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### State of the U.S. Ocean and Coastal Economies 2016 Update

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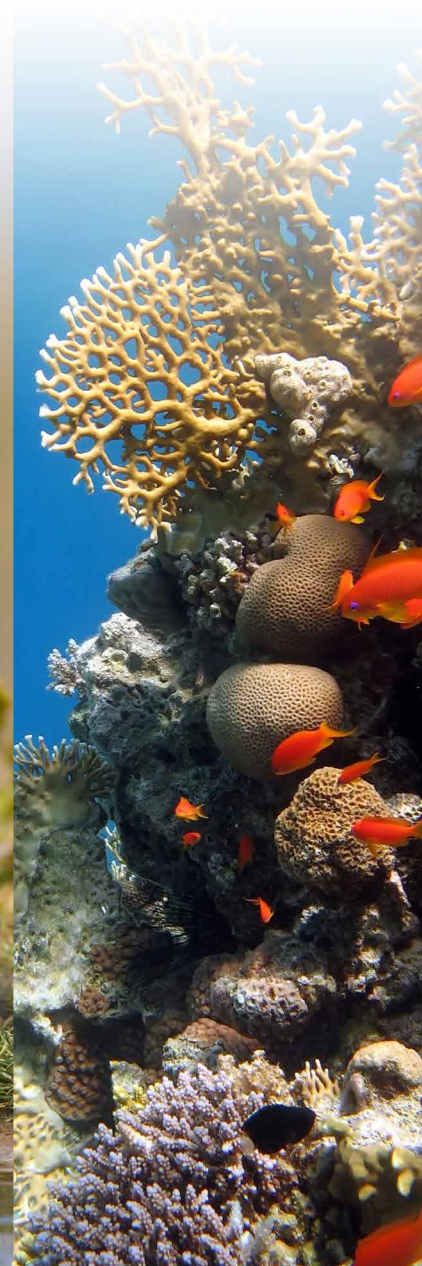
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# State of the U.S. Ocean and Coastal Economies 2016 Update



Middlebury Institute of  
International Studies at Monterey  
*Center for the Blue Economy*





## About the Authors

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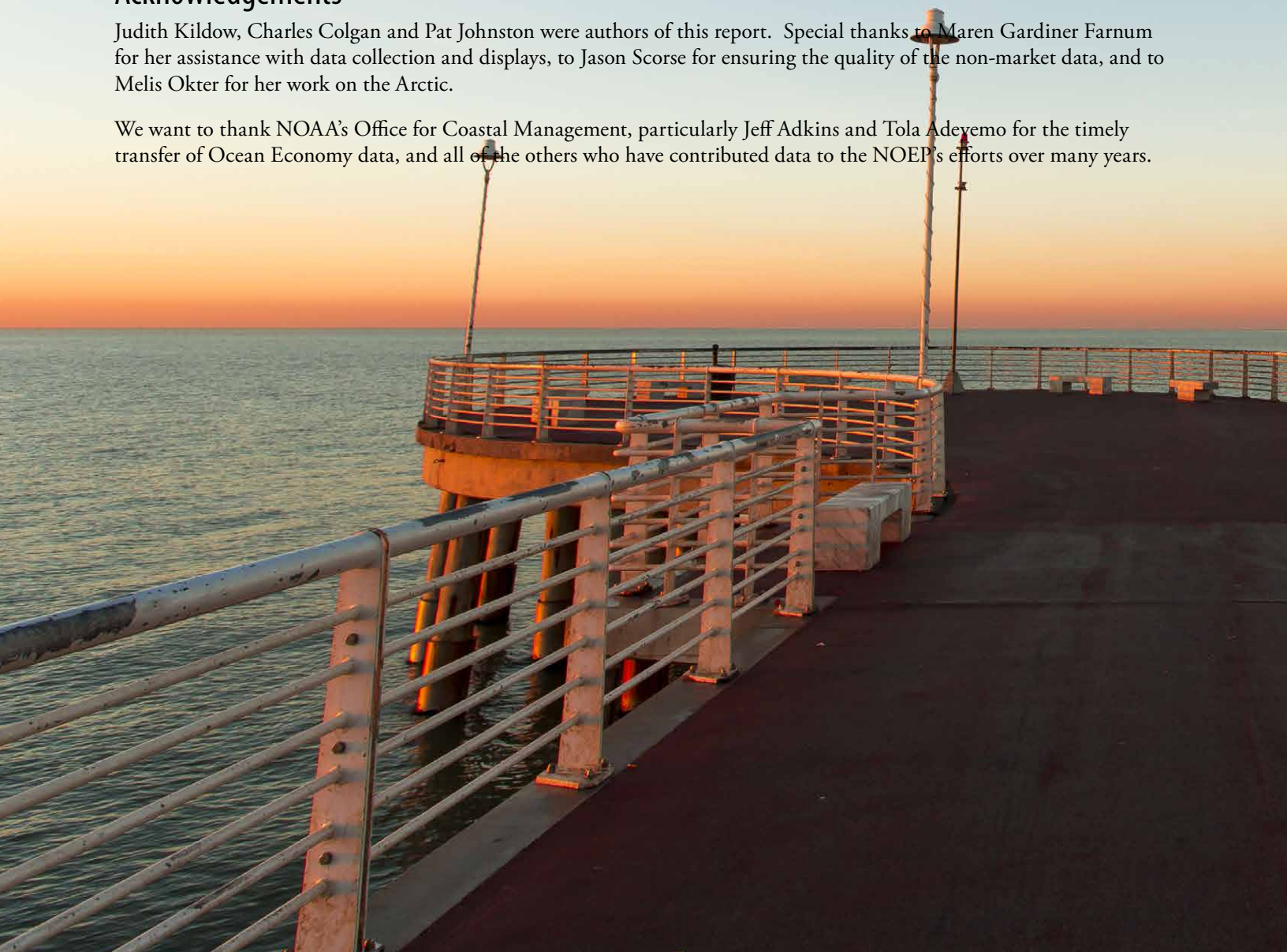
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# Definitions and Terminology

