level applies to port group areas. There is some fleet variability included in the analysis due to species and gear combinations and the marginal economic impacts are adjusted by port group area price.

- The amount of processing done within each state and port group area equals the amount landed for the base year. The intermediary table can be used to adjust for cross hauling of raw product.

- The sum of port group areas within each state will not equal the state total. This is because: a) not all landings reported by PacFIN are associated with a port, and b) the port group area price is used to calculate harvester economic contributions rather than the statewide average price.

- At the West Coast level, the three-state economic impacts are a sum of individual state economic impacts, rather than completing a region-wide analysis. This is because many species management regimes that affect landing locations, ex-vessel price, processing product forms, etc. are associated with state boundaries.

- The FEAM assumes only one mix of finished product form per species/gear category. The intermediary table can be used to adjust for different product forms.

- Ex-processor sales price is estimated using cost calculation from the FEAM model or using published sales price information for the product form sold in an area.

- Fish license fees and product taxes/surcharges are constantly changing.

- Marginal impacts are a constant percentage of average impacts. To estimate marginal impacts per pound, divide average impacts by 89 percent.

3. Limitations

The regional economic contribution calculated using the commercial fishing economic impact model are indicators of the amount of dislocation costs which may occur in the event of reductions in ocean fisheries, but are not indicators of the net loss to the nation from such reductions. If sufficient quantitative information and defensible analytical models are available, then a net gain or loss to the nation determined through a benefit-cost analysis (BCA) using net

economic value (NEV) measurements should be used.[1] In general, there is no particular relationship between changes in NEV derived in a BCA and regional economic contribution measurements. However, both are useful to decision makers for showing the consequences of management and policy actions.

Regional economic contribution estimates measured by personal income provide a value that is comparable to similar values often used to describe activities in nonfishing sectors of the economy. If the fishing activity is reduced, personal income is not necessarily reduced by a proportional amount. The effect on personal income in the local and national economies will depend on alternative activities available and the location of those activities. If there were a reduction in the ocean fisheries, over the long run workers in the commercial and recreational fisheries, vessel and processing plant owners, and food fish consumers would be expected to adjust to the reductions by changing the activities in which they engage. The type of the alternative activity in comparison to the fishing activity determines the net effect of changes in ocean fisheries.[2] The effect on the local economy would differ from the effect on the national economy to the degree the alternative activities were located outside the local community.

The personal income estimates from the FEAM provide information on a representative year basis and are an indicator of the magnitude of the possible redirection of money between nonfishing-dependent and fishing-dependent sectors that may occur with changes in the fishery. The amount of redirection represents a dislocation which may have regional economic and social costs that would not be reflected in a typical BCA analysis.

B. Application

The following is an explanation about procuring and reducing Pacific Fisheries Information Network (PacFIN) landing data; and, using FEAM results in the development of the intermediary table to be used in analysis applications. The landing data is received as text formatted files and committed to a Microsoft Access database. The FEAM is a menu driven computer program whose output is in text formatted files. Landing information from database queries and FEAM output is used as input to build an intermediary table using Microsoft Excel software. The figure in Appendix G.1 shows the steps used to develop the intermediary table in a flow chart depiction.

The resulting intermediary table is in FEAM species/gear categories and required adaption to Ecotrust fishing strategies according to the rules in Table G.1.

<u>Algebraic Notation for Calculating Economic Contribution</u>

Total commercial economic contribution (*CC*) is a function of average price (*p*) for all species harvested using a particular fishing strategy (*s*) and landed in a region (*d*). The multiplier effect from the expenditures made to support the fishing activity are different for harvesters (*h*) and processors (*b*), or in notation form:

$$CC_d = f(p, s, h, b)$$

where:

CC	=	total commercial economic contribution measured in personal income
d	=	region where harvest is delivered
p	=	average onshore landed price of all species associated with a fishing strategy
s	=	fishing strategy
t_0	=	base year for FEAM
t_1	=	analysis year
h	=	FEAM harvester economic contribution factor adapted to Ecotrust fishing strategy
b	=	processor economic contribution factor adapted to Ecotrust fishing strategy

