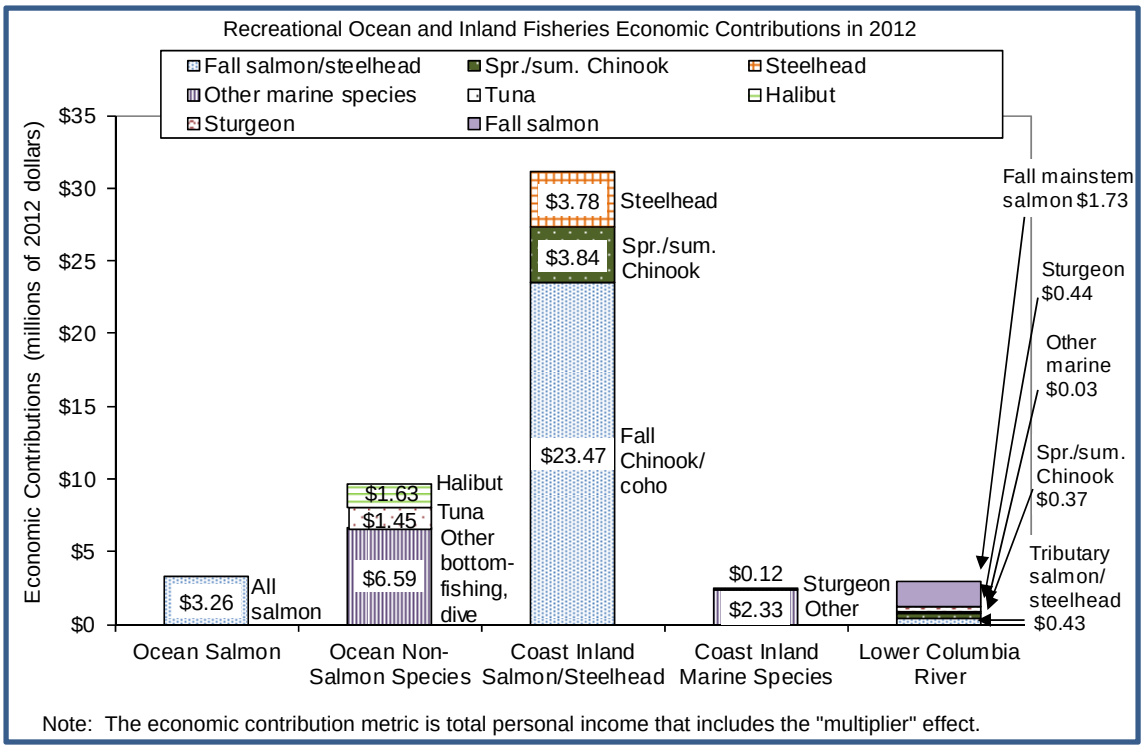
# OREGON MARINE RECREATIONAL FISHERIES ECONOMIC CONTRIBUTIONS IN 2011 AND 2012




**Oregon Department of Fish and Wildlife**

**and**

**Oregon Coastal Zone Management Association**

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# OREGON MARINE RECREATIONAL FISHERIES ECONOMIC CONTRIBUTIONS IN 2011 AND 2012

*Revision 2.1*


prepared by

The Research Group, LLC
Corvallis, Oregon

with assistance from

Oregon State University
Coastal Oregon Marine Experiment Station
Newport, Oregon


prepared for

Oregon Department of Fish and Wildlife

and

Oregon Coastal Zone Management Association

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# PREFACE

This study was sponsored by the Oregon Department of Fish and Wildlife (ODFW) and administered by the Oregon Coastal Zone Management Association (OCZMA). The OCZMA is a voluntary association of over 40 local coastal governments comprised of counties, cities, ports, Indian tribe, and soil and water conservation districts. The ODFW contract manager was John Seabourne and the OCZMA administrator was Georgia York. The study consultant was The Research Group, LLC, Corvallis, Oregon (TRG). At TRG, Shannon Davis was the principal author and was greatly assisted by Kari Olsen. Gil Sylvia, Superintendent at the Coastal Oregon Marine Experiment Station (COMES) provided valuable guidance and review.

The ODFW staff provided data and explanations in a timely manner. The staff includes Eric Schindler (Ocean Recreational Boat Survey); Shari Beals (Salmon-Steelhead, Halibut, and Sturgeon Tag Return Program); Jimmy Watts (Columbia River Creel Program); Brian Riggers and Shelly Miller (both from the Coastal Chinook Research and Monitoring Program); and, Troy Buell (Fisheries Management Program Leader). Bob Buckman (Middle Coast district fish biologist) and the other coastal district fish biologists also assisted. William Jenkins (ODFW economist) provided helpful advice. The federal agency people providing information and advice include Mike Burner (Pacific Fishery Management Council (PFMC) salmon fishery officer), John Devore (PFMC groundfish fishery officer), Brad Stenberg (Pacific States Marine Fisheries Commission (PSMFC) PacFIN representative), and Ed Hibsch (PSMFC RecFIN representative).

The report's title is somewhat of a misnomer in regards to the study being comprehensive for all Oregon Coast recreational fisheries. The study area and included fisheries are selective. Mostly their inclusion is driven by data availability and the study objective for being able to show trends. The report describes in detail the selected fisheries and locations so that the reader can sort out what is included in the accounting for Oregon Coast recreational fishing trips. Sufficient itemizations are provided so that comparisons and contrasts can be made between this study's results and to distinguish what might be found in other studies.

This report was reviewed in draft form for the purpose providing candid and critical comments that were to assist in making study results as sound as possible and to ensure that the report meets standards for objectivity, evidence, and responsiveness to the study charges. Although the reviewers have provided many useful comments and suggestions, they were not asked to endorse study findings and recommendations. The authors are solely responsible for making certain independent examination of this report was carried out in accordance with accustomed procedures and that review comments were carefully considered.

The authors' interpretations and conclusions should prove valuable for this study's purpose, but no absolute assurances can be given that the described results will be realized. Government legislation and policies, market circumstances, and other situations can affect the basis of assumptions in unpredictable ways and lead to unanticipated changes. The information should not be used for investment or operational decision making. The authors do not assume any liability for the information and shall not be responsible for any direct, indirect, special, incidental, or consequential damages in connection with the use of the information.

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# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ASA | American Sportfishing Association |
| CCRMP | Coastal Chinook Research and Monitoring Program (ODFW) |
| COMES | Coastal Oregon Marine Experiment Station |
| CPUE | catch per unit effort |
| CRCP | Columbia River Creel Program (ODFW and WDFW) |
| CSF | Congressional Sportsman's Foundation |
| FEAM | Fishery Economic Assessment Model |
| IMPLAN® | IMpact Analysis for PLANning |
| IPHC | International Pacific Halibut Commission |
| MSA | Magnuson-Stevens Act |
| MRFSS | Marine Recreational Fisheries Statistics Survey |
| MRIP | Marine Recreational Information Program |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic and Atmospheric Administration |
| OCZMA | Oregon Coastal Zone Management Association |
| ODFW | Oregon Department of Fish and Wildlife |
| ORBS | Ocean Recreational Boat Survey (ODFW) |
| PacFIN | Pacific Coast Fisheries Information Network |
| PFMC | Pacific Fishery Management Council |
| PSMFC | Pacific States Marine Fisheries Commission |
| RecFIN | Recreational Fisheries Information Network |
| SEB | Shore and Estuary Boat survey |
| SSHSTRP | Salmon-Steelhead, Halibut, and Sturgeon Tag Return Program (ODFW) |
| TRG | The Research Group, LLC |
| USFWS | U.S. Fish and Wildlife Service |
| WDFW | Washington Department of Fish and Wildlife |

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# OREGON MARINE RECREATIONAL FISHERIES ECONOMIC CONTRIBUTIONS IN 2011 AND 2012


## ABSTRACT

There is scattered and disparate information available about the economic effects from recreational finfish fisheries in Oregon's coastal areas. A study was undertaken to bring together existing economic information and provide additional economic analysis results so that magnitudes and trends could be discerned. Despite the attempt to make the descriptions comprehensive, the included fisheries are still selective. For example, the accounting does not include angler effort for targeting freshwater resident fish. The economic effects measurements are regional economic contributions measured by household personal income, and include the "multiplier" effect. The included fishing participants are a combination of resident and non-resident anglers. Total trips have been increasing in recent years, but are lower than the early 2000's when salmon abundances allowed for more recreational ocean fishing opportunities. For the study fisheries, there were about 1.0 million total trips in both 2011 and 2012. Recreational angling contributes substantially to coastal economies. Trip spending generated $47.5 million in 2011 and $49.5 million in 2012 of total personal income to coastal economies. Recreational anglers make additional contributions to local economies in ways other than trip spending, such as purchasing fishing equipment and boats, and owning second homes. Vibrant and year-around fisheries access is an indicator of healthy natural resources and can be considered an economic development asset. Living in such an environment is attractive to entrepreneurs and prospective employees. The attraction will be an important business location decision variable, along with more straightforward considerations such as the markets and suppliers logistics, and labor costs. Fishery managers are often presented with economic effects information from different user groups wanting more favorable access to fisheries. The report counsels that there are different ways to measure economic effects and that misuse of information can occur. Economic information can be valuable to decision making when there is forethought in proper data collection, economic modeling, and tradeoff discussions.


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## INTRODUCTION

The study's purpose was to compile information about the economic contribution from recreational finfish fisheries in Oregon's coastal area. This area was defined for the study to be westward of the Coast Range Crest.[1] The included fisheries are all saltwater fishing in the Pacific Ocean and inland estuaries, and freshwater fishing for some anadromous fish species. Fisheries are excluded when an angling trip's purpose is for freshwater resident species and other than the identified salmon, steelhead, and sturgeon anadromous species.[2,3] Trips for shellfish harvesting (such as for crab, clams, and mussels) are also excluded.[4] The presented economic information includes findings from other researchers, as well as economic modeling results developed for this study.

The selected recreational finfish fisheries in the study area have two major segments: when salmon is the targeted species; and, when all other non-salmon species are the primary purpose for making the fishing trip.[5] These two recreational fishery segments are further defined by where fishing occurs (ocean or inland), mode (boat or bank), and

whether guide services were used. Trip expenses and consequently the local economic contributions generated are quite different for these sub-segments. Ocean boat salmon fishing has much higher spending per trip, but there are more trips for the inland location. The ocean non-salmon fishery is often times referred to as the bottomfish fishery. Species targeted in this fishery are mostly bottom dwelling rockfish. There are also many charter and private boat trips for halibut and albacore tuna. Each of these non-salmon targeted species is itemized in the trip accounting for this study.

Recreational fishing usually occurs in the midst of a large commercial fishing industry effort.[6] Mostly the commercial fishing is relegated to ocean waters, but there are some bay commercial fisheries too.[7] To help characterize recreational fishing economic contributions, there are some comparative statistics discussed for commercial fishing.

A trip made for recreation purposes may be for multiple reasons, such as fishing and visiting a museum.[8] It could be the spending and consequently the economic contribution estimates in this study overlap with other studies of non-fishing recreational activities.

The recreational fishing economic contribution estimates provided in this report 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 estimates cannot be considered calculations of basic industry economic contribution.[9]

The economic contribution estimates do include the multiplier effect from respending in the local economy. The multiplier effect estimates are calculated using relationships from an economic input-output model. The 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. There are other studies that do include fishing capital costs which might be of interest to readers of this report: Gentner and Steinback (2008) and USFWS (2013).[10]

Oregon Coast recreational fishing trips have been increasing in recent years, mostly from increases in freshwater fisheries, but still are low compared to the early 2000's when salmon abundances allowed for more recreational ocean fishing opportunities (Figures 1 and 2). The reason has to do with the intricacies of angler motivations and fishing trip costs that influence angler behavior. Schramm and Gerard (2004) discuss these factors on a nationwide basis. Some anglers choose to make a fishing trip just to have an outdoor experience and others are more motivated by catch aspects (numbers and size of fish).[11]

There were many data sources and economic modeling considerations used in making the economic contribution estimates. Following sections in this report discuss some detail about the data limitations and modeling assumptions.[12] Another section contains summaries of modeling results and there is a concluding discussion section that cautions about using the results in fish management policy applications.

## DATA AND METHODS

### Background

Ocean salmon trip data is from Pacific Fishery Management Council (PFMC) annual preseason management reports. The data in these reports in recent years originate from state survey programs. The Oregon program for acquiring ocean salmon and bottomfishing catch and effort data is a service provided by the Oregon Department of Fish and Wildlife (ODFW) and is called the Ocean Recreational Boat Survey (ORBS). This ongoing program is an angler sample intercept survey (Schindler et al. 2012). In some years, the ODFW has also provided survey services for fishing in the lower estuary areas which is called the Shore and Estuary Boat (SEB) survey. ODFW discontinued the SEB survey services in 2005 due to budget restrictions. The last complete data year is 2002.

The Columbia River mainstem recreational fisheries have a separate survey program called the Columbia River Creel Program (CRCP). A sample angler intercept survey is combined with total trip counts from an aerial survey to provide the catch and effort estimates for the different mainstem fisheries. The area used in this study is downstream of the CRCP Section 9 and 10 demarcation (see Appendix A maps) and includes the popular Columbia River fall mainstem salmon fishery (sometimes referred to as the Buoy 10 fishery).[13]

The ORBS, SEB, and CRCP catch and effort estimates are compiled in a database called RecFIN. The RecFIN Program is administered by the Pacific States Marine Fisheries Commission (PSMFC).

Catch estimates for freshwater fisheries addressed in this study are from the ODFW Salmon-Steelhead, Halibut, and Sturgeon Tag Return Program (SSHSTRP). Program information provides annual catch data by stream segment or watershed. Anglers voluntarily return their completed tag forms to licensing agents and tabulations are expanded to also represent the proportion of anglers that do not return tags.[14] Reporting for the SSHSTRP is typically one or two years behind the current year, so the most recent year's analysis available was used to represent this study's current year. The SSHSTRP catch is translated to angler days using example coastal stream fishery creel survey CPUE results.

There may be some over-counting where an angler has combined more than one target species or fished in more than one location during one trip. This is an endemic problem in economic modeling when several different data sources are used to account for recreational fishing.

Catch is defined in this report to be retained fish. A recent trend in fishery management is to use "catch and release" or "selective fish" regulations. This means that average effort based on fish retained per unit of time fished may not adequately determine the total fishing pressure for certain fisheries where catch and release fish regulations are used. Because angler day estimates are based on catch and creel surveys that occur in areas where management regulations allow full and selective fish retention, the estimates probably are reflective of effort in these fisheries. However, some angling occurs in areas in wild fish management areas where available species and regulations are non-retention fishing only. Effort in areas and seasons with these regulations would not be included, causing a conservative influence on econometric contribution estimates.

Tables 1 and 2 show fishery specific data sources and have statements about data limitations and modeling methods and assumptions. Additional explanations about data and modeling are in The Research Group (2000).

The assigned success rates (days per fish, or the inverse of CPUE) used in this study (when it was necessary to calculate trips from catch) are shown in Table 3. Data sources except for the SSHSTRP did provide trip estimates so did not need the conversion to angler days. The assigned success rates are constant over all of the trend years referenced in this report. This is an important assumption because angler motivation is related to harvest rates (Larson and Lew 2013). To the degree that the assigned success rates reflect a particular year's harvest rate, it will dictate whether the assumption results in a conservative or liberal angler day estimate in a particular trend year.

This report's displays sometimes show effort and economic contributions itemized for port groups. The port groups' city and area assignments, and included major rivers and streams, are shown in Table 4.

Other Data Sources and Studies

*National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*

The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation has been conducted since 1955. The survey is sponsored by the U.S. Fish and Wildlife Service (USFWS). The main goal of the survey is to determine the number of anglers, hunters, and wildlife watching participants and the amount spent by those individuals. The survey is undertaken every five years. The survey results used in this study are angling data year 2011. The next survey will be in 2016.

The survey is a two phase telephone survey. The first phase is an initial large pool of households nationwide who are contacted to determine whether they are participants in certain types of recreational activity. The second phase is to contact people from the first phase that are most likely to participate in angling, hunting, or wildlife watching. Detailed interviews are conducted in four month waves. Some non-telephone interviews do take place in situations where the individual can not be reached by phone. The survey is developed in consultation with state and federal agencies as well as several non-governmental agencies. The USFWS survey results are used by other organizations to make economic contributions, such as those completed by Southwick Associates (2013) for American Sportfishing Association (ASA) and the Congressional Sportsman's Foundation (CSF). Other fish management and government economic development agencies rely on the ASA/CSF publications when quoting recreational fishing economic contributions.[15]

*Oregon Angler Survey*

The Oregon Angler Survey, performed by The Research Group, Corvallis, Oregon, was a combination mail and telephone survey to persons purchasing Oregon fishing licenses (The Research Group 1991). Survey results provide information about angler characteristics and preferences during the survey period (1988-1989 fishing season). The sample size for the mail survey that gathered basic catch data was 12.5 thousand licensees. The sample size for the follow up telephone survey that gathered more detailed demographic and economic information from licensees that fished during the survey

period was 2.0 thousand. Survey results were expanded based on known number of licenses. Economic contributions were calculated from the survey-determined fishing related expenditures for equipment and trips at the state and regional levels. The Oregon Angler Survey results for recreational economic contributions per angler day adjusted for inflation are used in this study for the freshwater fisheries.

*Fishing, Hunting, Wildlife Viewing, and Shellfishing in Oregon*

ODFW and Travel Oregon sponsored a survey and analysis that included Oregon license holders and citizens in general to estimate the expenditures for local, day, and overnight trips to the Oregon Coast for fishing, shellfishing, hunting, and wildlife-viewing (Dean Runyan Associates 2009). The fishing, hunting, and shellfishing activities survey was mail-out for a sample of license holders. For wildlife viewing, the survey was telephone administered for a sample of the Oregon population. The survey data year was 2008. Tabulated travel regions included the North Coast, Central Coast, and South Coast.[16]

*Creel Surveys*

The ODFW undertakes several annual creel surveys. These include the Pacific Ocean and Columbia River lower estuary fisheries, and Salmon River/Elk River inriver fisheries. The Salmon River/Elk River inriver creel surveys undertaken as tasks in the ODFW Coastal Chinook Research and Monitoring Program (CCRMP) are an obligation for the U.S./Canada Pacific Salmon Treaty. The ODFW has undertaken other special creel surveys from time-to-time to assist in determining management plans. Creel survey information is used in this report to determine freshwater salmon, steelhead, and sturgeon fishing angler success rates. These rates are applied to other data sources that provide catch information in order to derive effort estimates.

*Marine Recreational Information Program*

NOAA Fisheries sponsors the Marine Recreational Information Program (MRIP) as described in NOAA Fisheries (October 2008). The MRIP encompasses the old Marine Recreational Fisheries Statistics Survey (MRFSS) which was started in 1979. The expanded duties of the MRIP include inaugurating a national saltwater angler registry program required in the 2006 MSA amendments. The Oregon angler licensing system was reviewed by the MRIP and found to be consistent with standards so no additional licensing requirements were imposed.

Since the older MRFSS data collection procedures and economic studies that utilized the data are used in this report, a short summary of the survey approach is offered. The MRFSS was a two stage survey: a random-digit-dialing telephone survey of coastal residential households and an access-point intercept survey of anglers. The survey provided estimates of marine recreational angler fishing effort, participation, and catches of finfish and distinguishes among three different modes of fishing: bank, charter boat, and private boat at two locations in the ocean (within and outside territorial seas and inland saltwater (estuary) areas. There have been two add-on economic surveys along the West Coast. The 1998 survey questions allowed angling demand models to be developed to determine economic valuations. The 2000 survey questions were aimed at determining angling trip and angler capital costs. Researchers have used the

results to estimate saltwater fishing valuation (Hicks et al. 2000 and Haab et al. 2004) and economic contributions (Steinback et al. 2004). The MRFSS was discontinued on the West Coast in 2002 and state survey programs have substituted for acquiring recreational fishing data collection (Schindler et al. 2003). Concerns about the accuracy of MRFSS recreational angling statistics were addressed in National Research Council (2006) and McConnell (2006).