The following terms and definitions regarding economic indicators and valuation categories are presented in the beginning of this report to avoid repetition and for purposes of clarity so that the reader can understand fully the intent of the authors.

## Coastal Economy

The sum of all economic activity occurring in counties defined by states as part of their coastal zone management program or part of a coastal watershed as defined by the U.S. Geological Survey. For purposes of analyzing the Florida coastal economy, counties are divided between shore-adjacent and inland counties to more clearly illuminate the differences between the shoreline and inland regions.

## Dollar Values

Values are expressed in constant dollars with 2009 as the base year unless otherwise noted. Wages are deflated using the U.S. Consumer Price Index for All Urban Consumers (CPI-U). The Gross State Product (GDP-State) is estimated by the U.S. Bureau of Economic Analysis (BEA). Real GDP-S is calculated using chain-weighted indexes<sup>1</sup>.

## Employment

Annual average of monthly wage and salary employment as reported in the Quarterly Census of Employment and Wages. This definition covers about 85% of employment in the United States. It excludes farm employment, the military, railroads, and self-employment, which includes much of the fisheries harvesting industry. Wage and salary employment measures employment by place of work, not by place of residence. It also measures jobs, not people. It does not distinguish between full- and part-time work, or year-round and part-year jobs.

Self employment is estimated using data from the Bureau of the Census Non-Employer series for the NOAA Office for Coastal Management. It measures employment based on a survey conducted in March of each year.

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<sup>1</sup> “Chain weighted dollars” are a method of computing the difference in value arising solely from changes in price. This is done by first estimating changes in the quantities of goods and services produced at different time periods and then separating overall changes in value into price and quantity changes. The result is a more accurate method of estimating the effects of inflation on changes in output than using multipliers. (For more information, see Yuskavage, Robert 1996 Improved Estimates of Gross Product by Industry 1959-1994. Survey of Current Business August 1996.)

## Geography

“County” means a county or a county-equivalent area as defined by the Census. In most states, the county is an administrative unit of local government; this includes parishes in Louisiana. In Massachusetts and Connecticut the county has little or no administrative function, and historical county boundaries are used. In Alaska, the borough or the Census-designated area is used. In Virginia, counties and cities are separate administrative units, and both are included as “counties” in the NOEP data.

## Gross Domestic Product (GDP-State)

GDP-State is a measure of the contribution of the sector to the value of goods and services in the economy. GDP-State (or GDP in this report) is a measure of value-added, or sales, minus the cost of inputs. Using this measure eliminates “double counting,” among sectors. GDP data are published for industry aggregations greater than used in the ocean economy definition. In order to estimate a share of GDP in an ocean or coastal economy industry, the proportion of the GDP for a given sector is calculated based on the proportion of total wages paid in that sector by a given establishment. Since wages often account for as much as 60% of GDP, this method is a reasonable approximation of individual establishments’ contribution to GDP.

## National Ocean Economics Program (NOEP)

The National Ocean Economics Program is the core research activity of the Center for the Blue Economy at the Monterey Institute of International Studies. Funded by donations from the Loker Foundation and other generous donors, The NOEP compile, analyze and distribute data at [www.oceaneconomics.org](http://www.oceaneconomics.org), to provide users with accurate and timely estimates of changes in the nature and value of the ocean and coastal-based economy.

## Non-market Values

Values attributed to goods and services which are not exchanged in normal market transactions, but which have economic value nonetheless.

## Ocean Economy

The concept of the ocean economy derives from the ocean (or Great Lakes) and its resources being a direct or indirect input of goods and/or services to an economic activity: a) an industry whose definition explicitly ties the activity to the ocean, or b) which is partially related to the ocean and



is located in a shore-adjacent zip code. This is defined in part by the definition of an industry in the North American Industrial Classification System<sup>1</sup> (for example, deep sea freight transportation) and partly by geographic location (for example, a hotel in a coastal town).