1. The benefit-cost analysis from management actions includes the sum of expected changes in: (1) potential changes in consumer surplus derived from recreational fishing, (2) potential changes in consumer surplus derived from non-consumptive use, (3) existence value, (4) consumer and producer surplus from commercial fishing landings, and (5) less management costs (administration, monitoring, and enforcement).
2. For example, if a worker on a vessel or processing plant goes on government assistance as a result of lost ocean fishing opportunity and there is no new job or income created elsewhere in the economy, then the net loss to the nation and local economy with respect to the workers job would be the entire wages for that worker. However, if additional income is generated elsewhere either through the increased harvest in other fisheries or through the consumers redirection of food expenditures from West Coast caught fish to another food source such as fish from other areas or chicken (with the consequent generation of additional income or jobs for some of those in the other fishery or chicken producing industry), then size of the net negative effect of the lost employment income would have to be reduced by some portion of the value of the increased economic activity elsewhere in the economy.

v = volume in round pounds

then:

$$CC_d = \sum_s v \cdot \left[\left(\frac{p_{t_1,s}}{p_{t_0,s}} \right) \cdot h_s + b_s \right]$$

Changing Economic Activity Measurements Between Economy Regions

The ratios used to change region impacts are calculated using the input-output coefficients for household expenditures from the FEAM. The total coefficients (direct, indirect, and induced) in a larger area are divided by a smaller area to get the ratios. The ratios shown are normalized to state areas. The ratios for port groups are for changing local to state impacts.

State	1.00
Astoria Area	1.16
Astoria, Cannon Beach, Gearhart - Seaside, Columbia River	
Tillamook Area	1.25
Tillamook/Garibaldi, Pacific City, Nehalem Bay, Netarts Bay, Salmon River	
Newport Area	1.25
Newport, Depoe Bay, Siletz Bay, Waldport	
Coos Bay Area	1.23
Florence, Winchester Bay, Coos Bay, Bandon	
Brookings Area	1.25
Port Orford, Gold Beach, Brookings	

III. RECREATIONAL FISHING ECONOMIC CONTRIBUTION MODEL DESCRIPTION

A. Background

The RecFEAM generates economic contribution factors measured by total personal income per angler day for different target fisheries and for different modes of fishing.[1] There are two components that go into the factor calculations: (1) angler's itemized trip expenditures, and (2) the appropriate income multipliers for the itemization and pulled from IMPLAN system.[2] The calculation of the economic contribution factors is the multiplication of the two components and the division of the number of trips. The application of the economic contribution factors is simply to multiply a known number of angler days for a particular fishery by the factor for that fishery.

The recreational fishing economic contribution factors are measured by personal income accruing to local households. No differentiation is made between anglers that are resident and non-residents. This is important to point out because non-resident spending in regional economies generates new income through their trip expenditures. Local resident fishing trip spending may or may not have been spent anyway in the regional economy, so the economic contribution cannot be considered calculations of basic economic contribution arising from recreational fishing activities. The economic contribution estimates do include the multiplier effect from respending in the local economy.

The economic contribution calculations start with estimates of angler spending for a fishing trip's variable cost. This means the economic contributions do not include effects from capital purchase items like boats.[3] There are other

1. The Research Group (September 2009) contains a more thorough explanation of RecFEAM and the calibration data sets. This reference also contains economic contribution results from applying the model to Year 2008 coastal Oregon recreational fishing activity.
2. Sometimes the word "trip" is used in this report's narrative, but the unit of measurement for effort is an angler day. The hours actually spent fishing in a calendar day are not a consideration. The amount of money spent for the fishing experience is not appreciably different whether fishing was for a few or many hours. Literature use of the word trip is usually associated with a fishing experience duration that may be more or less than a calendar day. Trip counts in this study have been adjusted to account for multiple days when fishing occurred during a single trip.
3. There are modeling issues associated with determining the economic effects from capital purchases in a regional economic study such as the Oregon Coast. One issue is where the spending for capital items has occurred. Was the spending in the angler's resident economy, en route

studies that do include fishing capital costs which might be of interest to readers of this report, and they include Steinback et al. (2004) and USFWS (2007). A fishing trip may be for multiple purposes such as visiting a museum, so it could be the spending and consequently the economic contribution estimates overlap with other causes of recreational activity impacts. Number of angler days are from the Oregon Recreational Boat Survey (ORBS) results.