*Oregon Angler Preference Surveys*

The ODFW conducts angler preference surveys from time-to-time. The surveys are sometimes applicable for all State fisheries and other times are fishery and area specific. Three preference surveys applicable to this economic study were conducted for angling years 1977, 2006, and 2012. The 1977 data year survey was completed by the OSU Survey Research Center (1978) and was for a survey base of resident license holders. The 2006 data year survey was completed by Responsive Management (2006) for a survey base of resident license holders. The 2012 data year survey was completed by the OSU Survey Research Center (2013) for two survey bases: (1) sample of western Oregon resident SSHSTRP tag holders; and, (2) a sample of western Oregon residents who did not purchase a SSHSTRP tag. All preference survey results were reviewed to help make this report's interpretations and findings.

*Oregon Sport Angling License Sales*

The decrease in this report's fisheries overall trips in recent years is consistent with a decrease in angling license sales (Figure 4). Total license sales in Oregon have been stagnant while the State's population has been increasing, which means per capita sales have been steadily decreasing. This trend appears to have bottomed out in 2011 because there is a slight uptick in statewide license sales and the per capita ratio in 2012.

*Additional Ocean Economic Surveys*

The NMFS at a national level sponsored a marine angler expenditure survey in 2006 which was subsequently used to determine recreational angler regional economic impacts (Gentner and Steinback 2008). The MRIP does not undertake intercept and telephone surveys (i.e. the old MRFSS) on the West Coast and Alaska, so an add-on economic survey approach could not be used in these areas. In these states, license frames were utilized to contact anglers via a mail survey regarding both trip and durable good purchases. The NMFS at a regional level has recently sponsored special economic surveys of charter service businesses and anglers. The Northwest Fishery Science Center (NWFSC) sponsored a charter service business survey to collect cost-earnings data in 2006. An angler economic survey was undertaken by the NWFSC in 2006 and 2007. The angler economic survey was described by Anderson and Lee (2011). Recent survey data interpretation studies are by Anderson et al. (2013) and Anderson and Lee (2013).

## ECONOMIC ANALYSIS METHODS

Mention has already been made about the economic contribution measurement unit used in this report. The section more fully explains the definition so that study results can be interpreted in context with other recreational and commercial fishing economic analysis studies.

The economic contribution measurements for total personal income used in this study

can be thought of as the money that accrues to households through spending and respending for the purchases of goods and services used in recreational fishing activities. Sometimes studies will quote results in terms of other economic performance indicators, such as full-time equivalent jobs whose compensation would equate to generated personal income's net earnings, the region's business output associated with the trip spending, added value the trip spending makes in the region, and even local and state level taxes produced from the economic activity. This basket of indicators differently describes the same long term economic effects arising from recreational fishing spending. Using any of the indicators is certainly acceptable as long as one measurement is not compared to another. This report adopts the singular indicator for personal income because it tends to be the most comprehensible of all the mentioned indicators.

The angler trip spending used in this study originate with results from other data collection and modeling studies. Gentner and Steinback (2008) survey results trip expenditure estimates are used for ocean bottomfishing and inland marine fishing. Economic response coefficients from 2007 IMPLAN were used to expand the trip expenditure estimates to represent economic contribution unit estimates. Freshwater fisheries rely on economic contribution unit estimates from the Oregon Angler Survey. The economic contribution estimates per angler day for the various fisheries are shown in Table 5.

Trip trends for ocean salmon and coastal sturgeon fisheries' trips are shown in Tables 6 and 7, respectively. The estimated trips for all of the itemized fisheries used to make current year economic contribution estimates are shown in Table 8.

All economic contribution estimates referenced or developed in this study rely on factors from the IMPLAN system.[17] The spending and economic contribution estimates are adjusted to 2012 dollars using the Gross Domestic Product Implicit Price Deflator Index developed by the U.S. Bureau of Economic Analysis.

There are other ways to measure the value of recreational fishing. Valuation measures for recreational fish resource use include:

- Willingness to pay beyond what was spent on the fishing trip (sometimes called a type of consumer surplus),[18] and
- Commercial profits from angler expenditures (net revenues or sometimes called producer surplus).

The two added together are called net economic value from recreational fishing and are a different metric from the economic contributions measured by personal income used in this study.

There are methods to generate commercial fisheries net economic value that can be validly compared to the recreational fisheries net economic value. Calculating the commercial fishing net economic value metric is an equally formidable exercise as for recreational fishing. Producer surplus is related to harvester and processor business profits. Consumer surplus is related to willingness to pay less actual price for the produced seafood.

There is also a non-use value associated with the existence of fish resources that, for example, come from a value placed on the option for fishing. Total net economic value is the sum of the use and non-use values.

Acquiring pertinent data, applying correct methods, and interpreting results for total net economic valuations is laborious and problematic. If there is not the time and budget justification to generate quantitative information, value change movements and magnitudes can be discussed in a qualitative manner to assist in policy decision making. While net economic values were not estimated for this study, a concluding section in this report discusses their application in management policy decision making.

## RESULTS SUMMARY

The total economic contributions measured by personal income for the analyzed recreational fisheries in 2011 are estimated to be $47.5 million and in 2012 are estimated to be $49.5 million. There were an estimated 67.3 thousand ocean salmon fishing angler days generating $3.3 million economic contribution in 2012 (Table 9 and Figure 5). Ocean non-salmon angler days were estimated to be 103.9 thousand which generate $9.7 million in economic contributions. Of this amount, $6.6 million was generated when bottomfish was the target species or trips were for diving. Halibut as a target species generated $1.6 million and tuna as a target species generated $1.4 million.

The inland recreational fisheries can be defined first by those fisheries in all non-Columbia River inland locations, and second by the lower Columbia River estuary and its tributaries. The total non-Columbia River coastal inland estuary and freshwater fisheries estimated angler days were 793.4 thousand and the economic contribution is estimated to be $33.5 million for the 2012 season. (Year 2012 non-Columbia River catch and effort estimates are not available and it is assumed that Year 2011 data applies.) Of this, salmon fisheries generated $27.3 million in coastal economies. This includes all spring, summer, and fall Chinook, and hatchery origin coho, as well as native coho fishing allowed in some rivers. Trips for other coastal inland anadromous fish and other marine species generated $6.2 million in coastal economies in 2012. This includes $3.8 million for trips where the primary purpose is for steelhead, $0.1 million for sturgeon, and $2.3 million for other marine species trips.

The lower Columbia River estuary is estimated to have had 69.9 thousand angler days which generated $3.0 million in economic contributions in 2012. Of this, the Columbia River fall salmon fishery in 2012 generated $1.7 million in economic contributions. The fall salmon fishery includes trips in the mainstem that catch Chinook and coho salmon, and steelhead. This includes the popular August 1 opening Buoy 10 fishery. The lower Columbia River estuary sturgeon fishery is estimated to have generated $0.4 million in economic contributions in 2012. Other marine species trips in the lower Columbia River estuary were expected to have generated $34 thousand in economic contributions in 2012. Salmon and steelhead trips in tributaries to the lower Columbia River estuary are estimated to have generated $0.8 million in economic contributions in 2012.

Of all recreational fisheries trips described above, trips to non-Columbia River coastal inland estuary and freshwater areas are estimated to generate 67.8 percent of the economic contributions in 2012 (Figure 6). The largest share of economic contribution in these locations is from trips when targeting salmon species, estimated to generate 55.2 percent. The Columbia River fisheries generate 6.1 percent and ocean

fisheries generate 26.1 percent of the economic contribution in 2012. Ocean trips when bottomfish were the target species generated the most economic contribution in 2012, but trips when salmon alone or combination salmon and bottomfishing are target species can be the highest generator depending on fishing opportunities allowed for a particular year's salmon abundance.

## DISCUSSION

Measuring economic contribution from recreational fisheries provides information to compare its importance to other economic activities. For example, Oregon commercial fisheries have been estimated by The Research Group, LLC (2013) to have generated $541.0 million in 2012 (Table 10 and Figure 7), which represents about five percent of the Oregon Coast's total economy.[19] In regards to particular fisheries, Figures 8 and 9 show the comparison of ocean salmon commercial and recreational fisheries. The commercial troll salmon fishery generated $6.2 million and the recreational ocean salmon fishery generated $3.3 million in 2012. Table 11 and Figure 3 show the comparison of the nearshore commercial and recreational bottomfish fisheries. The nearshore commercial fishery generated $2.8 million and the recreational bottomfish fishery generated $6.0 million in 2009.

Fishery managers are often presented with regional economic contribution comparisons when trying to determine equitable assignment of fishing opportunities between commercial and recreation user groups while still ensuring fish resource conservation. (Appendix B describes current user group allocation arrangements for salmon, bottomfish, and halibut fisheries.) As mentioned in the economic analysis methods section of this report, there are other economic valuation measurements which may be more appropriate for comparisons. For example, Southwick Associates (2006) uses a variety of measurement units to compare commercial and recreational fisheries on a nationwide basis. Gislason (2006) presents an interesting case study for allocating herring, salmon, and halibut between the sectors in western Canada and references several of the same measurements used by Southwick Associates (2006). Pendleton (2006) attempts to sort out recreational resource use and non-use value measurements for California recreational fisheries and discusses allocation policy implications. Additional cautions on the use of regional economic impact assessments are in Propst and Gavrilis (1987). Hanna et al. (2006) discusses the application of economics to fishery allocation issues and cautions against misinterpretation and misuse of economic analysis. Plummer et al. (2012) cites many economic studies that discuss economic efficiency and fairness/equity concepts related to making user group allocation decisions. The report is noteworthy in the compilation of many user group allocation practices used by U.S. ocean fishery management councils.

Reducing economic measurements to a per fish value whether using regional economic contribution estimates or other economic valuation can be a misuse of economic analysis. Commercial fisheries economic contributions are a result of the total operations that transcend different fish resources found off the Oregon Coast and even include distant water fisheries in Alaska. Profit from harvest and processing revenue and operation expenditure variables change significantly from year to year.[20] Recreational fisheries are equally complicated. Spending comes from a

commitment to make the trip and not from the number of fish caught. Also, angling is one form of outdoor recreation that is tied to the more general tourism industry. The attraction of just the opportunity to fish may have been one motivation to make a trip amongst other planned general tourism activities. Moreover, vibrant and year-around fisheries access is an indicator of healthy natural resources and can be considered an economic development asset. Living in such an environment is attractive to entrepreneurs and employees. The attraction is an important decision variable with more straightforward business location considerations such as market and suppliers logistics, and labor costs.

Fish resource management and policy alternatives have to be weighed for their potential complex outcomes on conservation and society. Well-intended decisions can lead to unexpected effects when outcome evaluations are not provided or are specious. Economic information along with other social and environmental impact interpretations can assist the decision making proceed in a tractable manner. For example, policy makers might be interested when the sum of two or more user groups' net economic value is optimal when determining fisheries access allocations. If such information is to be included in the decision making, a research plan that determines data collection needs and desired analysis result indicators needs to be first determined. Otherwise, incompatible measurements may be promulgated by interest groups to favor allocation or conservation in their direction. It is hoped that there is sufficient qualification descriptions about study results in this report that such improper use of presented statistics would not occur.

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*Notes:*

1. *The study area can be approximated by five whole coastal counties (Clatsop, Tillamook, Lincoln, Coos, and Curry) plus the western portions of Lane and Douglas counties. Fishing trips in the Columbia River up to Puget Island that originate on the Oregon side are included.*

2. *Salmon and steelhead species are categorized in this study depending on their adult freshwater return timing. This is done for convenience with the acknowledgement that the species have finer biological groupings more aligned with life histories that have adapted them to localized conditions of climate and habitat. Salmon in this study have two categories: spring/summer and fall. Steelhead are lumped into one category despite life histories that show distinction in winter and summer runs. Steelhead were included with trouts in the Salmo genus until the 1990's, when they were reclassified in the Oncorhynchus genus with salmon. Oncorhynchus means "hooked snout," a physical characteristic of adult salmon when they are ready to spawn.*

3. *There are other anadromous fish species that are sought by anglers, such as striped bass and cutthroat trout. Trips for these species are only included in the other marine species (non-salmon) fisheries category if they occur in the lower estuaries. For example, fishing trips for the popular "half-pounders" on the Rogue River east of the Highway 101 bridge would not be included.*

4. *Recreational shellfish (principally Dungeness crab, but also other crabs, clams, mussels, etc.) harvesting is a popular fishing activity on the Oregon Coast. Ainsworth et al. (2012) provided catch and effort estimates for a recent five year time period ending in 2011. The greatest statewide harvest occurred in 2011 when over one million pounds of Dungeness crab were harvested by recreational crabbers. The greatest number of crabbing trips were in 2009, when an estimated 130,000 trips occurred. The bay crab fisheries were the greatest component of the statewide harvest, accounting for approximately 60 percent of the annual total recreational harvest. The study did not sort out when crabbing trips are combined with finfish angling. The crabbing trip estimates were conservative because only five of nine major bays were sampled, only boat-based crabbing effort was counted, and the time period when sampling occurred was restricted to summer and fall months.*

5. *There is cross over between these two fisheries' segments. When non-salmon species are caught when salmon is the primary target species, the trip is counted as a salmon trip.*

6. *The ocean salmon fisheries in 2006 and 2008 were declared fishery disasters by the U.S. Department of Commerce. Commercial fisheries south of Cape Falcon were closed in these years, except to some brief bubble fisheries within the Oregon Territorial Sea. There was a restricted commercial season south of Cape Falcon in 2007, but harvest rates were low and many fishermen elected not to participate. The south of Cape Falcon commercial season was closed in 2008. There was a short (September only) limited area (north of Humbug Mt. and south of Cape Falcon) commercial season in 2009. There was a return to the south of Cape Falcon commercial season in 2010 with traditional open fishing days, but Chinook harvest numbers were moderate. There were traditional day seasons for Chinook south of Cape Falcon in 2011 and 2012. These years additionally had trip limit seasons for marked coho. The year 2012 season was supplemented with a September non-mark coho fishery.*

7. *Bay commercial fisheries using boats include Dungeness crab and herring in non-Columbia River bays. The Columbia River also has very active other commercial fisheries, such as for salmon, sturgeon, and shad.*

8. *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.*

9. *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.*

10. *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 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, Gentner and Steinback (2008) found 63.6 percent in survey year 2006 of total economic contributions were from durable goods used for saltwater fishing in Oregon. The U.S. Fish and Wildlife Service (USFWS) National Surveys found total spending for saltwater fishing nationwide was 40.4 percent in data year 2006 and 29.1 percent in data year 2011 for non-trip related items.*

11. *The Oregon 2006 angler preference survey report (Responsive Management 2006 and ODFW July 2007) discusses participation factors for resident fish fishing, but survey results can be interpreted to apply to all participation for some factors such as behavior response to fishing regulations.*

12. *There are many worthy data sources not referenced in this study that not only cover user group activity levels, but also stock conditions and management approaches. The reader is directed to salmon, groundfish, halibut, and highly migratory species fishery management plans developed by the Pacific Fishery Management Council (PFMC) as a start in better understanding fishery conditions. Freshwater anadromous fish returning to the Columbia River have overwhelming libraries of past and ongoing study publications. Current in-river management regimes are described in Columbia River Compact joint state staff reports and action notices. A wealth of information about anadromous fish returning to Oregon Coast streams can be found at the Oregon Department of Fish and Wildlife (ODFW) conservation and recovery plan website.*

13. *Other salmon and steelhead in the Columbia River are from fisheries in the estuary tributaries on the Oregon side, such as the Youngs River, Lewis and Clark River, and Klaskanine River.*

14. *Estimating catch from voluntary harvest card return programs has accuracy issues. The Oregon Department of Fish and Wildlife (ODFW) requested a study by Hicks and Calvin (1964) to determine best methods to account for non-returns. Return compliance in Oregon is around 20 percent per year. The Washington Department of Fish and Wildlife (WDFW) in the past also relied on voluntary return program, but supplemented freshwater catch estimates with creel surveys and telephone surveys results. The WDFW has transitioned to a mandatory return program for crab fisheries which is enforced with a $10 penalty. A study by Conrad and Alexanders (1993) who compared harvest card and creel survey results in Puget Sound salmon fisheries found that harvest card return rates would have to be a minimum of 70 percent to provide acceptable estimates that require no bias adjustments.*

15. *An example recreational fishing economic study that relies on ASA/CSF publications for Washington State is TCW Economics and The Research Group (2008).*

16. *The expanded sample survey estimates are higher than observed estimates used in this report. Statewide trip days (thousands) in 2008 are freshwater angling 7,260 days (23 percent Coast), saltwater angling 1,119 (100 percent Coast), shellfish 994 (100 percent Coast), hunting 3,298 (41 percent Coast), wildlife viewing 21,756 (30 percent Coast), and total 32,313 (33 percent Coast). In regards to statewide freshwater trips (including multi-day trips), approximately 19 percent are salmon, 20 percent are steelhead, and five percent are sturgeon. In regards to statewide saltwater trips (including multi-day trips), 64 percent are for salmon and 36 percent are*

*for other marine saltwater species. For the three coastal regions, saltwater salmon trips sum to 328.0 thousand and freshwater salmon, steelhead, and sturgeon trips sum to 612.0 thousand.*

17. *The multiplier effects are calculated using the Fishery Economic Assessment Model (FEAM). The FEAM is based on economic response coefficients generated from the IMPLAN input-output model. The FEAM theory and structure is described in Seung and Waters (2006). IMPLAN models are available for each county and state in the U.S. The models are distributed by MIG, Inc., 1725 Tower Drive West, Suite 140, Stillwater, MN 55082.*

18. *Studies have shown that people are willing to pay extra for the opportunity to use fish resources. Haab et al. (2006) used a nested random utility model and the 1998 Pacific Region economic add-on survey results for such calculations. Anglers in Oregon would pay between $13 and $28 for site access. Anderson and Lee (June 2013) using 2006 and 2007 survey based discrete choice experiments determined willingness-to-pay (WTP) differences in catching and releasing Chinook and coho salmon of hatchery and wild origin in an ocean mixed stock fishery setting. For example, anglers value higher the "catch" of a hatchery origin Chinook rather than a wild origin Chinook ($150 vs. $102 for medium size fish). However, anglers value higher the "release" of a wild origin Chinook ($64 vs. $22 for medium size fish). The values for coho are smaller with wild origin release value having a $15 positive difference.*

19. *The commercial fishing economic contributions include effects from capital expenditures. The recreational fishing economic contributions for this report only include effects from trip expenditures.*

20. *Economic analysis for commercial fisheries also includes fish processing and vessel repair/fabrication and other supply type businesses. Profits in commercial fisheries depend on the revenue variables for fish weight, price, and product form and the variable and fixed costs in harvesting and processing.*

Table 1
Data Sources Used to Estimate Fisheries' Economic Contributions

| Source | Data Year | Fishery Scope | Data Type |
|---|---|---|---|
| Pacific Fishery Management Council (PFMC) | Annual | Ocean and Columbia River Buoy 10 | No primary data collection, relies on state provided data |
| Columbia River Creel Program (CRCP) | Annual | Lower Columbia River and Buoy 10 salmon, steelhead, and sturgeon | Intercept survey, aerial counts |
| Ocean Recreational Boat Survey (ORBS) | Annual | Ocean salmon and bottomfishing | Angler intercept and total boating exit count |
| Shore and Estuary Boat (SEB) survey | Through 2002 | Estuaries marine species | Angler intercept and total boating exit count |
| Marine Recreational Fishery Statistics Survey (MRFSS) Economic Add-on Survey | Special | Ocean and lower estuary salmon and other marine (non-salmon) species | Intercept and random household interviews |
| Salmon-Steelhead, Halibut and Sturgeon Tag Return Program (SSHSTRP) | Annual | Freshwater salmon and steelhead, sturgeon | Harvest tag returns |
| National Survey of Fishing, Hunting, and Wildlife Associated Recreation | 5 year | Ocean and freshwater | Household interviews |
| Oregon Angler Survey | 1989-90 | Ocean and freshwater | Random permit holder survey |
| Coastal Chinook Research and Monitoring Program (CCRMP) | Annual | Salmon and Elk rivers, others | Intercept survey |
| Preference Surveys | 1977, 2006, 2012 | Statewide in 1977, 2006, and western Oregon in 2012 | Angler license holder mailout and Internet website administered |

Source: Study.