### Ocean Economy Coincident Index

The data used to measure the ocean economy come primarily from the Bureau of Labor Statistics and the Bureau of Economic Analysis. While the data are highly detailed, the data take time to compile and make available. In order to provide more timely indication of the growth trends in the ocean economy, the National Ocean Economics Program has developed an Ocean Economy Coincident Index (OECI). The OECI draws on data from the BLS Quarterly Census of Employment & Wages already used in the ocean economy data series to create an index to track trends in employment, establishments, and real wages. The index base year is 2010. It is prepared for the sum of the 30 ocean and Great Lakes states and covers each of the ocean economy sectors and industries. The index is a coincident measure of the economy. It measures the level of economic activity at the time of the measurement. Changes in the index between the base year and the most recent period indicate the trend in economic activity, but not the level of activity.

**Regions**

Northeast	ME, NH, MA, RI, CT
Mid-Atlantic	NY (Atlantic Coast), NJ, DE, MD, VA, PA (Delaware River)
Southeast	NC, SC, GA FL (Atlantic Coast)
Gulf of Mexico	FL (Gulf Coast), AL, MS, LA, TX
Great Lakes	NY (Lake Erie/Ontario), OH, IN, IL, MI, WI, MN
West Coast	CA, OR, WA
North Pacific (AK)	AK
Pacific (HI)	HI

# Chapter 1

## Introduction

Relative to the landmass of coastal regions, America's coasts and oceans contribute a disproportionately high value to the United States economy. For the past fifteen years, the National Ocean Economics Program (NOEP) has compiled time-series data that track multiple indicators for economic activities, demographics, natural resource production and values, non-market values, and federal expenditures in the U.S. coastal zone on land and in the water. On our website ([www.oceanomics.org](http://www.oceanomics.org)), government agencies, academia, industry, advocacy groups and the general public representing more than 40 nations—have had interactive access to this information and used it widely for many different purposes.

This Update features highlights denoting economic changes that have occurred since our last report was issued in February 2014. We continue to measure two economies: the ocean economy, which includes all ocean-dependent activities in coastal states, and the coastal economy, which includes all economic activity in coastal states, according to geographies such as zip codes, shore adjacent and other coastal zone counties, and watersheds. In addition to updating the measures of economic activity such as employment, wages, and gross domestic product, we have updated our fisheries, offshore oil and gas, and ports and cargo data to indicate changes since our last report. Also, as we have in the past, we show sand nourishment production and price estimates; this time to track continuing changes in price and location in view of climate impacts along our nation's coasts. We have added a new Arctic Economy page to our site and provide a brief report from it. Finally, we have been compiling federal expenditure data based on OMB annual estimates of all federal agency

civilian expenditures for many years. We provide a brief summary of those data as well. The analysis presented here updates ocean economy information to 2013, the most recent available year for these data.

Because of the lag in the production of ocean economy data by the federal agencies from which estimates are drawn, this report includes a new data series in the NOEP database: the Ocean Economy Coincident Index. This index utilizes more recent data on employment, establishments, and real wages to provide an indicator of trends between the most recent ocean economy data available (2013 in this report) and the most recent full year for which data are available (2014).

A Note on Data Sources: All of the data reported here except for the Arctic data is sourced from public sources, including the Bureau of Labor Statistics, Bureau of Economic Analysis, the Census Bureau, and National Oceanic and Atmospheric Administrations' Office of Coastal Management, NOAA Fisheries, Department of Interior, States of Alaska, Texas, Louisiana, California and Mississippi and Alabama for oil and gas data, beach nourishment data from West Carolina University (<http://beachnourishment.wcu.edu>). Thanks to Daniel Pauly and Rashid Sumalia at the University of British Columbia, for allowing us to use their Arctic fisheries data from Sea Around Us. All data is available for viewing and download on the website of the National Ocean Economics Program at [www.oceanomics.org](http://www.oceanomics.org).

# Chapter 2

## The Coastal Economy

There are thirty coastal states bordering the Atlantic, Pacific, Gulf of Mexico and the Great Lakes<sup>2</sup>. In 2014, these states comprised 57% of the U.S. land area but more than four fifths (82%) of the population and economy. (Figure 1) Within the coastal states, the 445 counties included within the Coastal Zone Management Program as defined by the individual states (coastal zone counties), account for almost half the U.S. GDP (48%). The 357 counties immediately adjacent to the shore, reflecting the large number of cities in shore adjacent counties, contrib-

uted 43% percent of the U.S. GDP. The coastal zone counties accounted for 42% of the U.S. employment. Shore adjacent counties contained 37% of both U.S. employment and population.

The period 2010 to 2014 reveals the U.S. economy recovering from the severe recession of 2007-2009. National GDP growth averaged 1.8% per year, a pace consistent with coastal states and counties. Employment growth averaged 1.6% per year, also an increase fairly consistent across areas.