Response coefficients from IMPLAN are then applied to the itemized expenditures for the trip's variable costs. The results are summed over the itemizations to show total personal income contributions for a trip. To generalize the results for use in new applications, the ratio of total personal to total trips is calculated. The above calculations are repeated for each trip target fishery differentiation that has known expenditures.

B. Application

When effort and economic contributions are reported in port groups, the following are city and area assignments.

Port Group	Cities and Areas
Astoria	Astoria, Hammond/Warrenton, Gearhart, Seaside and Cannon Beach
Tillamook	Tillamook, Garibaldi, Netarts, and Pacific City
Newport	Newport, Depoe Bay, and Salmon River
Coos Bay	Coos Bay, Florence, Charleston, Winchester Bay, and Bandon
Brookings	Brookings, Gold Beach, and Port Orford

The algebraic notation for calculating total economic contribution for ocean charter and private boat expenditures is as follows.

Total recreational economic contribution (*RC*) is a function of fishing mode (*m*), angler residency (*l*), angler spending (*c*), and the multiplier effect (*e*) in the region (*d*) where the spending occurs. In notation form:

$$RC_d = f(m, l, c, e)$$

where:
- *RC* = total recreational economic contribution
- *d* = economic region where spending occurs (including destination, en route, or trip origin locations)
- *m* = mode (private boat, charter)
- *l* = residency (resident and non-resident to economic region)
- *c* = trip spending for itemization *i* (bait, lodging, license fees, etc.)
- *g* = total number of angler days
- *e* = IMPLAN response coefficient for sector *i*

The economic contribution factor (*k*) is:

$$k_m = \sum_i c_{l,m} \cdot e_i$$

Assume there are no substitution effects (i.e. trips by residents within the economic region being analyzed are included), then:

$$RC_d = \sum_m g_m \cdot k_m$$

to the fishing location, or at the fishing location? Another is how much of the capital item is actually associated with fishing. A pickup truck used to pull a boat may be used for other transportation purposes too. Estimates of the economic effects from equipment and other capital items vary widely in studies. For example, Steinback et al. (2004) found 87 percent of total economic contributions were from capital items for saltwater fishing in Oregon. The USFWS (2008) found total spending for saltwater fishing nationwide was 47 percent for non-trip related items.

IV. BIBLIOGRAPHY

Crihfield, J.B. and H.S. Campbell. "Evaluating Alternative Regional Planning Models." *Growth and Change,* 22(2):1-16. 1991.

National Marine Fisheries Service (NMFS). Guidelines for Economic Analysis of Fishery Management Actions. Revised March 2007.

Pacific Fishery Management Council (PFMC). Final Environmental Impact Statement for the Proposed Groundfish Acceptable Biological Catch and Optimum Yield Specifications and Management Measures 2003 Pacific Coast Groundfish Fishery. January 2003.

Rickman, D.S. and R.K. Schwer. "A Comparison of the Multipliers of IMPLAN, REMI, and RIMS II: Benchmarking Ready-Made Models for Comparison." *The Annals of Regional Science,* 29:363-374. 1995.

Scott, M. "A Fishery's Guide to Understanding Secondary Economic Impacts of Northwest Salmon and Steelhead." Paper presented at Making Economic Information More Useful for Salmon and Steelhead Decision, a workshop sponsored by National Marine Fisheries Service, July 24-26, Seattle, Washington. NOAA Technical Memorandum NMFS F/NWR-8, National Marine Fisheries Service. Portland, Oregon. 1984.

Steinback, Scott, Brad Gentner, and Jeremy Castle. The Economic Importance of Marine Angler Expenditures in the United States. Via Internet: http://www.ncseagrant.org/files/ NOAA_economic_abb.pdf. NOAA Professional Paper NMFS-2. January 2004.

Steinback, Charles, Sarah Kruse, Cheryl Chen, Jon Bonkoski, Taylor Hesselgrave, Nick Lyman, Leanne Weiss, Astrid Scholz, Ed Backus, Kelsey Miller and John Stevenson. Supporting the Oregon Territorial Sea Plan Revision: Oregon Fishing Community Mapping Project. November 2010.

The Research Group. Oregon Angler Survey and Economic Study. Final Report. Prepared for Oregon Department of Fish and Wildlife. June 1991. The Research Group.

The Research Group. Nearshore species commercial fishing economic analysis. Prepared for Oregon Department of Fish and Wildlife and Oregon Coastal Zone Management Association. August 2005. The Research Group.