Table 2
Data Sources and Methodological Basis Used in Modeling

| Fishery | User | Harvest and Effort (pounds and fish) | Recreational Trips (angler days) | Recreational Catch Per Unit Effort (retained catch per angler day) | Data Source Limitations and Methods Assumptions |
|---|---|---|---|---|---|
| Ocean salmon | Commercial | PFMC | -- | -- | Additional assumptions needed to disaggregate salmon management unit estimate to state boundaries and individual ports. Current year economic contributions based on previous year's market conditions. |
| Ocean salmon | Recreational | PFMC | PFMC | PFMC-Salmon Technical Team | PFMC information about ocean salmon abundance used to assess likelihood of angler effort. Other factors, such as weather, general economic conditions that determine disposable income, inriver regulations, etc. are not considered. Methodological sources have a high nonresponse; available results typically for 2 to 3 years prior to current year. |
| Ocean other (non-salmon) and distant water fisheries | Commercial | TRG | -- | -- | Source (published in spring of each year) for current year is based on expert opinion about future market conditions; and, uses preliminary data from previous year fisheries. Ocean other (non-salmon) commercial fisheries includes estuary commercial fisheries such as Alsea Bay crab, Yaquina Bay herring, Columbia River sturgeon, Columbia River other (shad, smelt, anchovy), and Columbia River non-Indian gillnet and tribal salmon fisheries. Other commercial shellfish harvests (clams, oysters, mussels, etc.) are not included. |
| Ocean bottomfish and halibut | Recreational | PFMC and IPHC | ORBS | -- | Bottomfish species, including halibut, sometimes have current year management quotas. This means there can be in-season management changes. Previous years stock assessment and angler participation information used to forecast current year angler participation. There may be duplicate counting when estimating trips for one species and comparing estimates to other fisheries. |
| Lower estuary salmon, steelhead, and sturgeon | Recreational | Study | SSHSTRP, ORBS, CRCP | CCRMP | Bay salmon fisheries are generally not managed by quota except for Columbia River. In recent years, there has been a native coho salmon quota fishery in some coastal streams. Catch may not adequately predict effort for fisheries regulated to be only catch and release. Creel surveys are for individual stream reaches and species and may not be applicable to other locations. There may be duplicate counting if salmon and marine species (non-salmon) are caught in the same trip. Economic contributions per day based on survey of angler trip expenditures from TRG (2000). |
| Lower estuary marine (non-salmon) | Recreational | Study | SSHSTRP, ORBS, and SEB | -- | Marine species caught within bays generally are not managed by quota, except sturgeon in Columbia River. Previous year's effort averages used to forecast current year when using SSHSTRP data. There are geographic boundary alignment problems when using data from SEB, SSHSTRP, and CRCP. The upstream SEB boundary is generally where Highway 101 crosses the waterway. The most recent complete year of SEB data is 2002. |

Notes: 1. Current year requires forecast based on fishery management decisions or assumptions about previous year's fishing participation.
2. See Study bibliography section for report author, title, publication date, and agencies that maintain databases.

Source: Study.

Table 3
Historical and Assigned Success Rates for Inland and Ocean Recreational Fisheries

| | | | Inland Success Rates | | | | |
|---|---|---|---|---|---|---|---|
| | | | Chinook | | | Winter/ | |
| | | | | Spring/ | | Summer | |
| Waterway | Source | Dates | Fall | Summer | Coho | Steelhead | Sturgeon |
| ESTUARY AND INLAND | | | | | | | |
| Lower Columbia River | | | | | | | |
| Sturgeon fishery | | | | | | | |
| | Devore et al. (1999) | 1996-1998 average | -- | -- | -- | -- | 7.32 |
| Columbia River fall mainstem salmon fishery | | | | | | | |
| | Watts (CRCP) | 2002 | 3.91 | -- | 13.51 | -- | -- |
| | | 2003 | 6.13 | -- | 1.64 | -- | -- |
| | | 2004 | 3.73 | -- | 4.49 | -- | -- |
| | | 2005 | 4.95 | -- | 7.00 | -- | -- |
| | | 2006 | 19.01 | -- | 9.17 | -- | -- |
| | | 2007 | 8.32 | -- | 4.21 | -- | -- |
| | | 2008 | 3.40 | -- | 4.22 | -- | -- |
| | | 2009 | 11.58 | -- | 1.49 | -- | -- |
| | | 2010 | 6.80 | -- | 5.95 | -- | -- |
| | | 2011 | 4.43 | -- | 5.95 | -- | -- |
| | | 2012 | 3.20 | -- | 8.23 | -- | -- |
| | | 2002-2012 average | 5.10 | -- | 3.68 | -- | -- |
| Columbia River mainstem Section 10 | | | | | | | |
| | Watts (CRCP) | 2002 | -- | 7.65 | -- | 17.54 | 2.26 |
| | | 2003 | -- | 6.66 | -- | 16.43 | 2.53 |
| | | 2004 | -- | 4.32 | -- | 19.92 | 2.77 |
| | | 2005 | -- | 7.95 | -- | 28.92 | 3.44 |
| | | 2006 | -- | 6.76 | -- | 17.41 | 2.85 |
| | | 2007 | -- | 7.99 | -- | 13.29 | 2.60 |
| | | 2008 | -- | 10.57 | -- | 12.92 | 3.56 |
| | | 2009 | -- | 6.29 | -- | 12.20 | 3.90 |
| | | 2010 | -- | 5.93 | -- | 21.96 | 5.82 |
| | | 2011 | -- | 10.69 | -- | 8.00 | 4.31 |
| | | 2012 | -- | 6.34 | -- | 10.03 | 4.45 |
| | | 2002-2012 average | -- | 6.63 | -- | 15.23 | 3.12 |
| Coast | | | | | | | |
| Nehalem River | | | | | | | |
| | ODFW AFS 65 | 1963-64 season | -- | -- | -- | 5.33 | -- |
| | | 1964-65 season | -- | -- | -- | 8.43 | -- |
| | | 1968-69 season | -- | -- | -- | 2.18 | -- |
| | Creel Surveys | 2010 | 10.03 | -- | -- | -- | -- |
| | | 2012 | 44.95 | -- | -- | -- | -- |
| Tillamook Bay | | | | | | | |
| | Creel Surveys | 1996 | 6.81 | -- | -- | -- | -- |
| Wilson River | | | | | | | |
| | ODFW AFS 65 | 1964-65 season | -- | -- | -- | 7.88 | -- |
| | | 1965-66 season | -- | -- | -- | 16.91 | -- |

Table 3 (cont.)

| | | | Inland Success Rates | | | | |
|---|---|---|---|---|---|---|---|
| | | | Chinook | | | Winter/ | |
| | | | | Spring/ | | Summer | |
| Waterway | Source | Dates | Fall | Summer | Coho | Steelhead | Sturgeon |
| ESTUARY AND INLAND, Coast (cont.) | | | | | | | |
| Salmon River | | | | | | | |
| | Creel Surveys | 1986-1989 average | 8.80 | -- | -- | -- | -- |
| | | 2002 | 6.91 | -- | 42.04 | -- | -- |
| | | 2003 | 6.70 | -- | 104.29 | -- | -- |
| | | 2005 | 5.28 | -- | -- | -- | -- |
| | | 2006 | 7.07 | -- | -- | -- | -- |
| | | 2007 | 12.61 | -- | -- | -- | -- |
| | | 2008 | 21.75 | -- | -- | -- | -- |
| | | 2009 | 14.49 | -- | -- | -- | -- |
| | | 2010 | 5.89 | -- | -- | -- | -- |
| | | 2011 | 5.20 | -- | -- | -- | -- |
| | | 2012 | 6.18 | -- | -- | -- | -- |
| Siletz Estuary | | | | | | | |
| | Creel Surveys | 2010 | 14.43 | -- | 34.55 | -- | -- |
| | | 2011 | -- | -- | 21.14 | -- | -- |
| | | 2012 | 29.86 | -- | 52.48 | -- | -- |
| Yaquina Estuary | | | | | | | |
| | Creel Surveys | 2009 | -- | -- | 6.44 | -- | -- |
| | | 2011 | -- | -- | 18.07 | -- | -- |
| | | 2012 | -- | -- | 32.96 | -- | -- |
| Alsea River | | | | | | | |
| | ODFW AFS 65 | 1964-65 season | -- | -- | -- | 22.79 | -- |
| | | 1965-66 season | -- | -- | -- | 32.25 | -- |
| Alsea Estuary | | | | | | | |
| | Creel Surveys | 2011 | -- | -- | 12.05 | -- | -- |
| | | 2012 | -- | -- | 6.12 | -- | -- |
| Siuslaw River | | | | | | | |
| | ODFW AFS 65 | 1967-68 season | -- | -- | -- | 7.88 | -- |
| Siuslaw Estuary | | | | | | | |
| | Creel Surveys | 2011 | -- | -- | 10.81 | -- | -- |
| | | 2012 | -- | -- | 16.29 | -- | -- |
| Umpqua River | | | | | | | |
| | Creel Surveys | 1977-1988 average | -- | 11.25 | -- | -- | -- |
| Elk River | | | | | | | |
| | Creel Surveys | 1972-1974 average | 3.53 | -- | -- | -- | -- |
| | | 1992-1998 average | 4.01 | -- | -- | -- | -- |
| | | 2007 | 4.47 | -- | -- | -- | -- |
| | | 2008 | 3.20 | -- | -- | -- | -- |
| | | 2009 | 3.71 | -- | -- | -- | -- |
| | | 2010 | 2.54 | -- | -- | -- | -- |
| | | 2011 | 2.19 | -- | -- | -- | -- |
| | | 2012 | 4.21 | -- | -- | -- | -- |

Table 3 (cont.)

| Waterway | Source | Dates | Inland Success Rates: Chinook Fall | Chinook Spring/ Summer | Winter/ Summer Coho | Winter/ Summer Steelhead | Winter/ Summer Sturgeon |
|---|---|---|---|---|---|---|---|
| ESTUARY AND INLAND, Coast (cont.) | | | | | | | |
| Rogue River | | | | | | | |
| | Creel Surveys | 1986 | 4.55 | 5.68 | -- | -- | -- |
| Chetco River | | | | | | | |
| | Creel Surveys | 2011 | -- | -- | -- | 3.67 | -- |
| Assigned non-Columbia River inland | | 2012 | 6.00 | 7.50 | 15.00 | 4.00 | 7.32 |

OCEAN

| Pacific Ocean (north or south of Cape Falcon) | | | Ocean Pacific Halibut Success Rates: Charter N CF | Charter S CF | Private N CF | Private S CF |
|---|---|---|---|---|---|---|
| | ODFW ORBS | 2011 | 1.66 | 1.15 | 1.36 | 1.94 |
| | | 2012 | 2.58 | 1.18 | 1.80 | 1.80 |

| Pacific Ocean (north or south of Cape Falcon) | | | Ocean Salmon Success Rates: Chinook Only N CF | Chinook Only S CF | Chinook or Coho N CF | Chinook or Coho S CF | Season N CF | Season S CF |
|---|---|---|---|---|---|---|---|---|
| | PFMC annual | 2011 | 3.56 | 11.55 | 0.94 | 1.86 | 0.96 | 2.53 |
| | | 2012 | 1.18 | 3.42 | 1.53 | 1.78 | 1.43 | 1.98 |

Notes:
1. Success rates are expressed as number of days per fish retained.
2. The "assigned" 2012 success rate is a conservative estimate used to convert data about fish from the ODFW Salmon-Steelhead Tag Return Program to angler trips. The assigned success rates are used in the economic modeling for all lower estuary salmon and sturgeon recreational fisheries, except Chinook and coho caught in Youngs Bay use the Columbia River mainstem success rates.
3. Fall Chinook and coho fisheries are concurrent on some rivers and streams.
4. Columbia River fall mainstem salmon fishery includes Oregon side only, and Columbia River mainstem Section 10 includes both Oregon and Washington side.
5. Sturgeon has a catch and release regulation in some months, and trips for those months are included in success rates to account for the fishing pressure during the catch and release season.
6. Ocean salmon 'Chinook only' includes June and October for North of Cape Falcon, and June, August, and October for South of Cape Falcon. Ocean salmon 'Chinook or coho' includes July through September for North of Cape Falcon, and July and September for South of Cape Falcon. In some years coho fisheries allowed in other months. Ocean salmon 'season" includes all months and both fisheries.
7. North of Cape Falcon (N CF) region includes Astoria area. South of Cape Falcon (S CF) region includes the south of Humbug Mt. to Oregon-California border management area.

Sources: Watts (2013); creel surveys performed by ODFW (CCRMP); ODFW (1977); Devore et al. (1999); PFMC (February 2013); ODFW (ORBS).

Table 4
Port Group Mapped Ports and Waterways

| Port Group | Cities and Areas | Major Rivers and Streams |
|---|---|---|
| Astoria | Astoria, Hammond/Warrenton, Gearhart, Seaside and Cannon Beach | Columbia, Klaskanine, Lewis and Clark, Youngs, and Necanicum rivers; Big Creek, Gnat Creek, and Bear Creek |
| Tillamook | Tillamook, Garibaldi, Netarts, and Pacific City | Tillamook, Kilchis, Miami, Nehalem, Nestucca, Trask, and Wilson rivers |
| Newport | Newport and Depoe Bay | Yaquina, Siletz, Alsea, and Salmon rivers; Big Elk Creek, Drift Creek |
| Coos Bay | Coos Bay, Florence, Charleston, Winchester Bay, and Bandon | Siuslaw, Umpqua, Smith, Coos, Millicoma, and Coquille rivers; Isthmus Slough |
| Brookings | Brookings, Gold Beach, and Port Orford | Chetco, Elk, Sixes, and Rogue rivers |

Source: Study.

Table 5
Economic Contributions Per Angler Day for Study Recreational Fisheries in 2012

| Fishery | Fishing Mode | | | |
|---|---|---|---|---|
| Inland Marine and Freshwater Fisheries | Guided | Private Boat | Private Bank | |
| All areas and species | $170.85 | $42.95 | $20.81 | |
| | Coast Inland | Lower Columbia River | | |
| Salmon and steelhead (incl. coast and lower Col. R. off-channel) | $44.64 | $45.94 | | |
| Salmon (incl. lower Col. R. mainstem) | | $41.69 | | |
| Sturgeon | $43.43 | $49.09 | | |
| Other marine | $24.75 | $21.05 | | |
| Ocean Non-Salmon Fisheries | Charter | Private | Shore | Trip Weighted Average |
| Bottomfish | $151.78 | $67.54 | $42.12 | $94.29 |
| Halibut and tuna | $303.57 | $67.54 | $42.12 | $90.25 |
| Ocean Salmon Fisheries | | | | |
| All salmon species | $145.04 | $38.89 | | $48.37 |

Notes:
1. Economic contributions are expressed as personal income in 2012 dollars and are at the coastwide economic level.
2. Coastwide economic contributions for ocean salmon fisheries and the lower Columbia River mainstem fall salmon fishery are from PFMC (February 2013). The ocean non-salmon fishery uses economic contributions per angler day derived from expenditures in Gentner and Steinback (2008). Coastwide economic contributions per angler day for inland marine and freshwater fisheries are from The Research Group (1991).
3. The ocean non-salmon trip weighted average economic contributions per day are based on 2012 trips provided by ODFW (ORBS).
4. Tuna and halibut ocean bottomfishing economic contributions per day adjusted for additional spending due to charter services fishery higher costs.
5. Lower Columbia River mainstem spr./sum. salmon fishery economic contributions per angler day are assumed to be the same as the fall mainstem salmon fishery.
6. Ratio of coastwide to state economic level uses household expenditure coefficients from 2007 IMPLAN data year, except lower Columbia River mainstem salmon uses PFMC (February 2013).

Source: Study; The Research Group (June 1991); PSMFC RecFIN database; ODFW (ORBS); PFMC (February 2013); Gentner and Steinback (2008).

Table 6
Trips and Catch by Mode in the Ocean Salmon Recreational Fishery in 1979 to 2012

| | Angler Trips (thousands) | | Chinook Catch (thousands) | | Coho Catch (thousands) | |
|---|---|---|---|---|---|---|
| Year | Charter | Private | Charter | Private | Charter | Private |
| 1979 | 73.7 | 187.7 | 5.4 | 13.3 | 59.8 | 101.8 |
| 1980 | 79.0 | 218.9 | 5.1 | 11.9 | 98.3 | 207.5 |
| 1981 | 65.4 | 245.8 | 6.6 | 22.5 | 64.5 | 135.3 |
| 1982 | 43.3 | 182.7 | 8.2 | 30.6 | 48.5 | 126.7 |
| 1983 | 41.9 | 184.1 | 4.7 | 20.0 | 39.7 | 107.2 |
| 1984 | 24.3 | 128.7 | 2.2 | 14.8 | 27.3 | 96.1 |
| 1985 | 53.4 | 198.2 | 9.2 | 46.6 | 60.2 | 122.8 |
| 1986 | 43.7 | 143.3 | 4.2 | 18.7 | 75.0 | 143.9 |
| 1987 | 60.9 | 194.2 | 14.3 | 45.1 | 61.9 | 118.7 |
| 1988 | 62.5 | 188.2 | 7.3 | 31.0 | 73.5 | 153.3 |
| 1989 | 60.2 | 206.1 | 4.2 | 27.9 | 85.8 | 187.5 |
| 1990 | 55.3 | 191.2 | 5.1 | 21.5 | 61.6 | 139.1 |
| 1991 | 40.3 | 149.7 | 1.9 | 12.5 | 68.9 | 190.2 |
| 1992 | 30.0 | 135.4 | 2.7 | 9.9 | 46.2 | 139.6 |
| 1993 | 13.4 | 66.9 | 0.9 | 5.6 | 16.2 | 43.1 |
| 1994 | 1.4 | 25.7 | 0.5 | 5.5 | 0.0 | 0.0 |
| 1995 | 4.6 | 31.2 | 0.3 | 6.4 | 4.0 | 7.9 |
| 1996 | 5.6 | 38.3 | 1.2 | 10.1 | 3.0 | 4.2 |
| 1997 | 3.9 | 26.4 | 1.5 | 6.2 | 2.4 | 3.6 |
| 1998 | 1.8 | 24.2 | 0.5 | 3.6 | 0.5 | 1.8 |
| 1999 | 5.5 | 43.9 | 0.9 | 6.9 | 3.4 | 10.3 |
| 2000 | 9.8 | 68.7 | 3.6 | 21.8 | 7.5 | 25.7 |
| 2001 | 18.2 | 102.3 | 6.4 | 20.8 | 19.3 | 75.0 |
| 2002 | 15.7 | 91.9 | 7.9 | 39.5 | 9.0 | 27.5 |
| 2003 | 23.4 | 121.1 | 8.8 | 31.8 | 23.7 | 90.0 |
| 2004 | 21.1 | 124.6 | 14.6 | 41.8 | 13.1 | 58.8 |
| 2005 | 9.9 | 66.1 | 4.5 | 23.4 | 3.1 | 10.6 |
| 2006 | 8.0 | 54.4 | 1.5 | 10.1 | 3.6 | 12.0 |
| 2007 | 11.4 | 76.9 | 0.6 | 6.4 | 10.6 | 50.1 |
| 2008 | 1.9 | 28.5 | 0.2 | 1.4 | 1.0 | 11.1 |
| 2009 | 12.6 | 71.9 | 0.2 | 1.3 | 14.2 | 75.4 |
| 2010 | 5.0 | 48.3 | 0.6 | 4.4 | 2.8 | 15.5 |
| 2011 | 5.9 | 42.8 | 0.6 | 4.6 | 3.5 | 15.3 |
| 2012 | 6.6 | 60.7 | 1.5 | 17.3 | 3.0 | 13.1 |

Notes: 1. Salmon data from surveyed ports only. These include Astoria, Garibaldi, Depoe Bay, Newport, Winchester Bay, Coos Bay, and Brookings. Since 1981, Pacific City and Florence have also been included. Gold Beach data are included from 1981-1987. Astoria was not included in 1994.