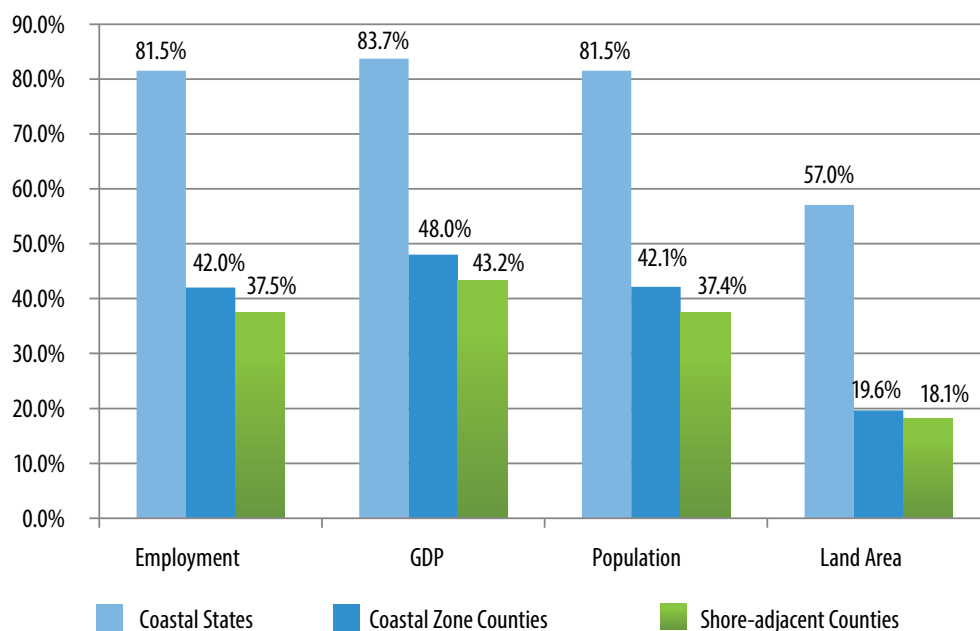


Figure 1: Coastal Regions' Share of U.S. Economy 2014 (See also Appendix Table A-1)

Region	Employment (millions)			GDP (\$Trillion, 2009)			Population (millions)		
	2010	2014	Annual Change	2010	2014	Annual Change	2010	2014	Annual Change
United States	127.8	136.6	1.72%	\$14.6	\$15.8	1.9%	309.3	318.9	0.77%
Coastal States	104.1	111.3	1.73%	\$12.3	\$13.2	2.0%	252.1	259.8	0.76%
Coastal Zone Counties	53.6	57.3	1.72%	\$7.0	\$7.6	1.9%	129.9	134.2	0.84%
Shoreline Adjacent Counties	47.8	51.2	1.78%	\$6.3	\$6.8	2.0%	115.5	119.3	0.82%

Table 1: Growth Rates in the Coastal Economy 2010-2014

<sup>2</sup> Puerto Rico, and the U.S. Virgin Islands, are not included in the data for this report, but coastal economy data for these areas are available at [www.oceaneconomics.org](http://www.oceaneconomics.org).



## Chapter 2: The Coastal Economy

A long-standing trend in coastal America is that population growth rates in the areas closest to the shore have been slower relative to more inland areas, but employment growth has been faster in nearer the shore. This gradual shift was consistent with sprawling patterns of development. From 2010 to 2014, employment growth has continued to be slightly faster in the near shore areas, but population growth has also been faster in coastal zone and near shore counties (Table 1).

The population growth in shore adjacent counties may be related to a relatively recent pattern of increasing population in America's major cities, which are predominantly coastal. If both employment growth and population growth in coastal areas continue to exceed overall growth in coastal states and the U.S., pressures on 18% of U.S.

land area in coastal counties will only increase as will the population and economic vulnerabilities to the increasing coastal hazards associated with climate change.

The pattern of faster employment and population growth in the shore adjacent counties is typical of most of the regions in the U.S. Faster near shore population growth was particularly noteworthy along the Atlantic seaboard from the Northeast to the Southeast. These regions were also characterized by strong employment growth. The weakest coastal economies were those in the states bordering the Great Lakes, where population showed no significant growth. The West Coast showed slightly faster population growth in shore adjacent counties, and employment growth was faster than the states as a whole.