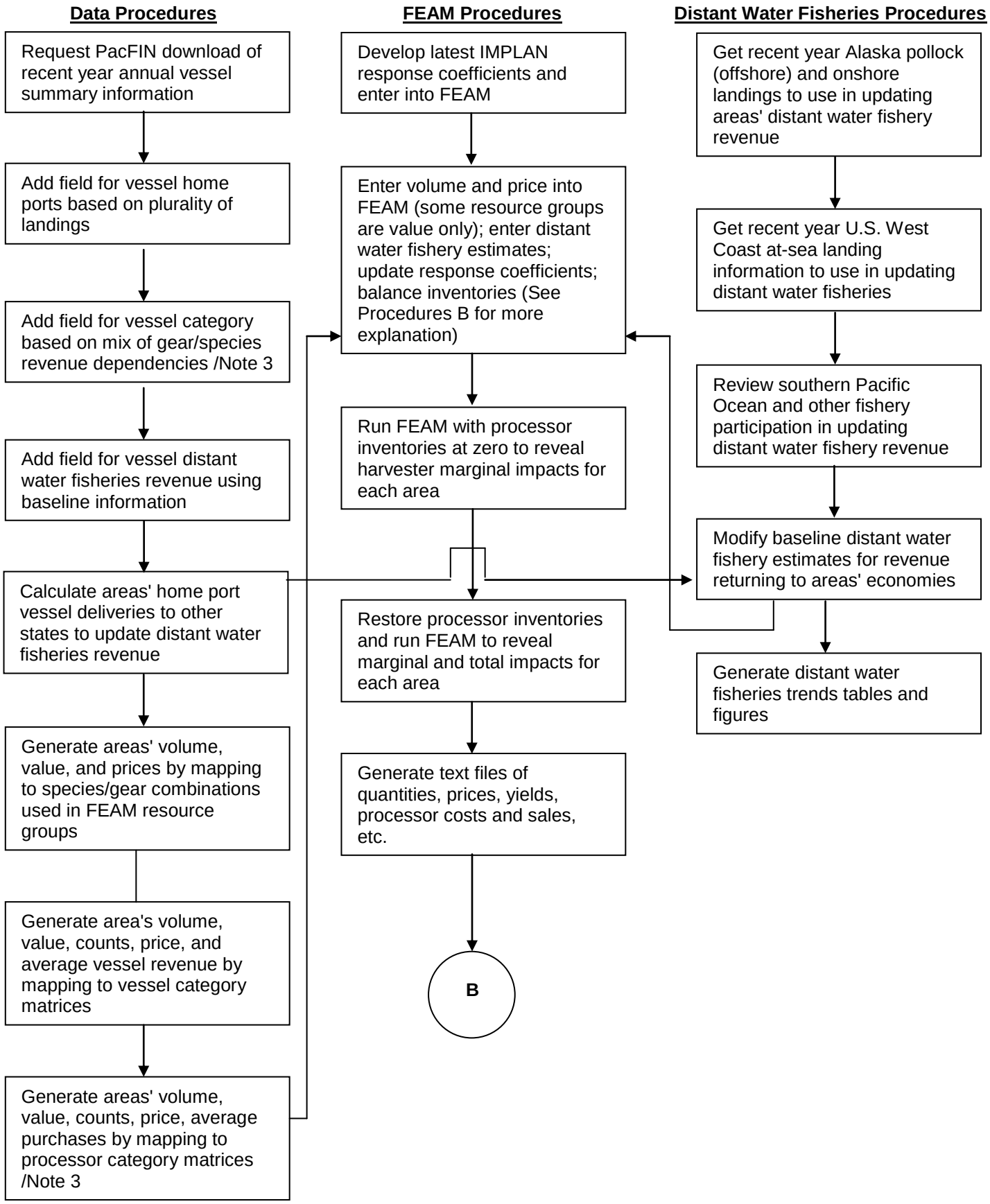
The Research Group. Review of the West Coast Commercial Fishing Industry in 2004. Pacific States Marine Fisheries Commission. September 2006. The Research Group.

The Research Group. Oregon Marine Recreational Fisheries Economic Contributions in 2007 and 2008. Prepared for Oregon Department of Fish and Wildlife and Oregon Coastal Zone Management Association. September 2009. The Research Group.