2. Angler trips includes combination purpose trips when both salmon and bottomfish were target species.

Source: PFMC (February 2013).

Table 7
Recreational Sturgeon Trips in 1986 to 2011

| | Columbia River | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lower Section | | | Upper Section | | | Coastal Tributaries and Bays | | | Pacific Ocean | | | Total | | |
| Year | Green | White | Total | Green | White | Total | Green | White | Total | Green | White | Total | Green | White | Total |
| 1986 | 1.2 | 47.7 | 48.9 | 0.4 | 212.8 | 213.3 | 1.1 | 12.1 | 13.2 | -- | -- | -- | 2.7 | 272.7 | 275.4 |
| 1987 | 1.4 | 59.3 | 60.7 | 1.0 | 227.1 | 228.0 | 1.2 | 12.3 | 13.5 | -- | -- | -- | 3.7 | 298.6 | 302.3 |
| 1988 | 1.1 | 50.1 | 51.2 | 0.5 | 169.6 | 170.1 | 1.9 | 14.3 | 16.2 | -- | -- | -- | 3.5 | 234.0 | 237.5 |
| 1989 | 0.2 | 18.6 | 18.7 | 0.1 | 126.9 | 127.0 | 1.5 | 12.2 | 13.6 | -- | -- | -- | 1.7 | 157.6 | 159.4 |
| 1990 | 0.3 | 22.6 | 22.9 | 0.1 | 76.3 | 76.4 | 1.1 | 8.8 | 9.9 | -- | -- | -- | 1.5 | 107.7 | 109.2 |
| 1991 | 0.5 | 21.5 | 22.0 | 0.3 | 112.1 | 112.3 | 2.7 | 10.0 | 12.6 | -- | -- | -- | 3.5 | 143.5 | 147.0 |
| 1992 | 0.6 | 37.1 | 37.7 | 0.2 | 156.1 | 156.4 | 1.4 | 7.4 | 8.9 | -- | -- | -- | 2.3 | 200.6 | 202.9 |
| 1993 | 0.6 | 52.5 | 53.1 | 0.2 | 167.7 | 167.9 | 2.1 | 9.7 | 11.8 | -- | -- | -- | 3.0 | 229.8 | 232.8 |
| 1994 | 0.4 | 31.6 | 31.9 | 0.2 | 141.7 | 141.9 | 1.2 | 9.6 | 10.8 | -- | -- | -- | 1.7 | 182.9 | 184.6 |
| 1995 | 0.9 | 62.5 | 63.4 | 1.5 | 111.3 | 112.8 | 0.6 | 11.6 | 12.2 | -- | 1.0 | 1.0 | 2.9 | 186.5 | 189.4 |
| 1996 | 1.0 | 79.8 | 80.8 | 2.1 | 111.9 | 114.0 | 1.5 | 22.6 | 24.1 | -- | 2.3 | 2.3 | 4.6 | 216.6 | 221.1 |
| 1997 | 0.9 | 79.5 | 80.4 | 1.4 | 107.6 | 109.0 | 1.3 | 31.2 | 32.5 | 0.2 | 3.1 | 3.3 | 3.8 | 221.4 | 225.2 |
| 1998 | 1.6 | 81.6 | 83.2 | 1.6 | 123.4 | 125.0 | 1.1 | 17.8 | 18.9 | 0.1 | 1.3 | 1.4 | 4.3 | 224.2 | 228.5 |
| 1999 | 1.1 | 106.4 | 107.5 | 1.5 | 161.8 | 163.3 | 1.1 | 21.0 | 22.1 | -- | 2.2 | 2.2 | 3.7 | 291.4 | 295.0 |
| 2000 | 0.7 | 65.0 | 65.7 | 2.2 | 135.8 | 137.9 | 0.5 | 10.5 | 11.0 | 0.0 | 1.3 | 1.3 | 3.4 | 212.5 | 215.9 |
| 2001 | 0.4 | 46.5 | 46.9 | 2.5 | 174.6 | 177.1 | 0.7 | 7.6 | 8.4 | 0.1 | 1.2 | 1.3 | 3.8 | 229.9 | 233.7 |
| 2002 | 0.2 | 58.8 | 59.1 | 2.0 | 124.3 | 126.3 | 0.8 | 5.9 | 6.6 | 0.0 | 0.8 | 0.8 | 3.0 | 189.8 | 192.8 |
| 2003 | 0.1 | 37.5 | 37.6 | 1.5 | 106.1 | 107.6 | 0.5 | 6.2 | 6.7 | -- | 1.2 | 1.2 | 2.1 | 151.0 | 153.1 |
| 2004 | 0.2 | 31.3 | 31.4 | 1.6 | 100.8 | 102.5 | 0.5 | 4.5 | 4.9 | 0.1 | 0.7 | 0.8 | 2.3 | 137.3 | 139.7 |
| 2005 | 0.3 | 37.0 | 37.2 | 0.8 | 82.4 | 83.2 | 0.7 | 5.5 | 6.2 | -- | 0.5 | 0.5 | 1.8 | 125.4 | 127.2 |
| 2006 | 0.3 | 38.3 | 38.5 | 0.5 | 84.1 | 84.6 | 0.2 | 6.3 | 6.5 | -- | 0.8 | 0.8 | 1.0 | 129.5 | 130.5 |
| 2007 | 0.2 | 54.5 | 54.7 | 1.0 | 114.5 | 115.5 | 0.9 | 5.0 | 6.0 | -- | 1.4 | 1.4 | 2.1 | 175.5 | 177.6 |
| 2008 | -- | 39.7 | 39.7 | 0.7 | 113.6 | 114.3 | 0.3 | 5.1 | 5.4 | -- | 0.6 | 0.6 | 1.0 | 159.1 | 160.1 |
| 2009 | -- | 38.5 | 38.5 | 0.6 | 102.1 | 102.6 | 0.2 | 5.1 | 5.3 | -- | 0.5 | 0.5 | 0.8 | 146.1 | 146.9 |
| 2010 | 0.0 | 20.0 | 20.0 | 0.1 | 74.6 | 74.7 | 0.1 | 2.2 | 2.3 | 0.0 | 0.1 | 0.2 | 0.3 | 97.0 | 97.2 |
| 2011 | 0.1 | 19.5 | 19.6 | 0.2 | 62.6 | 62.8 | -- | 2.9 | 2.9 | -- | 0.3 | 0.3 | 0.3 | 85.2 | 85.6 |

Notes: 1. Trips are reported in thousands.
2. Trips are based on ODFW tag return estimates for catch and on 1996-1998 average success rates as reported in Devore, James, and Beamesderfer repor
3. Recreational sturgeon trips in the Pacific Ocean are not included for 1986-1994 due to missing catch data.
4. Columbia River Lower Section is defined as Buoy 10 to Puget Island. Calculation of catch for this region is the sum of "Buoy 10 - Astoria Bridge" (211) and 50 % of "Above Astoria Bridge - Longview" (212) from ODFW tag return estimates.
5. Columbia River Upper Section is the difference between total Columbia River system and the definition for Columbia River lower section.

Source: Study; ODFW (SSHSTRP); Devore, James, and Beamesderfer (April 1999).

Table 8
Ocean and Inland Recreational Fisheries Trips in 2007 to 2012

| Target Fishery | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|
| Ocean | | | | | | |
| Salmon | 88.3 | 30.4 | 84.5 | 53.3 | 48.8 | 67.3 |
| Halibut | 18.0 | 17.5 | 10.8 | 13.8 | 16.5 | 18.0 |
| Tuna | 12.1 | 7.1 | 10.4 | 11.4 | 10.8 | 16.0 |
| Bottomfish | 60.8 | 64.8 | 64.0 | 71.3 | 69.2 | 69.9 |
| Subtotal ocean | 179.1 | 119.9 | 169.6 | 149.7 | 145.3 | 171.2 |
| Coast estuary and freshwater | | | | | | |
| Fall salmon | 199.5 | 154.0 | 253.1 | 305.5 | 525.6 | 525.6 |
| Spr./sum. Chinook | 25.9 | 25.3 | 39.4 | 77.8 | 86.0 | 86.0 |
| Freshwater steelhead | 107.5 | 79.0 | 79.9 | 104.4 | 84.7 | 84.7 |
| Other marine species | 94.2 | 94.2 | 94.2 | 94.2 | 94.2 | 94.2 |
| Sturgeon | 5.9 | 5.4 | 5.3 | 2.3 | 2.9 | 2.9 |
| Subtotal Coast | 433.1 | 358.0 | 471.9 | 584.2 | 793.4 | 793.4 |
| Lower Columbia River | | | | | | |
| Mainstem fall salmon/steelhead | 20.9 | 19.2 | 41.3 | 31.0 | 31.8 | 41.6 |
| Mainstem spr./sum. Chinook | 11.5 | 6.0 | 10.3 | 25.5 | 8.8 | 8.5 |
| Tributary fall salmon/steelhead | 10.3 | 13.4 | 16.0 | 13.4 | 9.4 | 9.3 |
| Other marine species | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 |
| Sturgeon | 21.2 | 20.7 | 22.7 | 16.4 | 11.7 | 8.9 |
| Subtotal Lower Columbia River | 65.5 | 61.0 | 91.9 | 87.9 | 63.3 | 69.9 |
| Total | 677.7 | 538.8 | 733.4 | 821.9 | 1,002.0 | 1,034.5 |

Notes:
1. Trips are in thousands.
2. Lower Columbia River mainstem spring/summer Chinook fishery includes trips in off-channel areas.
3. Coast estuary other marine species trips most complete recent year available from RecFIN is for year 2002. The counts include trips when anadromous fish are the target species. The anadromous fish trips in 2002 based on SSHSTRP data for "bay" waterway segments are subtracted from the RecFIN derived trip data in order to avoid double counting. It is assumed that other marine species trip counts after the subtraction do not change from 2002 in subsequent years. Lower Columbia River estuary other marine trips only available from MRFSS data ending in Year 1999. The 1997 to 1999 three year average was assumed the trip count for subsequent years.
4. Coast freshwater fisheries data is only available up to 2011. It is assumed trip counts do not change for 2012.
5. Fishery definitions and data sources from Figure 1 apply to this table.

Table 9
Ocean and Inland Recreational Fisheries Economic Contributions in 2011 and 2012

Economic Contributions in 2011:

| | | Recreational | | | | | |
|---|---|---|---|---|---|---|---|
| | | Location | | | | | |
| | Commercial | | Coast Inland | | Lower | | |
| Target Fishery | Ocean Salmon | Ocean | Salmon/ Steelhead | Marine Species | Columbia River | Total | Fishery Share |
| Ocean salmon | $3.21 | $2.49 | | | | $2.49 | 5.2% |
| Inland fall salmon | | | $23.47 | | $0.33 | $23.80 | 50.1% |
| Inland steelhead | | | $3.78 | | $0.10 | $3.88 | 8.2% |
| Inland spr./sum. Chinook | | | $3.84 | | $0.37 | $4.21 | 8.9% |
| Mainstem fall salmon | | | | | $1.30 | $1.30 | 2.7% |
| Ocean halibut | | $1.46 | | | | $1.46 | 3.1% |
| Ocean tuna | | $0.96 | | | | $0.96 | 2.0% |
| Ocean bottomfish | | $6.31 | | | | $6.31 | 13.3% |
| Other marine species | | | | $2.33 | $0.03 | $2.37 | 5.0% |
| Sturgeon | | | | $0.12 | $0.57 | $0.70 | 1.5% |
| Total | $3.21 | $11.23 | $31.09 | $2.46 | $2.71 | $47.48 | 100.0% |
| Shares | | 23.6% | 65.5% | 5.2% | 5.7% | 100.0% | |

Economic Contributions in 2012:

| | | Recreational | | | | | |
|---|---|---|---|---|---|---|---|
| | | Location | | | | | |
| | Commercial | | Coast Inland | | Lower | | |
| Target Fishery | Ocean Salmon | Ocean | Salmon/ Steelhead | Marine Species | Columbia River | Total | Fishery Share |
| Ocean salmon | $5.62 | $3.26 | | | | $3.26 | 6.6% |
| Inland fall salmon | | | $23.47 | | $0.33 | $23.79 | 48.1% |
| Inland steelhead | | | $3.78 | | $0.10 | $3.88 | 7.8% |
| Inland spr./sum. Chinook | | | $3.84 | | $0.37 | $4.21 | 8.5% |
| Mainstem fall salmon | | | | | $1.73 | $1.73 | 3.5% |
| Ocean halibut | | $1.63 | | | | $1.63 | 3.3% |
| Ocean tuna | | $1.45 | | | | $1.45 | 2.9% |
| Ocean bottomfish | | $6.59 | | | | $6.59 | 13.3% |
| Other marine species | | | | $2.33 | $0.03 | $2.37 | 4.8% |
| Sturgeon | | | | $0.12 | $0.44 | $0.56 | 1.1% |
| Total | $5.62 | $12.92 | $31.09 | $2.46 | $3.00 | $49.46 | 100.0% |
| Shares | | 26.1% | 62.9% | 5.0% | 6.1% | 100.0% | |

Notes: 1. Economic contributions are expressed as personal income in millions of 2012 dollars and are at the coastwide economic level.
2. Fall Columbia River mainstem salmon is sometimes referred to as the Buoy 10 salmon fishery.
3. Other marine species is sometimes referred to as bottomfishing when it takes place in the ocean.

Source: Study.

Table 10
Economic Contributions From Oregon's Commercial Fisheries in 1986 to 2012

| | Fishery | | | | | | |
|---|---|---|---|---|---|---|---|
| Years | Offshore and Distant Water | Ocean Troll Salmon | Net Salmon | Ocean Groundfish | Other Landed Fish | Total Contributions | |
| 1986-2006 | $124.9 | | | $62.3 | $162.5 | $349.6 | |
| 1996-2006 | $143.7 | | | $50.0 | $180.4 | $374.1 | |
| 1986 | $124.9 | | | $59.0 | $144.2 | $328.1 | |
| 1987 | $115.7 | | | $78.4 | $189.0 | $383.1 | |
| 1988 | $109.1 | | | $80.4 | $230.3 | $419.8 | |
| 1989 | $103.9 | | | $84.8 | $169.8 | $358.6 | |
| 1990 | $134.6 | | | $75.9 | $136.7 | $347.2 | |
| 1991 | $91.1 | | | $86.6 | $94.2 | $271.9 | |
| 1992 | $88.4 | | | $73.2 | $135.4 | $297.0 | |
| 1993 | $86.7 | | | $74.5 | $91.9 | $253.1 | |
| 1994 | $91.8 | | | $69.1 | $101.8 | $262.8 | |
| 1995 | $95.8 | | | $75.2 | $133.9 | $304.9 | |
| 1996 | $100.6 | | | $73.3 | $155.0 | $328.9 | |
| 1997 | $118.7 | | | $66.3 | $138.1 | $323.2 | |
| 1998 | $132.8 | $4.8 | $0.8 | $48.9 | $97.7 | $284.9 | |
| 1999 | $160.9 | $2.9 | $1.9 | $54.6 | $136.2 | $356.4 | |
| 2000 | $135.2 | $7.1 | $3.8 | $60.9 | $161.2 | $368.1 | |
| 2001 | $143.4 | $11.4 | $3.9 | $49.7 | $142.5 | $350.9 | |
| 2002 | $151.9 | $12.9 | $4.8 | $33.6 | $153.4 | $356.5 | |
| 2003 | $160.3 | $15.3 | $4.8 | $41.4 | $190.6 | $412.4 | |
| 2004 | $153.9 | $18.3 | $7.0 | $38.3 | $231.0 | $448.5 | |
| 2005 | $167.5 | $15.4 | $4.0 | $40.9 | $212.4 | $440.2 | |
| 2006 | $155.4 | $4.4 | $4.1 | $42.4 | $238.9 | $445.2 | |
| 2007 | $178.1 | $4.5 | $3.1 | $42.6 | $206.8 | $435.1 | |
| 2008 | $268.6 | $0.6 | $6.5 | $49.3 | $159.7 | $484.8 | |
| 2009 | $211.5 | $0.6 | $5.7 | $51.9 | $171.1 | $440.7 | |
| 2010 | $225.1 | $4.3 | $8.0 | $46.3 | $166.0 | $449.8 | |
| 2011 | $281.7 | $3.6 | $6.8 | $46.2 | $232.1 | $570.3 | (preliminary) |
| 2012 | $261.3 | $6.2 | $4.1 | $39.1 | $230.3 | $541.0 | (preliminary) |

Notes: 1. Economic contributions are expressed as personal income in millions of 2012 dollars. Years 2011 to 2012 are preliminary estimates.
2. The economic contribution from distant water fisheries includes the effects of vessel revenue returned to Oregon's economy from U.S. West Coast at-sea fisheries, Oregon home-port vessels landing in other U.S. West Coast states and Alaska, southern Pacific Ocean, and other fisheries. New fishing vessel construction, fishery management, and fishery research and training are not included.
3. Years 2008 to 2012 use 2007 IMPLAN response coefficients, and prior years use 1998 IMPLAN response coefficients.
4. Salmon is included in other landed fish in years prior to 1998.
5. Net salmon includes tribal and non-Indian fisheries.

Source: The Research Group, LLC (2013).