Region		Employment (Million)			GDP (\$Billion, 2009)			Population (Million)		
		2010	2014	Annual Change	2010	2014	Annual Change	2010	2014	Annual Change
United States	States Totals	127.82	136.61	1.72%	\$14,637.7	\$15,773.5	1.94%	309.35	318.86	0.77%
	Shore-adjacent	47.79	51.19	1.78%	\$6,329.7	\$6,843.3	2.03%	115.52	119.32	0.82%
Northeast	States Totals	6.37	6.69	1.27%	\$787.4	\$825.4	1.21%	13.84	14.05	0.39%
	Shore-adjacent	3.52	3.72	1.36%	\$455.0	\$476.9	1.20%	7.84	7.98	0.46%
Mid-Atlantic	States Totals	23.94	24.96	1.07%	\$3,039.9	\$3,198.6	1.31%	55.63	56.71	0.49%
	Shore-adjacent	11.61	12.23	1.35%	\$1,700.1	\$1,808.7	1.60%	27.50	28.22	0.65%
Southeast	States Totals	16.41	17.74	2.03%	\$1,713.8	\$1,820.1	1.55%	42.76	44.77	1.17%
	Shore-adjacent	4.06	4.40	2.10%	\$436.4	\$462.8	1.51%	10.78	11.38	1.39%
Gulf of Mexico	States Totals	22.01	24.02	2.29%	\$2,413.0	\$2,729.7	3.28%	56.40	59.34	1.30%
	Shore-adjacent	5.80	6.37	2.43%	\$708.4	\$814.1	3.73%	14.53	15.37	1.45%
Great Lakes	States Totals	35.90	37.91	1.40%	\$4,083.9	\$4,365.0	1.72%	83.86	84.73	0.26%
	Shore-adjacent	8.03	8.39	1.10%	\$914.8	\$965.7	1.39%	19.21	19.21	0.00%
West Coast	States Totals	18.82	20.58	2.33%	\$2,485.7	\$2,707.6	2.23%	47.92	49.83	1.00%
	Shore-adjacent	13.87	15.14	2.28%	\$2,003.6	\$2,199.3	2.44%	33.61	35.02	1.05%
North Pacific (Alaska)	State Totals	0.32	0.33	1.06%	\$48.5	\$48.7	0.10%	0.71	0.74	0.80%
	Shore-adjacent	0.27	0.28	1.18%	\$41.9	\$42.5	0.36%	0.60	0.62	0.90%
Pacific	Hawaii	0.59	0.63	1.68%	\$66.9	\$70.5	1.35%	1.36	1.42	1.02%

Table 2: Regional Coastal Economies

# Chapter 3

## The Ocean Economy

The Ocean Economy is defined as that part of the economy for which all or part of the inputs derive from the ocean and or Great Lakes. There are six sectors comprising twenty one industries (see Table 3).<sup>3</sup>

Sector	Industry
Construction	Marine Related Construction
Living Resources	Fish Hatcheries & Aquaculture
	Fishing
	Seafood Markets
	Seafood Processing
Minerals	Oil & Gas Exploration & Production
	Sand and Gravel Mining
Ship & Boat Building	Boat Building & Repair
	Ship Building & Repair
Tourism & Recreation	Amusement & Recreation Services
	Boat Dealers
	Eating & Drinking Places
	Hotels & Lodging Places
	Marinas
	RV Parks & Campgrounds
	Scenic Water Tours
	Sporting Goods
	Zoos, Aquaria
	Transportation
Marine Passenger Transportation	
Marine Transportation Services	
Search & Navigation Equipment	
Warehousing	

**Table 3: Ocean Economy Sectors and Industries**

<sup>3</sup> The ocean economy data is derived from the same sources as the coastal economy data. Using algorithms originally developed by the National Ocean Economics Program, the Office for Coastal Management of the National Oceanic and Atmospheric Administration compiles the ocean economy data in cooperation with the NOEP and publishes the data as the Economics-National Ocean Watch (ENOW) data series. The ocean economy data lag in publication because of the time needed by the US Bureau of Economic Analysis, to compile the detailed Gross Domestic Product-State data.

**Ocean – US, 2010 and 2013**

Year	Ocean GDP \$billion	U.S. GDP \$billion	% ocean/US
2013	\$359.32	\$16,549	2.17%
2010	\$289.60	\$14,870	1.90%

**Table 4: The Ocean Economy and U.S. GDP 2010 and 2013**

In 2013 the Ocean Economy comprised about 2.2% of both U.S. GDP and employment. (Table 4) To put this in perspective, the ocean economy generated a larger share of the U.S. economy than other major natural resource industries, including farming, food products, oil and gas extraction, and forest products. The ocean economy's share of employment is almost as large as the share of employment in these other natural resource industries combined (2.5%). (Figure 2).

The ocean economy showed significant strength compared to the U.S. as a whole, as the national economy recovered from the recession of 2007-09. Ocean based GDP grew slightly from 2008 to 2010 at a time when the U.S. GDP declined slightly. The recovery of the ocean economy was also stronger. From 2010 to 2013, the ocean economy grew at an annual average of 5.4% compared with U.S. average growth of 4.4% per year. Measured by employment, the decline in the ocean economy from 2008 to 2010 was smaller (1.4%) than the U.S. at 1.7%, and the recovery from 2010-2013 was stronger in the ocean economy, averaging 3.2% compared with the U.S. of 1.6%.