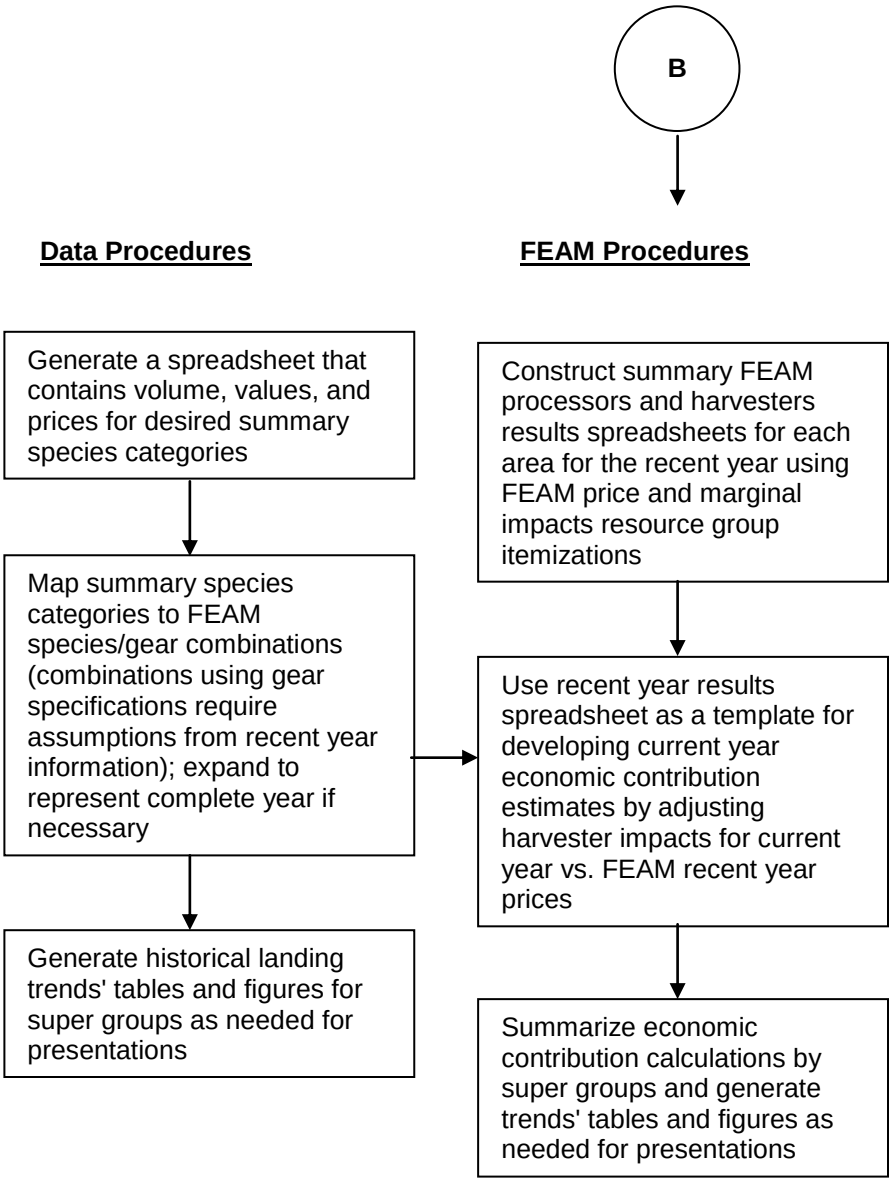
U.S. Bureau of Economic Analysis. http://www.bea.gov/.

U.S. Fish and Wildlife Service (USFWS). 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: Oregon. http://www.census.gov/prod/2008pubs/fhw06-or.pdf. April 2008.

APPENDIX G.1: FEAM DATA REDUCTION AND ECONOMIC ANALYSIS MODELING PROCEDURES



FEAM DATA REDUCTION AND ECONOMIC ANALYSIS MODELING PROCEDURES (CONT.)



Notes:
1. Areas are WOC, states, and port groups within states.
2. "Recent" year is the latest year when landing data is complete. "Current" year is today's year and may have partial year landing data requiring assumptions for making complete year estimates.
3. Processor and vessel categories are explained in The Research Group (2006).