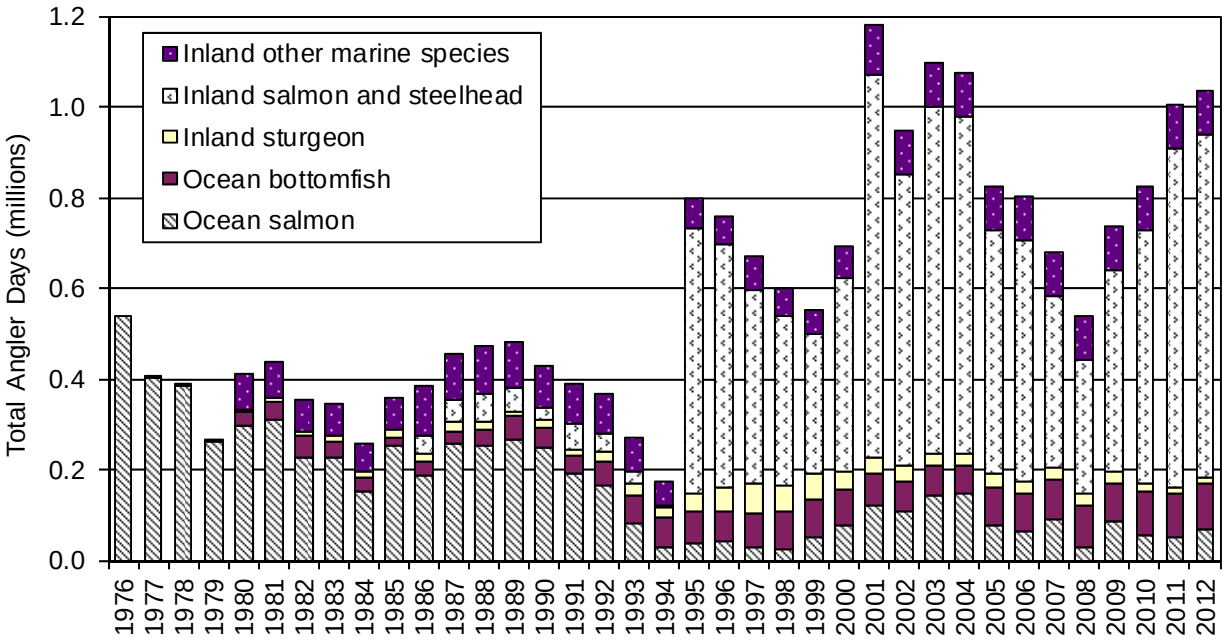
Table 11
Groundfish Nearshore Recreational and Commercial
Fisheries Catch and Economic Contributions in 2009

| | Recreational | | | Commercial | | | |
|---|---|---|---|---|---|---|---|
| Fishery | Catch (fish) | Effort (angler days) | Economic Contribution (millions) | Harvest (pounds) | Harvest (fish) | Harvest Value (millions) | Economic Contribution (millions) |
| RGC aggregate | | | | | | | |
| Nearshore rockfish | 273,893 | | | 325,559 | 136,912 | 0.70 | |
| Black/blue rockfish | 268,049 | | | 300,879 | 126,976 | 0.57 | |
| Other nearshore rockfish | 5,844 | | | 24,680 | 9,937 | 0.14 | |
| Greenlings complex | 5,367 | | | 45,433 | 28,230 | 0.21 | |
| Cabezon | 6,065 | | | 65,739 | 12,689 | 0.23 | |
| Lingcod | 19,412 | | | 232,406 | 33,360 | 0.31 | |
| Total | 304,737 | | | 669,136 | 211,192 | 1.46 | |
| Bottomfish | | 64,856 | 6.00 | | | | |
| Nearshore groundfish fishery | | | | 1,571,903 | | 1.83 | 2.82 |

Notes:
1. Recreational catch is in number of fish and commercial harvest is in pounds and fish. (See Note 3 for weight-to-fish conversion factors.) Harvest value is ex-vessel value expressed in millions of 2012 dollars. Economic contribution is total personal income expressed in millions of 2012 dollars.
2. Some groundfish species caught in Oregon's bottomfish fishery are referred to as the rockfish, greenling, and cabezon (RGC) bag limit aggregate because regulations are designed for allowing anglers to catch a combined sum of any of the species within the aggregate. Lingcod have a separate size and bag limit. For example, the RGC limit was six and the lingcod limit was two in 2009. Regulations also closed ocean waters to bottomfish fishing April 1-Sept. 30 seaward of 40 fm in 2009. Bottomfish fishery management is designed around avoidance for catching yelloweye and canary rockfish. These are prohibited species because of their overfished status. When they are caught, special techniques for discarding these fish are recommended to minimize barotrauma mortality.
3. Groundfish management agencies use research determined models for converting recreationally caught fish to weight. An average weight of less than 1.0 kg (2.2 pounds) across RGC species would not be unreasonable. Cabezon have a 16 inch minimum size limit, therefore heavier weight average at greater than 2.0 kg would be assumed. Lingcod minimum size limit is 22 inches which is about a 3.5 pound fish, however it is not unusual to catch five to 10 pound lingcods in the recreational fisheries. This table uses 2.4 pounds per fish for black rockfish, 1.4 for blue rockfish, 2.4 for brown rockfish, 3.7 for copper rockfish, 2.9 for quillback rockfish, 2.3 for China rockfish, 3.0 for grass rockfish, 1.6 for kelp greenling, 1.7 for rock greenling, 5.2 for cabezon, and 7.0 for lingcod.
4. Commercial catch of the RGC aggregate is shown for comparison purposes.
5. The economic contribution estimate for *recreational* bottomfishing is based on total angler days when a fishing trip motivation was primarily to target bottomfish. Determining the economic contribution estimate for *commercial* fishing associated with the RGC plus lingcod fishery has the difficulty that these species are caught during trips with many other species. The highest resolution economic modeling available would be for trips when nearshore species of rockfish, roundfish, and flatfish were targeted. The commercial fishing gear used to catch these species includes fixed gear and trawl gear. Vessels with open access permits and vessels with limited entry fixed gear permits fishing outside of the sablefish primary seasons target nearshore fish using jig and other fixed gear types. Vessels with limited entry, trawl endorsed permits make trips using selective flatfish and small footrope bottom trawl gear in nearshore areas (shoreward of 30 fm in 2009). The selective flatfish gear allows rockfish to escape while retaining flatfishes. The requirement to use small footrope gear means vessel operations will avoid rocky habitat in order to not damage the gear. Some nearshore species are also caught incidentally in nearshore areas during other fisheries such as the salmon troll gear fishery.
6. Nearshore rockfish species in the RGC aggregate group include black rockfish, blue rockfish, China rockfish, copper rockfish, quillback rockfish, grass rockfish, and brown rockfish. Other nearshore species not included are gopher rockfish, black and yellow rockfish, Irish lord, sculpins, wolf eel, surfperches, and others. The greenling complex includes kelp greenling and rock greenling. Species not included in the RGC aggregate plus lingcod that are sometimes caught on bottomfish targeted trips are flatfishes, such as Pacific sanddab, sand sole, and petrale sole.

Source: The Research Group and Golden Marine Consulting (2012). Weight factors from ODFW personal communication.

Figure 1
Recreational Angler Days for the Study Selected Fisheries in 1976 to 2012

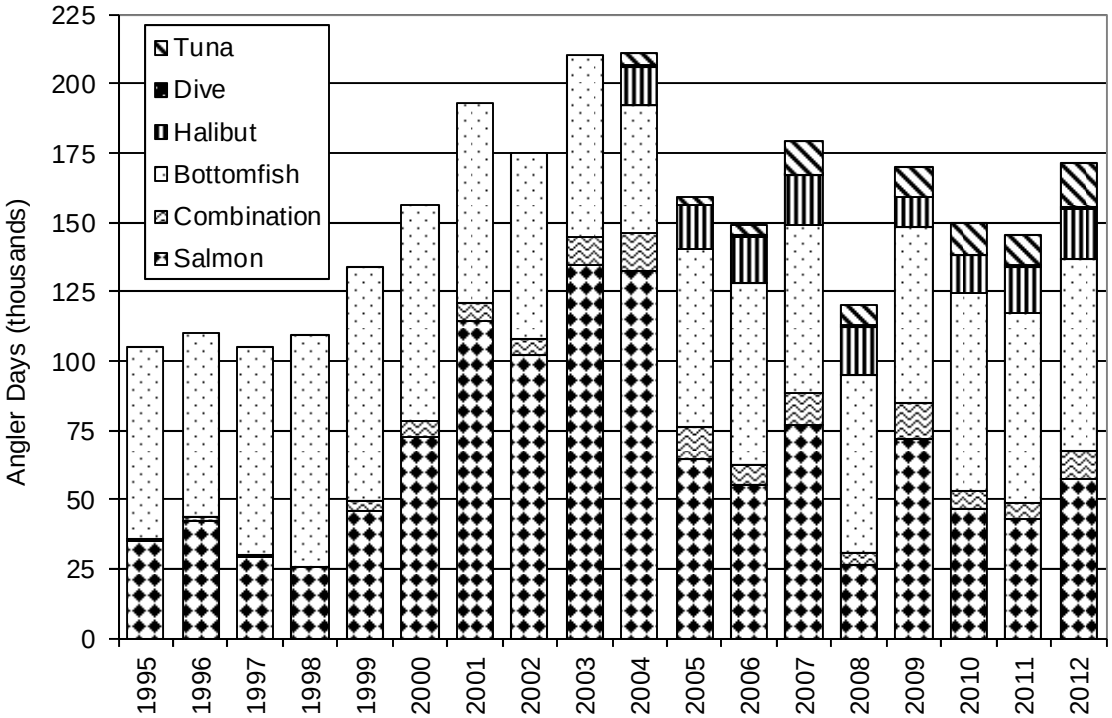



Notes: 1. Angler days are included when the fishing trip occurs in the ocean, inland marine areas (estuaries), and when the trip purpose is for certain species in coastal area freshwater locations. The ocean fisheries are separated by trip purpose being for salmon and bottomfish. If the trip purpose is for a combination of salmon and bottomfish, then it is classified as a salmon trip. The bottomfish fishery includes halibut and tuna trips. The only trips included at freshwater locations are when the trip purpose is for anadromous fish (Chinook and coho salmon, steelhead, and sturgeon). The freshwater locations are at locations approximated for being west of the Coast Range crest.

2. There are gaps in data for the included fisheries. Bottomfish angler days not available before 1980. Lower Columbia River fall salmon fishery trips are not included prior to 1982. Lower Columbia River estuary tributary and Coast estuaries are not included prior to 1995. Coast inland freshwater trips repeat 2011 for 2012. Lower Columbia River sturgeon is not available prior to 1977. Lower Columbia River mainstem salmon and steelhead trips are in the Columbia River Section 10 zone and include the popular fall Buoy 10 fishery for 1982 to 2012. Coast inland other marine species trips are only available for 1980 to 1989 and 1993 to 2002, with 1990 to 1992 estimated by 1989 and 1993, and 2003 to present estimated by 2002. Coast estuary other marine species trips most complete recent year available from RecFIN is for year 2002. The counts include trips when anadromous fish are the target species. The anadromous fish trips in 2002 based on SSHSTRP data for "bay" waterway segments are subtracted from the RecFIN derived trip data in order to avoid double counting. It is assumed that other marine species trip counts after the subtraction do not change from 2002 in subsequent years. Lower Columbia River other marine species trips are only shown for 1993 to 1999, with 2000 to present estimated by 1997-1999 average.

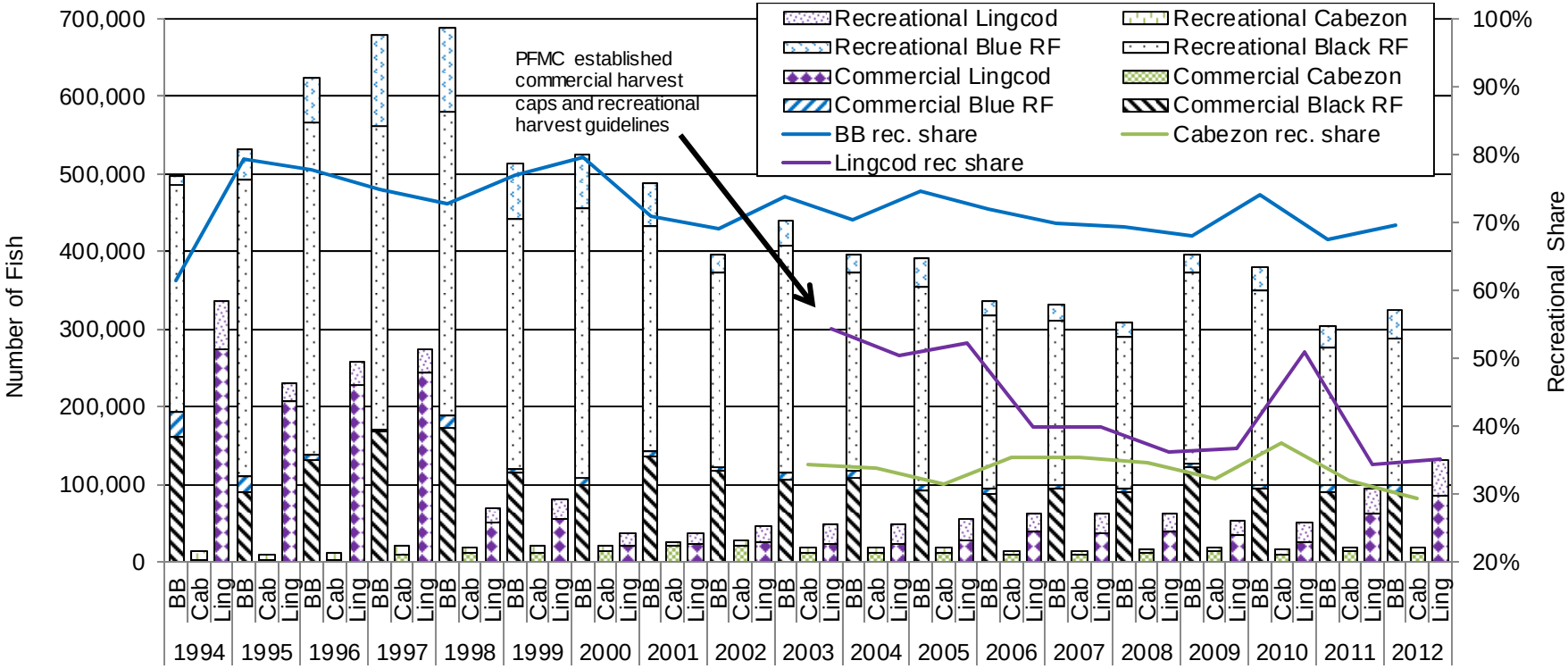
Sources: PFMC (February 2013) for salmon ocean and Columbia River mainstem; ODFW, Oregon Ocean Salmon Fisheries, Annual Status Report, for bottomfish. Watts (2013) for lower Columbia River estuary salmon and sturgeon; ODFW (SSHSTRP) for lower Columbia River off-channel and coast; RecFIN for coastal inland other species; and MRFSS for lower Columbia River other species.

Figure 2
Ocean Recreational Salmon and Non-Salmon Fishing Effort in 1995 to 2012




Notes: Halibut, dive, and tuna are included in bottomfish prior to 2004.
Source: ODFW (ORBS).

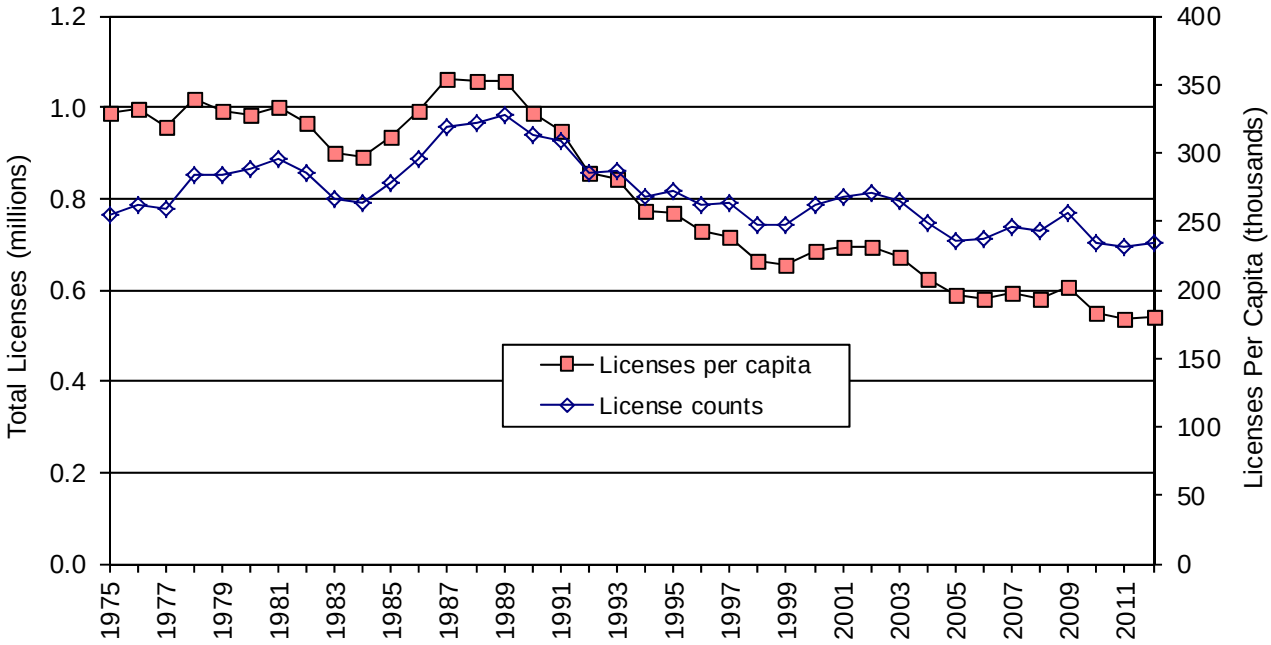
Figure 3
Commercial and Recreational Harvest and Share Trends for Selected Recreation Caught Bottomfish Species in 1994 to 2012




Notes: 1. The PFMC established commercial harvest caps and recreational harvest guidelines started in the 2003 groundfish season. Cabezon and lingcod recreational shares are not shown prior to 2003.
2. BB = black or blue rockfish; RF = rockfish.
3. Average weight per fish is 2.4 pounds for black rockfish, 1.4 pounds for blue rockfish, 5.2 pounds for cabezon, and 7.0 pounds for lingcod.

Sources: Commercial from PacFIN annual vessel summary July 2011 and April 2013 extractions for 2010 to 2012, and PacFIN vdrfd rockfish distributed March 2010 extraction for years 1994 to 2009. Recreational from RecFIN for 1994 to 2003 and ODFW (ORBS) for 2004 to 2012. Weight factors from ODFW personal communication.

Figure 4
Oregon Total and Per Capita Recreational Fishing License Sales in 1975 to 2012

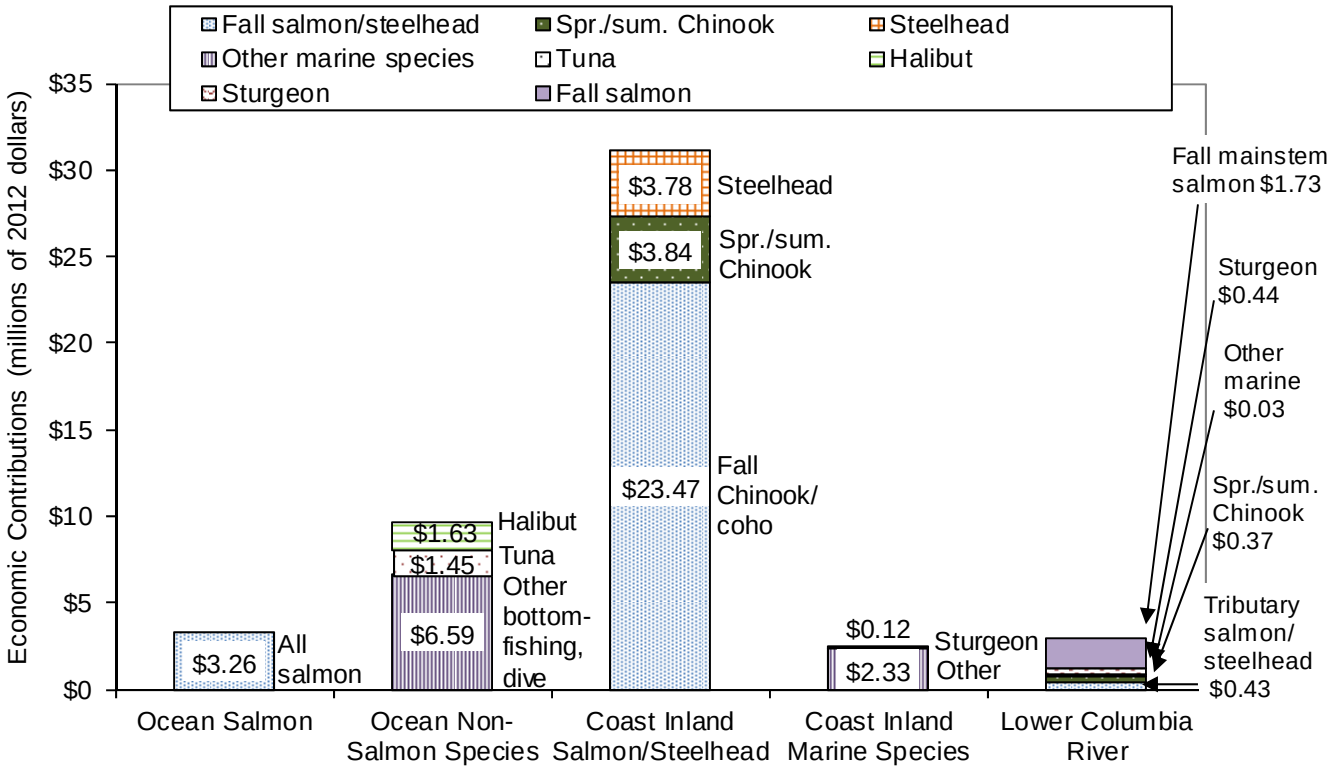



Notes: 1. Fishing license counts include all types of resident and non-resident annual and daily fishing licenses, combination hunting and fishing licenses, and the Resident Sportsman License.