The ocean economy's six sectors play different roles in shaping the overall economy. (Figure 3) The tourism and recreation sector accounts for the largest number of establishments (83%) and the largest share of employment (71%), but tourism & recreation's proportion of total wages paid (41%) and GDP (28%) are considerably smaller. In contrast, the minerals sector accounted for only 6% of employment but 46% of GDP. Other sectors are relatively consistent in their shares of the ocean economy's GDP and employment. (See Appendix Table A-3 for data)

The differences between the minerals and tourism & recreation sectors lie in the differences in productivity between the industries in these sectors. Dominated by oil and gas exploration and production, the minerals sector requires relatively few employees to operate the complex technologies that yield a high value product. As a service industry,

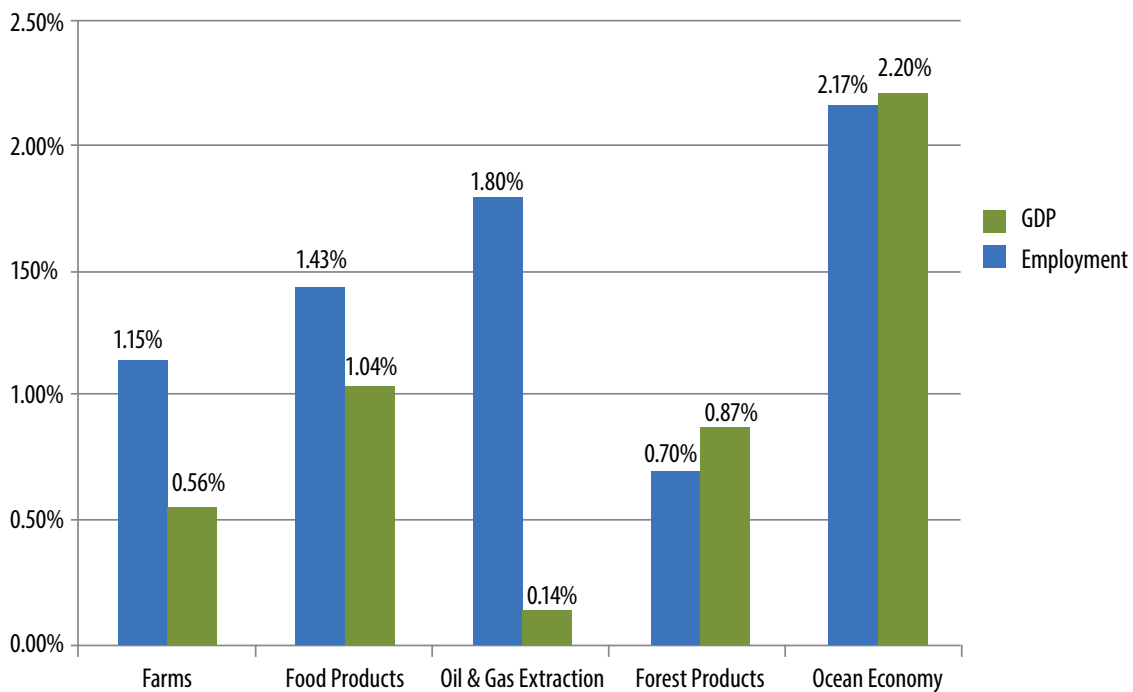


Figure 2 Natural Resource Industries Proportion of U.S. GDP and Employment, 2013<sup>4</sup>

U.S. Ocean Economy 2008, 2010, 2013

Year	Ocean GDP Millions of \$ 2009				Total US GDP Millions of \$ 2009			
	GDP	Annual Average % Change		GDP	Annual Average % Change			
2013	\$307.66	2010-2013	5.39%	\$16,549	2010-2013	4.38%		
2010	\$264.83	2008-2010	0.05%	\$14,628	2008-2010	-0.22%		
2008	\$264.41			\$14,727				
Year	Ocean Employment				US Employment			
	Employment	Annual Average % Change		Employment	Annual Average % Change			
2013	3,001,400	2010-2013	3.19%	133,968,434	2010-2013	1.60%		
2010	2,738,948	2008-2010	-1.41%	127,820,442	2008-2010	-1.73%		
2008	2,860,055			134,805,659				

Table 5: Changes in the Ocean Economy 2008-2013

the tourism & recreation industries require a large number of employees, particularly because of the strong seasonality in ocean related tourism.

The ocean economy sectors also played different roles in the growth trends from 2010 to 2013. (Table 6) The significant growth in GDP was driven by an annual average growth in minerals GDP of more than 20%, reflecting the significant fall in oil prices in the recession years and

the recovery thereafter. Minerals employment also grew by an average of more than 7% per year during the recovery. Two sectors, marine related construction and marine transportation continued to decline in employment from 2010 to 2013, though GDP growth did begin to recover in these sectors.

Omitting the minerals sector and its unique characteristics, ocean economy employment still grew by 3.3% per

<sup>4</sup> Food products and Oil & Gas Extraction for U.S. exclude ocean-based GDP in this analysis



year over 2010-2013 compared with U.S. employment growth of 1.6%. Non-minerals ocean economy employment growth was led by strong tourism & recreation employment growth. The non-minerals ocean economy sector GDP grew by an average 3.5% during this period,

compared with 4.4% in the U.S., pulled down by continued recession-related weakness in ship & boat building and marine transportation. The details of changes in these sectors are discussed in the sections below on each sector.