2. Licenses per capita are per 1,000 persons. Daily angler licenses are stated in terms of daily equivalents; e.g., a 3-day license = 3 x 1 daily equivalents. Daily licenses are sold to residents and nonresidents. Actual numbers of daily licenses are fewer than the daily equivalents because some licenses are for two, three, or four days. Some individuals may buy several daily licenses during the year. Ocean vs. inland breakdowns are not available after 1989. In 1994, the 10-day Nonresident Angler license (no tag privileges) was changed to a seven day license (tag privileges included). The Resident Sportsman's License was new in 1998 and includes deer, elk, bear, cougar, turkey, salmon-steelhead, sturgeon, and shellfish tags.

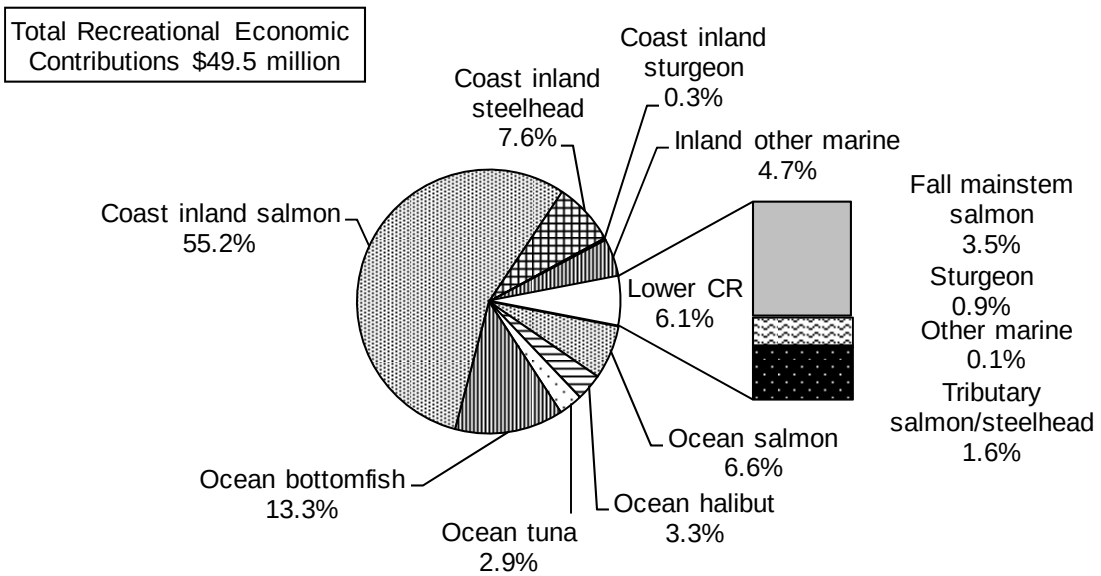
Sources: Personal communication with Chris Carter for 1975 to 2007 and W.A. Jenkins for 2008 to 2012 (ODFW); population from U.S. Bureau of Economic Analysis.

Figure 5
Recreational Ocean and Inland Fisheries Economic Contributions in 2012



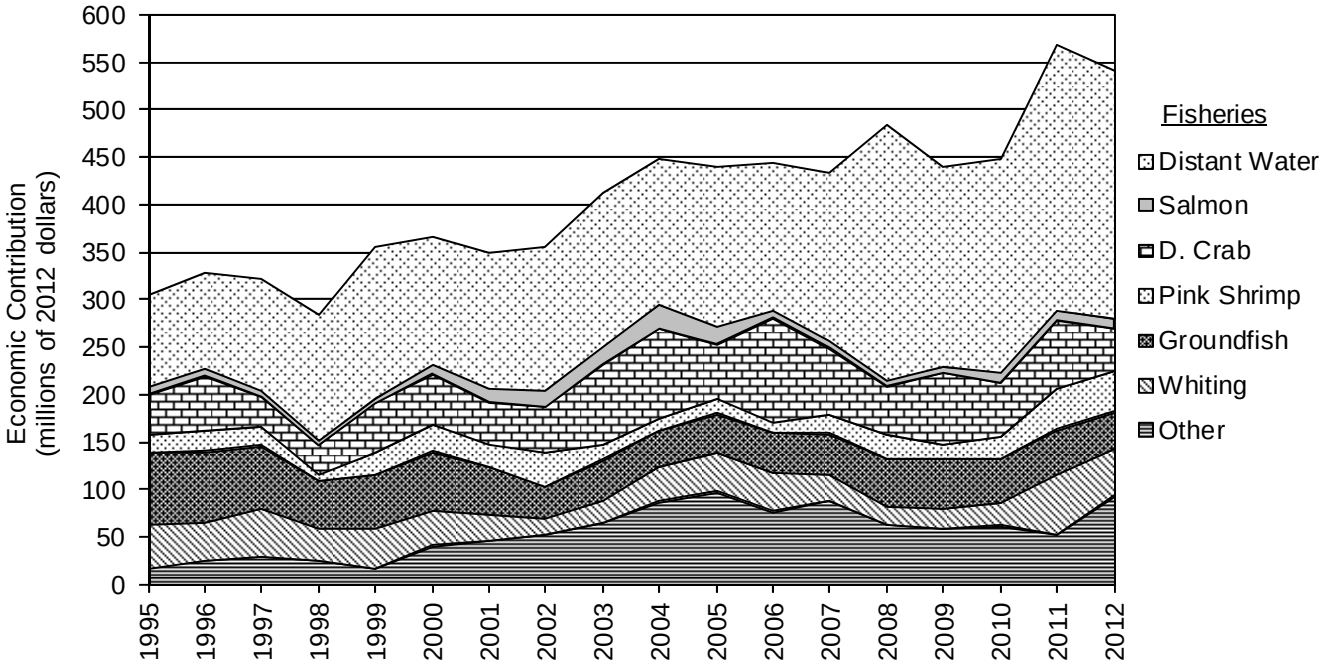

Notes: ODFW SSHSTRP data is 2011, June 2013 extraction.
Source: Study.

Figure 6
Recreational Ocean and Inland Fisheries Economic Contribution Shares for 2012




Notes: ODFW SSHSTRP data is 2011, June 2013 extraction.
Source: Study.

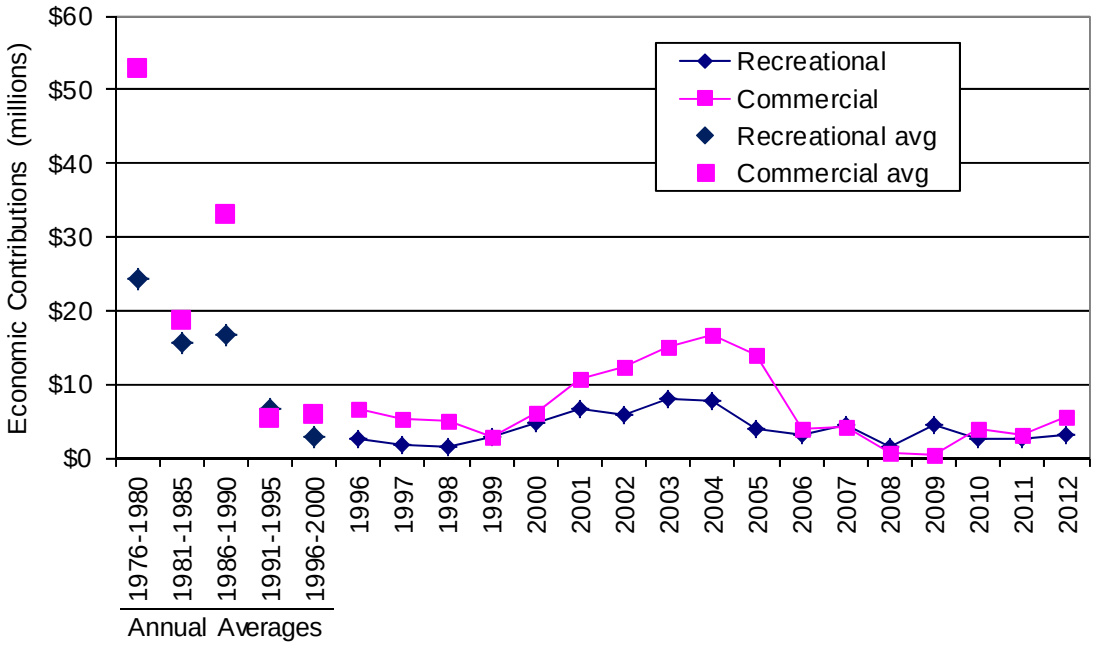
Figure 7
Ocean Commercial and Distant Water Fisheries Economic Contributions in 1995 to 2012




Notes: 1. Economic contributions are expressed as total personal income in millions of 2012 dollars.
2. Shellfish aquaculture is not included.
3. Years 2011 to 2012 are preliminary.
4. The economic contribution from distant water fisheries includes the effects of vessel revenue returned to Oregon's economy from U.S. West Coast at-sea fisheries, Oregon home-port vessels landing in other U.S. West Coast states and Alaska, southern Pacific Ocean, and other fisheries. New fishing vessel construction, fishery management, and fishery research and training are not included.

Source: The Research Group, LLC (2013).

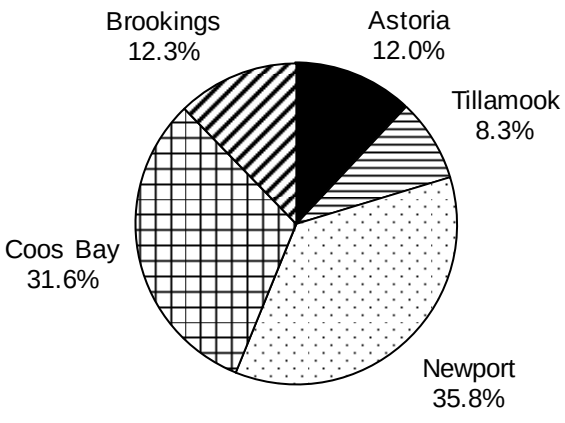
Figure 8
Ocean Commercial and Recreational Salmon Fisheries Economic Contributions for Historical Period Averages and 1976 to 2012



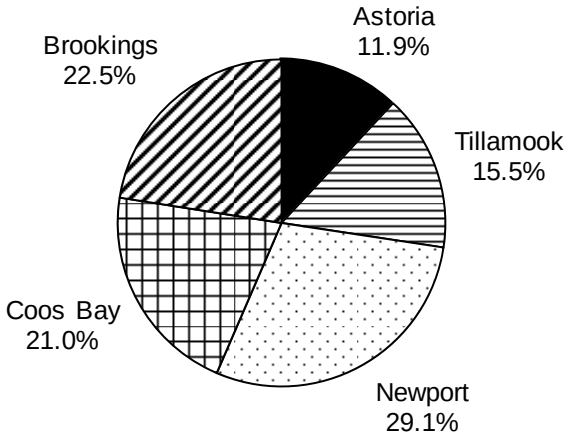

Notes: 1. Expressed as personal income in millions of 2012 dollars.
2. Contributions are at the coastwide level.
3. Contributions exclude Columbia River commercial and recreational fisheries.
Source: PFMC (February 2013).

Figure 9
Ocean Commercial and Recreational Salmon Fisheries Economic Contribution Shares by Port Region in 2012

Commercial Economic Contributions: $5.6 Million




Recreational Economic Contributions: $3.3 Million




Source: PFMC (February 2013).

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# APPENDIX A

# MAPS

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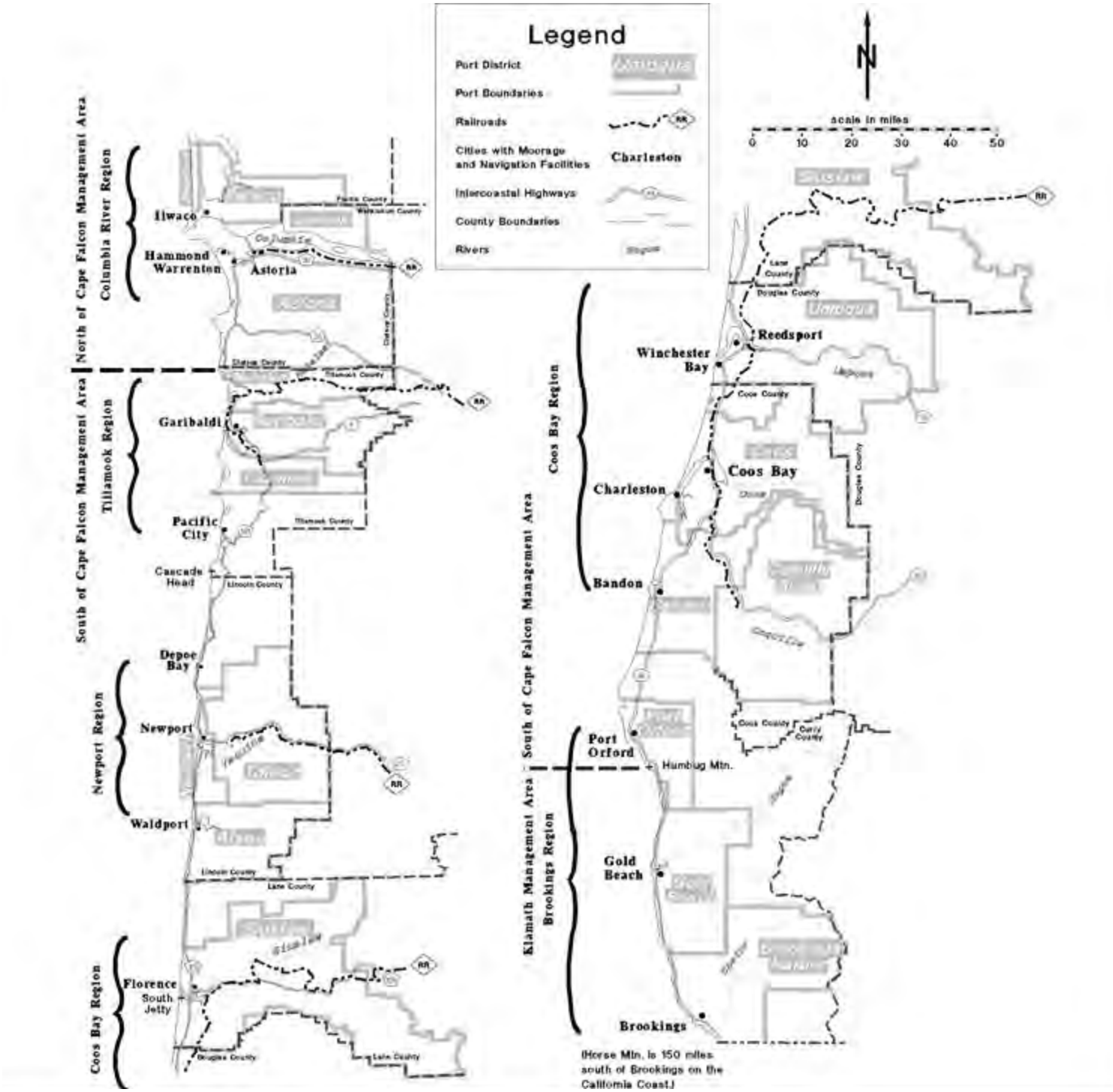
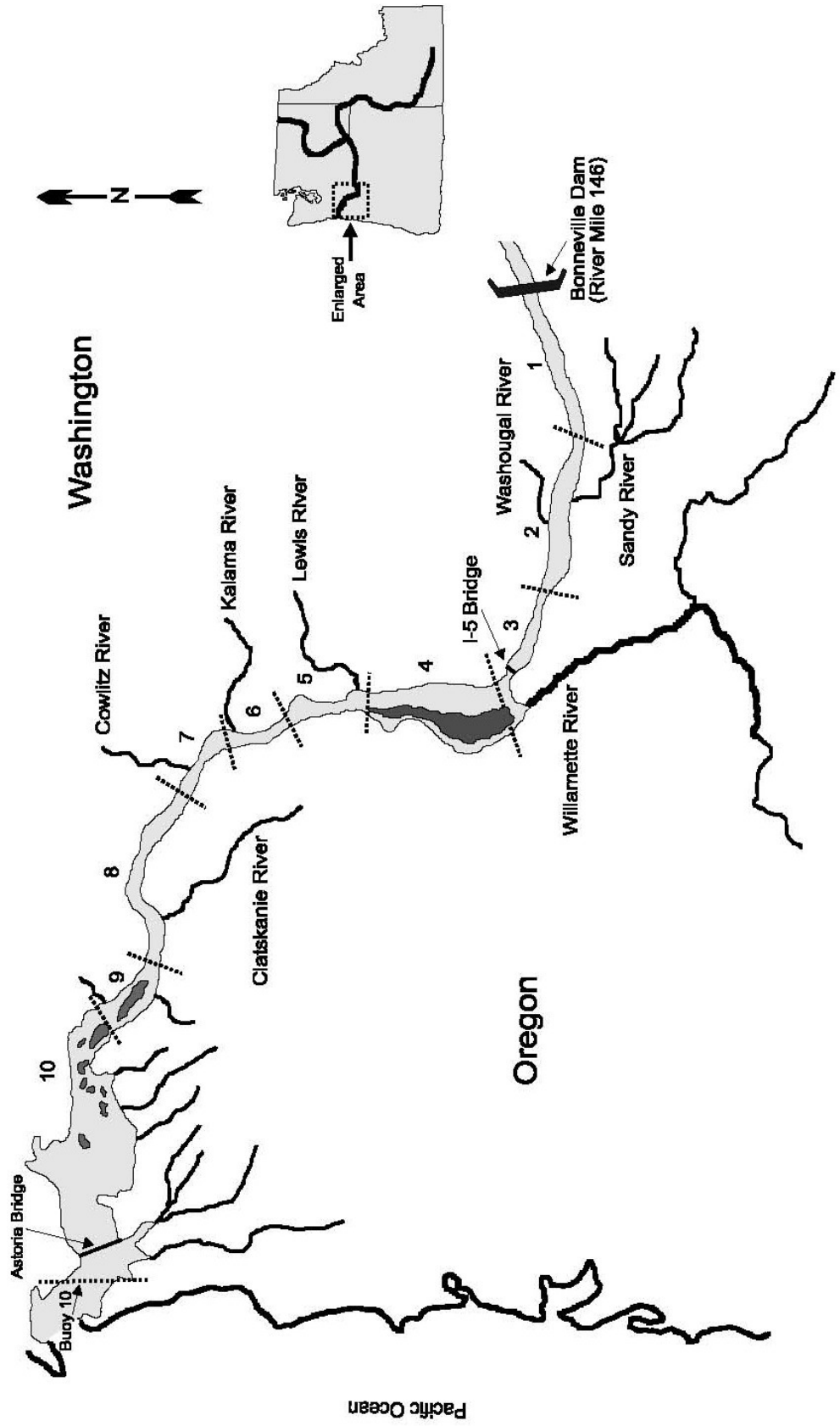
Map A.1
Salmon Fishery Management Areas and Port Regions