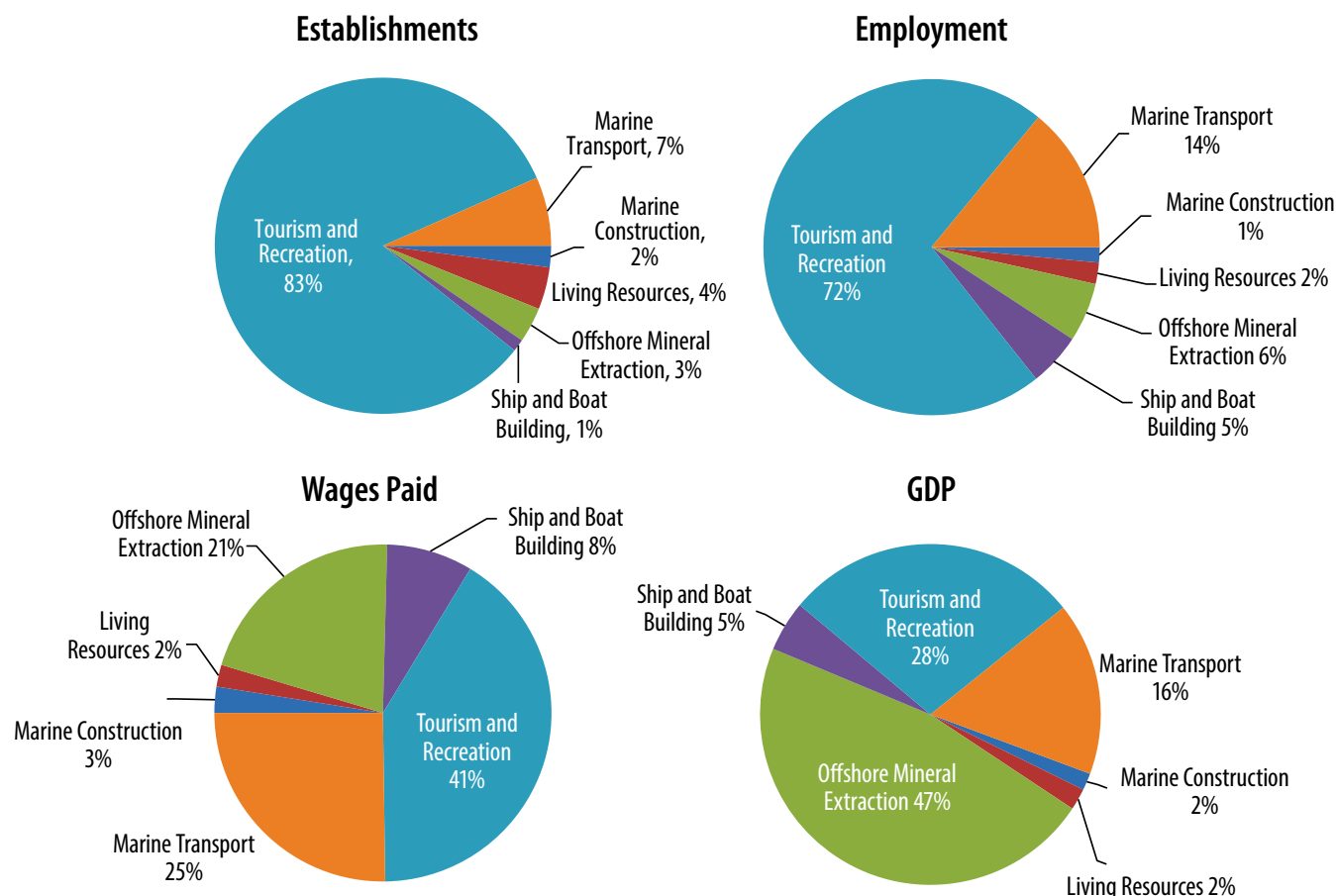


Figure 3: The Sectors of the Ocean Economy in 2013

The U.S. Ocean Economy 2010-2013

Industry	Employment				GDP (\$billion 2009)			
	2010	2013	Change	Annual Average % Change	2010	2013	Change	Annual Average % Change
Marine Related Construction	44,567	44,151	-416	-0.31%	\$5.70	\$5.81	\$0.11	0.64%
Living Resources	59,355	61,753	2,398	1.35%	\$6.60	\$7.33	\$0.73	3.69%
Offshore Minerals	138,833	170,537	31,704	7.61%	\$92.50	\$168.78	\$76.28	27.49%
Ship & Boat Building	144,067	153,480	9,413	2.18%	\$16.50	\$17.26	\$0.76	1.54%
Tourism & Recreation	1,928,141	2,149,892	221,751	3.83%	\$86.80	\$101.04	\$14.24	5.47%
Marine Transportation	423,986	421,585	-2,401	-0.19%	\$56.80	\$59.09	\$2.29	1.34%

Table 6: Changes in the Ocean Economy Sectors 2010-2013

### Chapter 3: The Ocean Economy

The principal measure of employment in the ocean and coastal economy data is wage & salary employment, that is employment where compensation is paid through wages and salaries. Self employment, which comprises jobs paid as independent contractors or as sole proprietors of certain types of small businesses, is another important source of employment. In 2012, self employment in the ocean economy is estimated at 132,000 jobs, which would increase estimated ocean economy employment by 4.5%. The living resources sector is the location for almost half of ocean economy self employment (Figure 4); this is primarily employment in the fisheries harvesting sector which is not generally included in wage & salary employment.