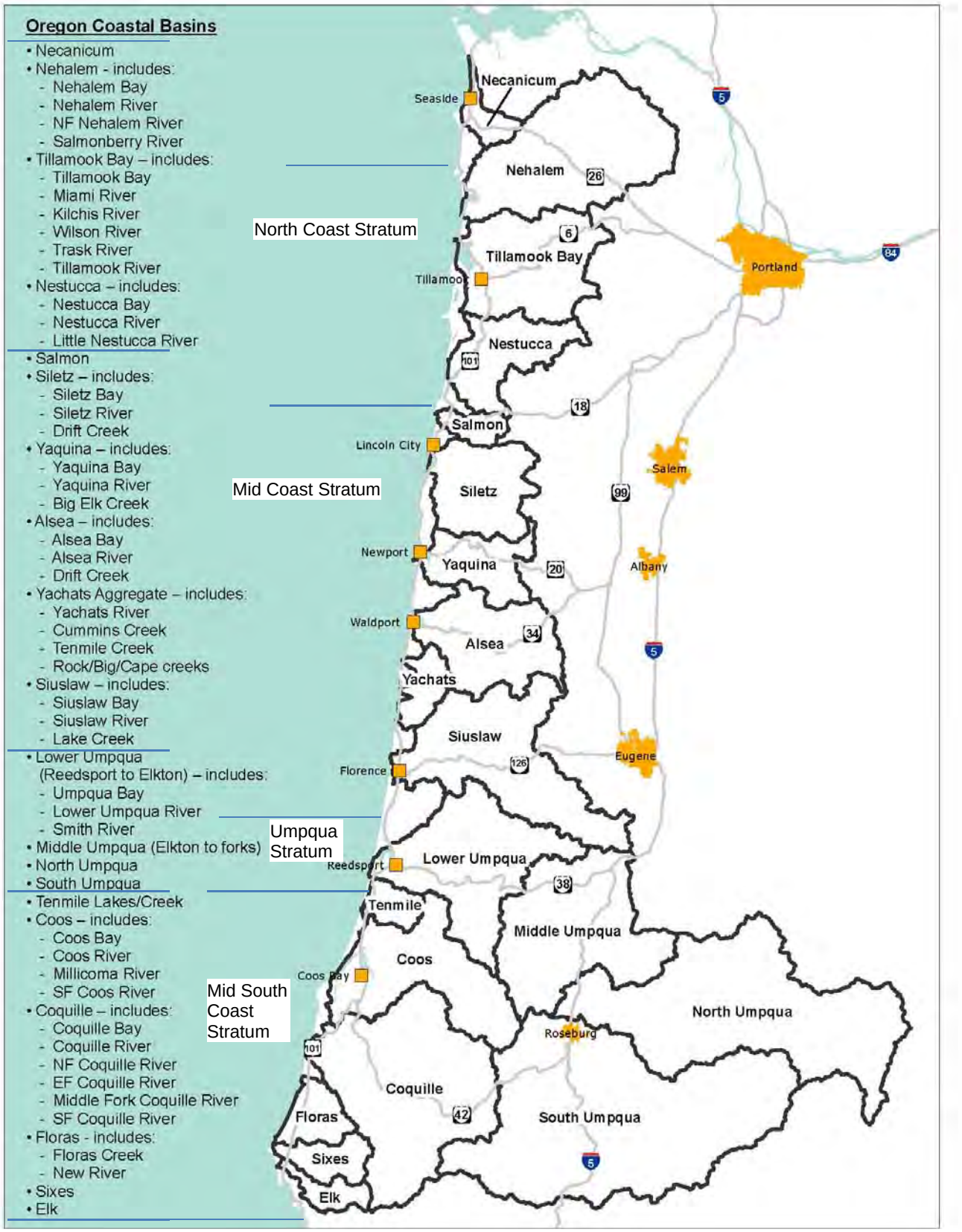

Source: The Research Group (June 2000).

Map A.2
Recreational Sampling Sections on the Columbia River Below Bonneville Dam




Source: Watts (2009).

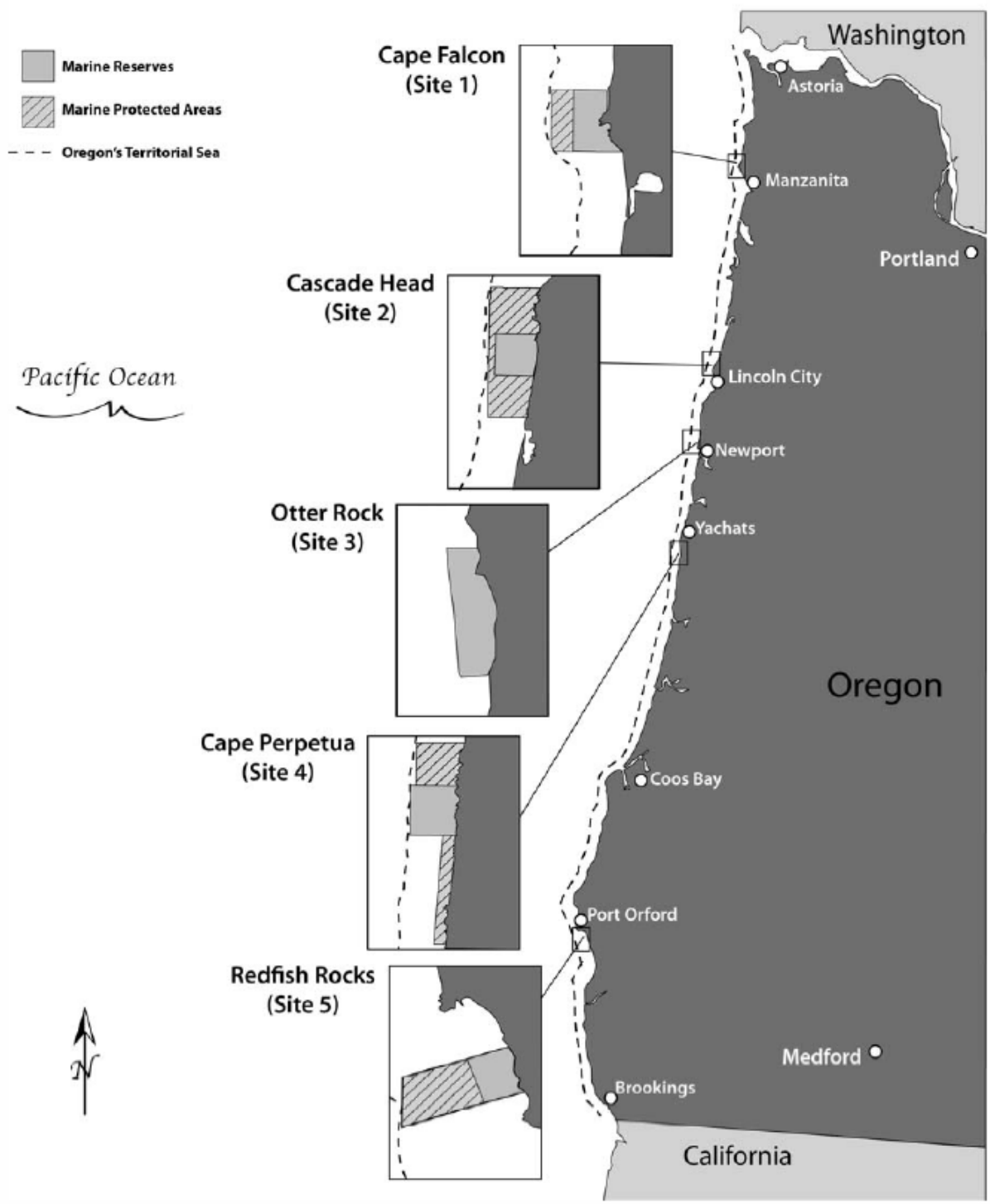
Map A.3
Coastal Basins Within the Oregon Coastal Multispecies Conservation and Management Plan Area




Notes: There are separate conservation and management plans for Columbia River tributaries in Clatsop County, and other coastal basins not shown on this map including the Rogue River. The conservation and management plans are required by the Oregon Native Fish Conservation Policy.

Source: ODFW (June 5, 2013).

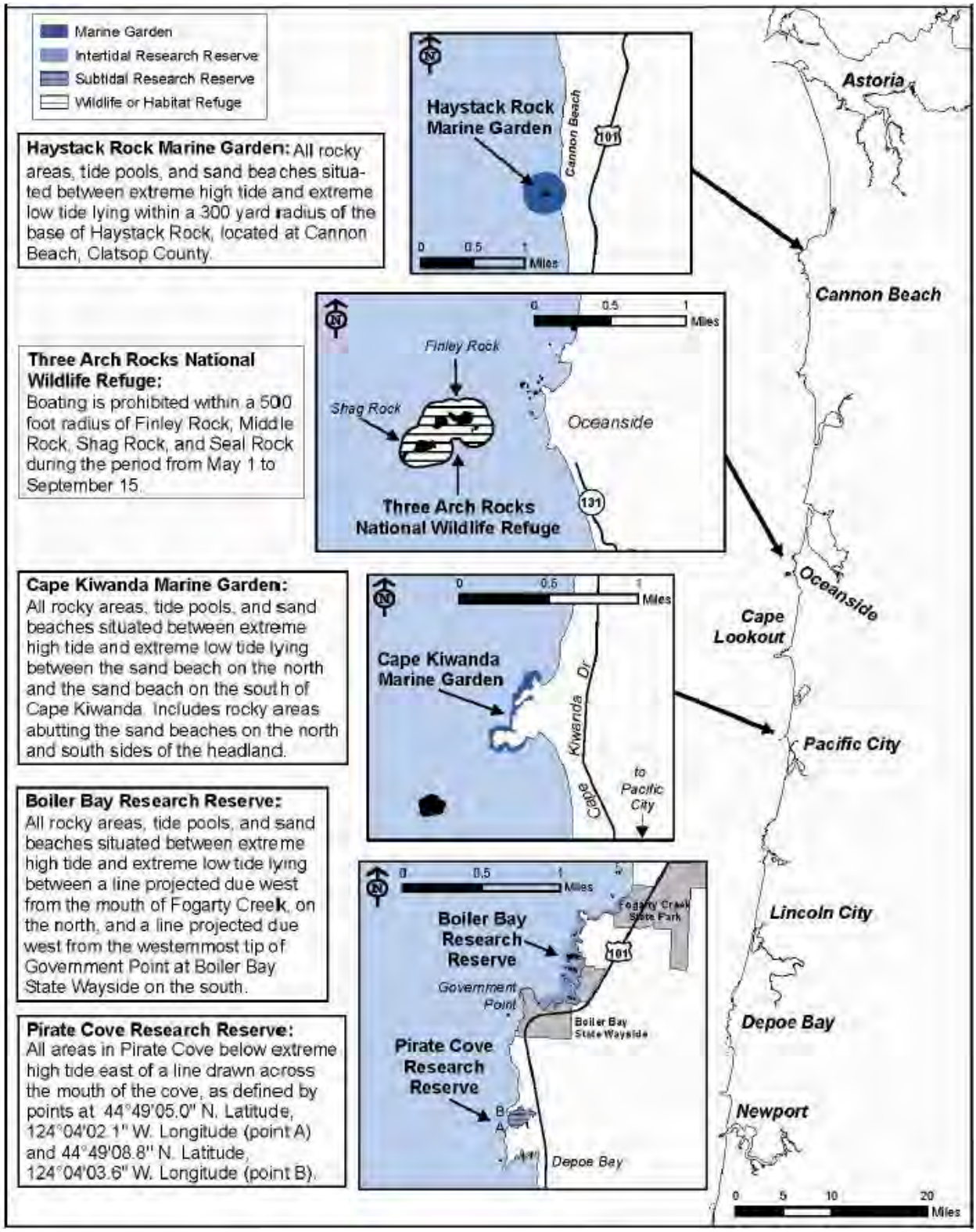
Map A.4
Oregon Marine Reserve Sites



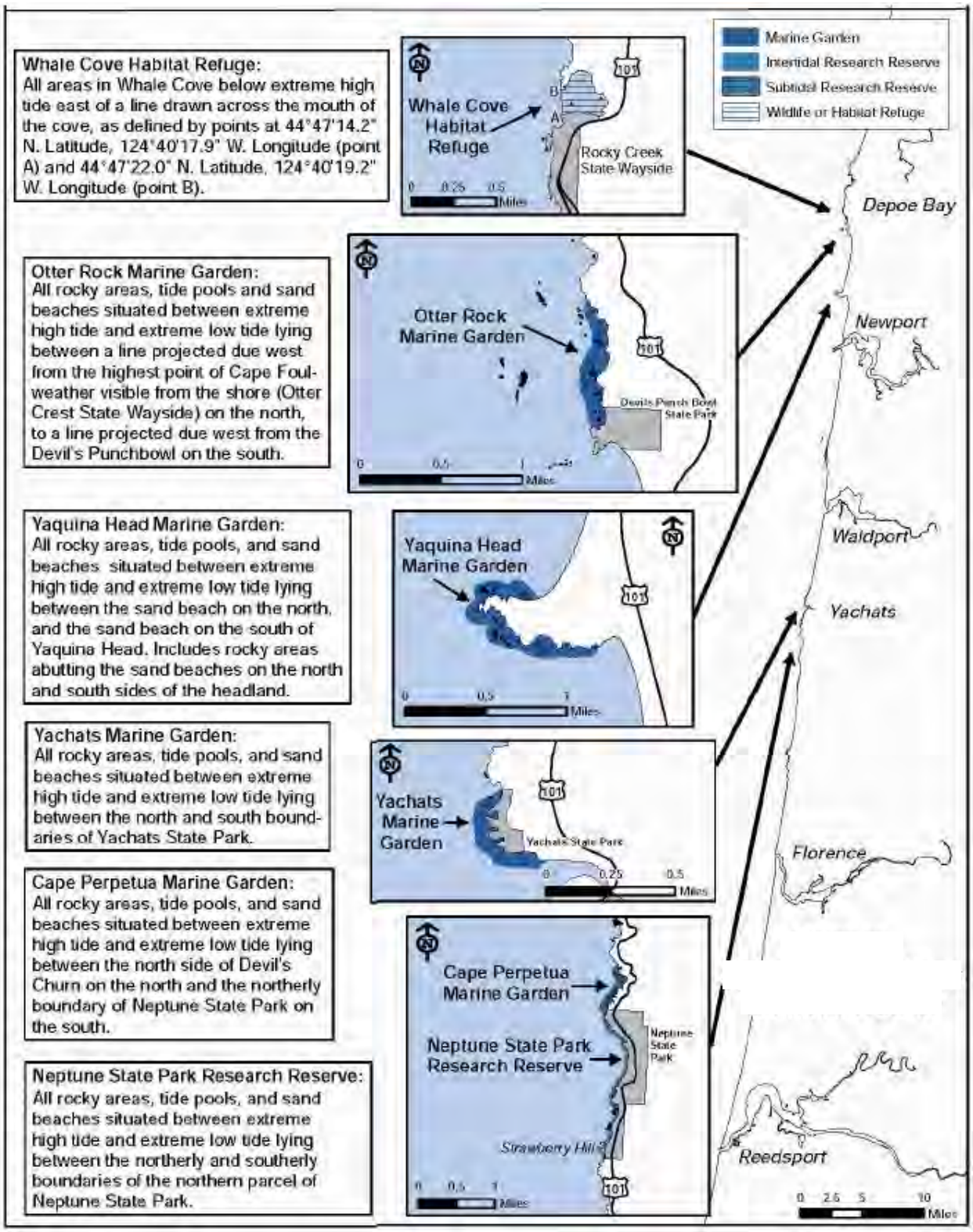

Notes: Marine reserve sites are defined by the Oregon Ocean Policy Advisory Committee to be areas within Oregon's state territorial waters that are to be protected from all extractive activities, including the removal or disturbance of living and non-living marine resources, except as necessary for monitoring or research to evaluate reserve condition, effectiveness, or impact of stressors. The Oregon Legislature House Bill 3013 enacted in 2009 assigned the ODFW as the lead agency for establishing and implementing marine reserve sites. Two sites were designated: Redfish Rocks at Port Orford and Otter Rock near Depoe Bay. Senate Bill 1510 was enacted in 2011 requiring ODFW to evaluate, establish, and enforce regulations on three new marine reserves: Cape Falcon, Cape Perpetua, and Cascade Head. Recreational and commercial fishing is constrained within the Redfish Rocks and Otter Rocks sites in 2012. Fishing constraints will occur at Cape Perpetua and Cascade Head in 2014. Fishing constraints will occur at Cape Falcon in 2015.

Source: Oregon Marine Reserves Website (2013).

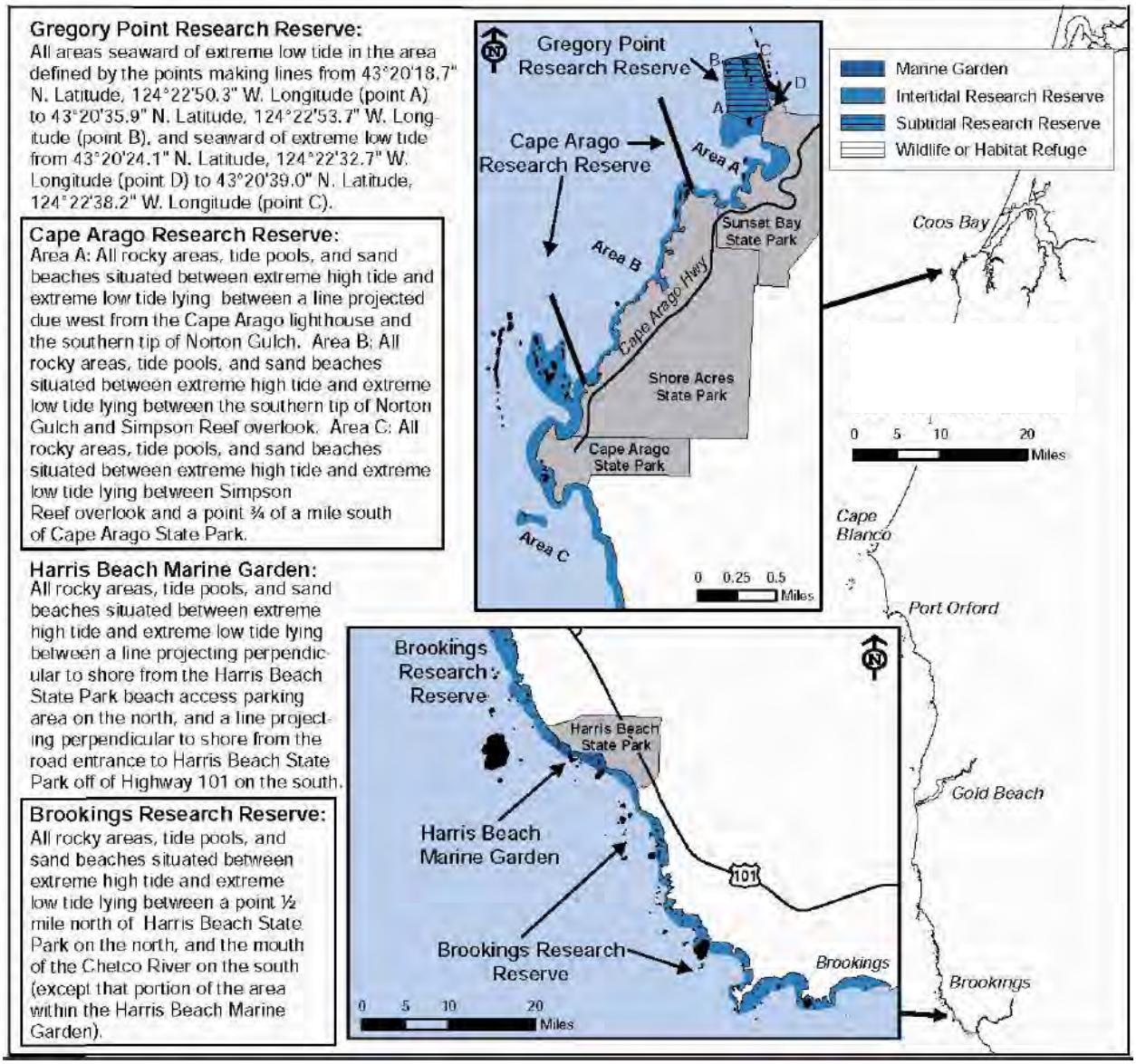
Map A.5
Marine Garden and Research Reserves



Map A.5 (cont.)


Whale Cove Habitat Refuge:
All areas in Whale Cove below extreme high tide east of a line drawn across the mouth of the cove, as defined by points at 44°47'14.2" N. Latitude, 124°40'17.9" W. Longitude (point A) and 44°47'22.0" N. Latitude, 124°40'19.2" W. Longitude (point B).
Otter Rock Marine Garden:
All rocky areas, tide pools and sand beaches situated between extreme high tide and extreme low tide lying between a line projected due west from the highest point of Cape Foulweather visible from the shore (Otter Crest State Wayside) on the north, to a line projected due west from the Devil's Punchbowl on the south.
Yaquina Head Marine Garden:
All rocky areas, tide pools, and sand beaches situated between extreme high tide and extreme low tide lying between the sand beach on the north, and the sand beach on the south of Yaquina Head. Includes rocky areas abutting the sand beaches on the north and south sides of the headland.
Yachats Marine Garden:
All rocky areas, tide pools, and sand beaches situated between extreme high tide and extreme low tide lying between the north and south boundaries of Yachats State Park.
Cape Perpetua Marine Garden:
All rocky areas, tide pools, and sand beaches situated between extreme high tide and extreme low tide lying between the north side of Devil's Churn on the north and the northerly boundary of Neptune State Park on the south.
Neptune State Park Research Reserve:
All rocky areas, tide pools, and sand beaches situated between extreme high tide and extreme low tide lying between the northerly and southerly boundaries of the northern parcel of Neptune State Park.
Marine Garden
Intertidal Research Reserve
Subtidal Research Reserve
Wildlife or Habitat Refuge
Whale Cove Habitat Refuge
Rocky Creek State Wayside
Otter Rock Marine Garden
Devils Punch Bowl State Park
Yaquina Head Marine Garden
Yachats Marine Garden
Yachats State Park
Cape Perpetua Marine Garden
Neptune State Park Research Reserve
Neptune State Park
Strawberry Hill
Depoe Bay
Newport
Waldport
Yachats
Florence
Reedsport
101
Miles

Map A.5 (cont.)




Notes: 1. Marine gardens and research reserves have special fishing regulations. They are generally closed to take of shellfish and marine invertebrates, but have exceptions. Refer to ODFW (December 2012(a)) special regulations for marine zone.

Source: ODFW (December 2012(a)).

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# APPENDIX B

# COMMERCIAL AND RECREATIONAL USER GROUP MARINE FISH RESOURCE ALLOCATION ARRANGEMENTS

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COMMERCIAL AND RECREATIONAL USER GROUP
MARINE FISH RESOURCE ALLOCATION ARRANGEMENTS

Background

There are federal and state fisheries management plans or less formal precedents that specify commercial and recreational total allowable catch (TAC) sharing schedules.[1] Oregon ocean recreational fisheries where the sharing schedules have been pre-determined include salmon, groundfish (termed bottomfish in the recreational fishery), and halibut. In general, management agencies receive stock assessment information that determines annual ocean and estuary TAC's. Then the formal fisheries plans or precedents determine user group's annual harvest caps. User groups can include commercial fisherman, recreational anglers, Indian tribes, researchers, and others. For the commercial and recreational user groups, determining regulations for commercial fisherman to stay within caps is much more definite than in in the recreational fisheries. For example, the commercial groundfish trawl fishery on the West Coast is managed by a catch-share program whereby individual fisherman are assigned a not-to-exceed species-by-species quota. A suite of management measures (such as bag and size limits, intraweek allowed days, depth defined area closures, etc.) must be used in the recreational bottomfish fishery to keep harvests within quotas and allow for a traditional season duration.[2]

Determining user group allocations is contentious. User groups will agree that fisheries must be sustainably managed, but disagree on allocation amounts because of the important economic and sometimes cultural implications. The Magnuson-Stevens Act (MSA) as amended addresses the principals of allocations for federally managed fisheries through National Standard 4 Guidelines. Other MSA national standards specify that economic and social impacts on communities must be assessed prior to allocation or reallocation decisions being made. State managed fisheries in Oregon have less legislative guidance, but do mention optimum and equitable utilization of wildlife and food fish resources (ORS 496.012 and ORS 506.109). Fishery managers and policy making boards rely on various levels of economic information about fair and equitable impacts for allocation decisions. Decision makers, however, are instructed by the MSA and by inference

1. Total allowable catch (TAC) is a term used synonymous with the meaning of annual catch limits (ACL) in this narrative. The MSA as amended in 2006 called for mechanisms for specifying ACL's and include accountability measures (AM) to ensure overfishing species does not occur. NOAA Fisheries subsequently revised National Standard 1 Guidelines in 2009 to further define management terms for acceptable biological catch (ABC) and other stock condition reference points such as the overfishing limit (OFL) and the annual catch target (ACT). In general, the definitional framework means OFL $\geq$ ABC $\geq$ ACL $\geq$ ACT. The distance between the levels depends on the scientific uncertainty in the estimates. The determination of ACL is based, when possible, that the probability ACL will exceed ABC is less than 50 percent. AM's prevent the ACL from being exceeded and correct or mitigate overages of the ACL if they occur. ACT's are recommended in the management system of accountability measures so that ACL is not exceeded. AM's can include in-season adjustments to bag limits, area closures, etc.
2. An approved suite of recreational management measures are best estimates of what will happen for throttling recreational catch. In-season review of quota attainment can be difficult because harvest amounts will depend on creel surveys and charter service logbooks that have compilation delays. Recreational interests generally prefer stricter regulations as a tradeoff that preseason duration estimates will last a predictable period. In-season closures of recreational fisheries can have adverse long-term implications to tourism businesses that depend on advance bookings and lengthy fishing seasons.

in Oregon statutes to not use economics as the sole decision making criteria. Consequently historical usage patterns between user groups tend to get more consideration in allocation decisions than other criteria such as attaining improved economic efficiencies and greater social welfare.

Authors in PERC (2009) argue that historical usage patterns are quasi-property rights, therefore the solution to re-distributing between user groups is to apply structures so that the allocations can be accomplished in a market-tradable format. The charter service recreational sector would be better positioned to take advantage of such an approach rather than the un-guided sector. A conservation benefit from the integration of the commercial and charter service users is that these sectors would be more responsive to stock abundance declines. In turn, commercials can catch every fish allocated and charter operators are in a position to raise angler demand when notified preseason about abundance increases.

To assist regional management councils in making allocation decisions, NOAA Fisheries began the Recreational Fisheries Engagement Initiative in 2009 (NOAA Fisheries April 2013). The Initiative provides guidance to councils and does not dictate user group sharing arrangements. A hallmark of the Initiative is promoting better data acquisition and interpretation programs. Results from the Initiative shows that nationally, an emerging consideration in allocation decisions is to separate recreational allocations into sectors for charter service and private anglers. Examples in federally managed recreational fisheries where allocations are being reviewed for sector separation are the Pacific halibut fishery in Alaska and the red snapper fishery in the Gulf of Mexico. There has not yet been an attempt on the West Coast to separate the recreational charter fleet and private boat fleet into sectors. For organizational reasons, charter service operators and associations will sometimes represent the unguided angler interests on management advisory and policy making boards. Charter service interests appreciate the unified sector representation when arguing for allocation shares and will compromise positions in order not to separate the sector. Additional historical information on user group allocation current trends at the national level can be found in Lapointe (2012).

## Ocean Fisheries User Group Sharing Arrangements

### *Salmon Fishery*

The West Coast salmon fishery is federally managed. The original Pacific Fishery Management Council (PFMC) Fishery Management Plan (FMP) for salmon was adopted in 1977. It has been amended 17 times with the latest being in October 2012. Salmon stocks to be allocated are primarily coho and Chinook. The original plan and subsequent amendments reflect the interests of recreational fishing groups to achieve to the extent possible, a minimum season starting Memorial Day and continuing through Labor Day. Commercial fishing interests' objectives are to achieve an economically viable allocation at low stock levels with an increasing share as allowed harvest levels increase. The conservation objective is to achieve an acceptable ocean escapement of returning adult salmon to their river basins of origin. The FMP is necessarily complex in meeting these objectives because it is co-managed by the PFMC with more than 20 tribes with usual and accustomed (U&A) fishing areas in western Washington and the Columbia

River, three Klamath River tribes, and four state fish and wildlife agencies. Several of the northwest and California stocks are further managed by a listing as threatened or endangered under the Endangered Species Act (ESA).

Tribes are allocated 50 percent of forecasted harvestable fish destined to pass through their U&A fishing areas. Commercial and recreational sector allocations occur after that subtraction from TAC occurs. The FMP specifies a sliding scale ocean harvest arrangement based on coho salmon abundance. The commercial sector receives an initial small allocation of coho for hook and release mortality when Chinook salmon are being targeted. Above that number the recreational sector is allocated a majority of the coho at very low TAC with an increase in sharing going to the commercial sector, at higher abundance levels. There are additional FMP elements that allow flexibility in trading fish numbers within and between management sub-areas. If the affected parties agree, trades are allowed between recreational and commercial sectors as well as between recreational port allocations on the northwest Oregon coast and the four coastal ports in Washington within the recreational sector in order to achieve season objectives among all sectors. Oregon has promoted late season terminal fisheries located within territorial sea boundaries and near the entrances of rivers with healthy Chinooks populations to supplement open ocean fisheries. In some years when ocean fisheries were closed to protect weak stocks in mixed stock fisheries, only these terminal fisheries were available to the commercial fishery sector.

*Bottomfish Fishery*

The West Coast groundfish fishery management is correspondingly more complex than the salmon fishery because of its multi-fleet, multi-species, and multi-sector participation. It is also a federally managed fishery with the first FMP adopted in 1984 and amended 23 times through 2010. (Two of the amendments have not yet been formally adopted to-date.) The original FMP and subsequent amendments have mostly addressed commercial fishing regulations prompted by the incompatibility of the groundfish fleet's harvesting capacity and TAC's made available at fish resource sustainability levels. The recreational sector harvests and associated discard mortalities were acknowledged for determining conservation standards, but formal allocations were not adopted in the early management of this fishery. It was not until certain shelf rockfish species reached overfishing levels that allocations became a concern. In 2003, the PFMC took action to conserve overfished shelf rockfish stocks by implementing depth-based Rockfish Conservation Areas (RCA's) which closed large areas of the shelf for commercial groundfish fishing, followed by similar action for recreational fisheries in 2004. It was anticipated that this would cause significant effort shift into nearshore waters and increase fishing pressure on nearshore groundfish stocks, for most of which conservation status was unknown at the time. Coincidentally, Oregon had seen a recent rapid increase in commercial nearshore groundfish effort since 1998 due to the growth of live fish markets. Based on recommendations from Oregon representatives on the Council, the PFMC established commercial harvest caps and recreational harvest guidelines for the 2003 groundfish season. In subsequent years, this authority defaulted back to the states as each adopted their own equally or more conservative caps or allocation schemes, and because nearshore groundfish occur predominately within the states' territorial seas.

Oregon management specifies separate recreational and commercial fishing "landing caps" and/or "harvest caps" for several species or species complexes.[1] Harvest caps are generally used when there is an Oregon-specific federal TAC for an applicable groundfish complex because federal limits require that all sources of fishery related mortality are accounted. Otherwise, landing caps are used because they are more amenable to in-season management. This creates a de facto allocation, and although the percentages are not hardwired in regulation or an FMP, Oregon has kept the proportional split between recreational and commercial sectors stable since caps were put in place for the 2003 season.

The harvest levels for both sectors change from time-to-time, typically based on new stock assessments used in the PFMC harvest specification and regulation setting process. Most recently, recreational management schemes have had to be adjusted for declining cabezon stocks to stay within the federal TAC. Caps for both black and blue rockfish and the other nearshore rockfish complex were raised starting in 2009 for recreational fisheries. Formal stock assessments from which management harvest caps are established for non-overfished stocks have been completed for black and blue rockfish, cabezon, and kelp greenling. Management techniques such as area and time closures are designed around avoiding incidental catches of the overfished species canary and yelloweye. Nearshore species stock status concerns and information can be found in ODFW (2012(b)).

*Pacific Halibut*

Pacific Halibut is an internationally managed fishery. The International Pacific Halibut Commission (IPHC) and NOAA's National Marine Fisheries Service (NMFS) manage the Pacific halibut fishery through regulations established under the Northern Pacific Halibut Act of 1982 (NPHA). The Alaska, British Columbia, and West Coast halibut fishery history, species biological traits, current management regime, and abundance issues are aptly described at the IPHC (2013). The IPHC promulgates regulations governing the Pacific halibut fishery under the Convention between the United States and Canada for the preservation of the halibut fishery of the North Pacific Ocean and Bering Sea. Regulations proposed by the IPHC are subject to approval by the Secretary of State with concurrence from the Secretary of Commerce. The NPHA authorizes the U.S. regional councils (e.g. the North Pacific Fishery Management Council (NPFMC) and the PFMC) to develop regulations that are in addition to, and not in conflict with, approved IPHC regulations. The regional council regulations may be implemented by NMFS only after approval by the Secretary of Commerce. Due to the overlap of halibut and non-halibut fishing, NMFS collaborates with the effected states in the management of recreational halibut fisheries.

The PFMC adopted a catch sharing plan (Plan) in 1994 for the fisheries off of Washington, Oregon, and California (termed regulation Area 2A by the IPHC). The Plan is very detailed in sharing percentages assigned to user groups, sub-areas, and seasons.[2] States have flexibility for

1. Landing caps are limits on the total amount landed in ocean boat-based fisheries in a calendar year and harvest caps are limits on the total estimated fishery-related mortality in a year, including landings, discard mortality, and shore-and-estuary based fishing.
2. The Plan specifies allocations to three user groups: commercial non-Indian including a directed longline halibut fishery, incidental salmon troll, and incidental longline sablefish fishery; treaty Indian commercial and

recreational fishery in-season management to keep catch within subarea quotas. Oregon has used varying combinations of regulations (fishing periods, bag limits, intraweek closures, etc.) for the in-season management.

West Coast states have not requested a Plan amendment process to have separate sector shares for charter services and private boats. The NPFMC has considered recreational sector specific quotas many times over the last 10 years. The consideration was induced because there was not a user group specified sharing plan when the individual catch-share plan was adopted in 1995. The estimated combined recreational and tribal catch was simply subtracted from the Alaska exploitable biomass for determining the commercial sector TAC. Charter services catch grew dramatically during the early 2000's prompting the commercial sector to seek relief from the NPFMC. There have been many alternatives considered including development of a charter service individual catch-share plan. The most recent planning (adopted by the NPFMC, but not yet approved by NMFS) has separated the charter service sector from the combined recreational and treaty user groups. The plan provides for sliding scale sharing between the charter service and commercial sector depending on the IPHC determined exploitable biomass. The estimated private boat and tribal catch follow traditional regulations and estimated catch is subtracted first in determining the charter service and commercial quotas. The NPFMC would be tasked with annually determining season regulations to keep the charter service catch within its assigned quota. An interesting feature of the plan is that the charter service may make side purchases from a willing seller of annual commercial quota pounds. That means a commercial fisher would forgo rights to harvest those quota pounds because a charter service operator has purchased them for a recreational angler.

Discussion

Regional councils have the authority under the MSA to allocate and re-allocate fisheries among user groups subject to a fair and equitable test and other MSA provisions. The authority could be regarded as the most important of council responsibilities after ensuring stock conservation. Allocation was an early and pressing challenge for councils when developing FMP's. The allocation decisions are controversial and there is a history of litigious challenges when exercised. Allocations between commercial and recreational user groups are particularly vexing because the groups' motivations and characteristics differ greatly (McLeod 1994). Despite

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ceremonial and subsistence fisheries; and, recreational fishery. The Alaska and British Columbia non-Indian commercial directed halibut fishery are managed via individual catch-share regulation, but the West Coast uses a derby fishery system of 10-hour seasons with fishing period limits. The IPHC adopts an annual exploitable biomass by regulation area in January of each year and the Plan specifies the user group TAC's. In Area 2A, the Plan allocates 35 percent of the TAC to tribes and 65 percent to non-Indian fisheries. The allocation to non-Indian fisheries is divided into three shares, with the Oregon/California recreational fishery receiving 31.7 percent. The Oregon/California recreational fishery has three subareas: north of Cape Falcon, south of Cape Falcon to Humbug Mt., and south of Humbug Mt. The central subarea is allocated 97.0 percent of the Oregon/California recreational allocation minus the amount needed to contribute to the Oregon portion of the Columbia River subarea quota. There are two central subarea seasons to provide periodic fishing opportunity in spring and in summer in productive deeper water areas along the Oregon Coast, and provide a more continuous period of fishing opportunity in the summer for nearshore waters. The area south of Humbug Mt. and including California waters is allocated 3.0 percent of the Oregon/California TAC. Management is structured to provide anglers the opportunity to fish in a continuous, fixed season that is open from May 1 through October 31.

economic information that might show gains in efficiencies and higher net economic benefits for re-allocation, councils generally settle on using historical fishery shares in setting allocation regulations.[1]

The three Oregon recreational fisheries described in this section are not managed in a framework whereby a market-tradable approach for re-allocation will work.[2] The hurdle for having such a system is for both the commercial and recreational user groups to be organized such that there can be an assignment of property rights. There are flexible MSA defined organizational approaches (e.g. individuals, cooperatives, regional fishery associations, and others) and non-MSA mechanisms (e.g. trusts, non-profit associations, and others) that could assume the asset value for fisheries (Ecotrust 2011). Hanna (2006) describes the other conditions that are necessary for specifying a property rights system.[3] Without these conditions in-place, a market-tradable approach for re-allocation would be considered at an impasse. In the absence of tradable rights, any attempts at re-allocation will revert to arguments over historical shares and greatest economic value in politically charged settings. In such an environment, allocation decisions may not reflect changed social and economic conditions and fisheries will be locked into structures that prevent improvements in overall social welfare that can come from fish resources.

1. An example where re-allocation was deemed was by Fisheries and Oceans Canada (FOC) in 2012. FOC took a relatively bold approach by modestly changing inter-sector shares for British Columbia halibut fisheries. The Department announced the recreational allocation will be 15 percent which is a three percent increase over previous years allocation. The decision was to recognize the importance of the recreational sector to the economy, the desire of the commercial and recreational sectors to have more long-term certainty within their fishery, and the value of the halibut resource (FOC 2013).
2. The commercial salmon and halibut fisheries are not managed with catch-share programs. The groundfish trawl gear component of the overall groundfish fishery has a catch-share program. Eligibility to own quota shares (QS) are being a U.S. citizen and the QS must be associated with a U.S. documented fishing vessel that has a groundfish LE trawl permit. So unless the program is changed, purchasing QS for recreational use is prohibited. The catch-share program has an "adaptive management program" provision whereby up to 10 percent of the trawl sector non-whiting allocation would be set aside for a variety of objectives, ranging from socioeconomic dislocation to encouraging innovative fishing methods. The program has not yet been fully defined, so inter-sector transfers of QS for the 10 percent to be used for recreational fishing could conceivably be a consideration.
3. The seven incentive conditions that must be present for industry and managers to initiate a property rights approach are:
    1) Scarcity: fish stocks reach a condition of scarcity relative to the demand for their use.
    2) Transaction costs: costs of allocation, operation, conflict reduction, or enforcement rise to a point of outweighing current benefits.
    3) Affected interests: industry, rather than managers, proposes the change in property rights.
    4) User participation: decision processes are fully representative, transparent, and based on consistent expectations.
    5) Management support: administrators recognize the potential for reductions in management costs under a new regime.
    6) Enforcement: a case can be made for more effective enforcement.
    7) Equity: notions of fairness among user groups are satisfied.