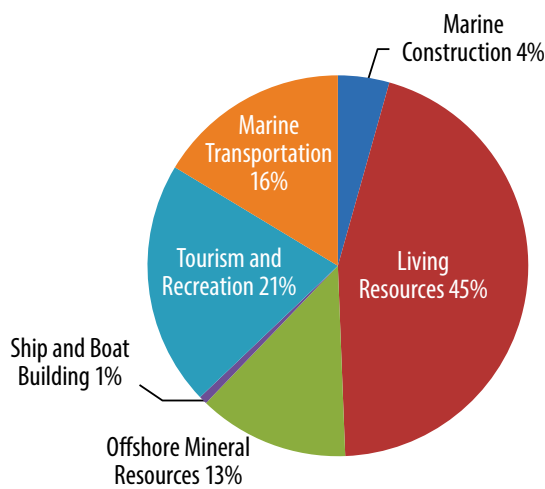


Figure 4: Self Employment in the Ocean Economy by Sector 2012

Self employment in the ocean economy was largely unchanged between 2010 and 2012. (Table 7) Ship and boat building experienced a significant rate of decline, but this was largely a function of the small number of self employed jobs in this sector (which are primarily in the boat building industry). Two sectors showed opposite trends in employment and self employment. Marine construction saw a rise in self employment accompanied by a decline in wage and salary employment. Tourism and recreation experienced the opposite trend: growth in wage & salary employment and a small decline in self employment.

Self Employment in the Ocean Economy

Sector	2010	2012	Annual Average % Change
Marine Construction	5,586	5,778	1.7%
Living Resources	56,002	59,618	3.2%
Offshore Mineral Resources	17,085	16,953	-0.4%
Ship and Boat Building	1,328	922	-15.3%
Tourism and Recreation	28,303	27,506	-1.4%
Marine Transportation	23,102	21,651	-3.1%
Ocean Economy	131,406	132,428	0.4%

Table 7: Self Employment in the Ocean Economy 2010-2012

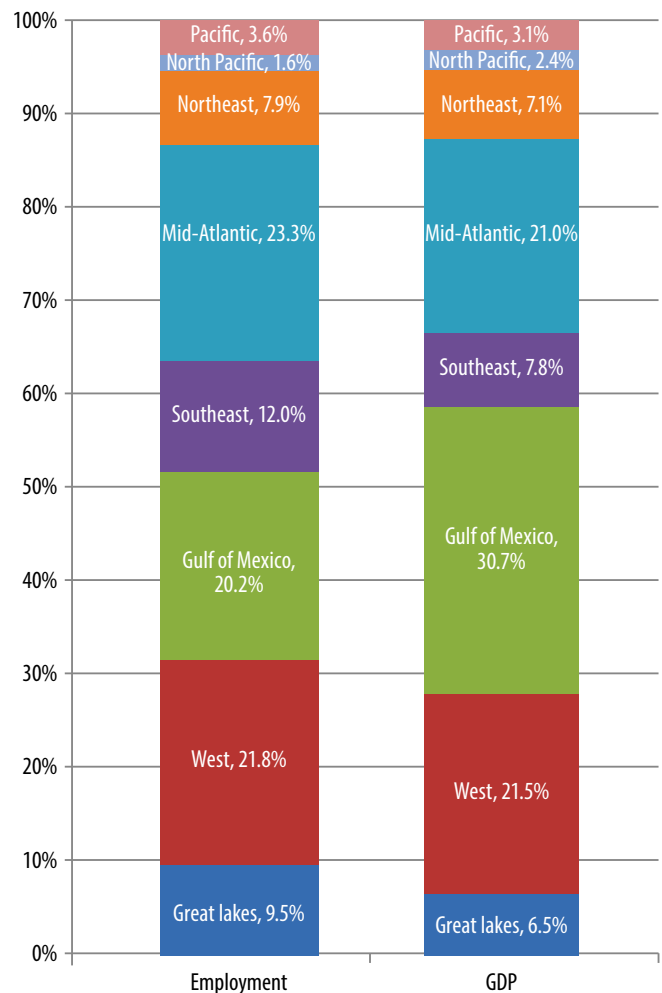


Figure 5: Regional Distribution of Ocean Economy: 2013

	Employment				GDP (\$billion 2009)			
	2010	2013	Change	Annual Average % Change	2010	2013	Change	Annual Average % Change
Northeast	213,373	235,807	22,434	3.50%	\$14,370	\$16,016	\$1,646	3.82%
Mid-Atlantic	635,348	699,722	64,374	3.38%	\$44,028	\$46,987	\$2,959	2.24%
Southeast	323,434	360,322	36,888	3.80%	\$17,136	\$19,758	\$2,622	5.10%
Gulf of Mexico	536,975	606,460	69,485	4.31%	\$103,100	\$135,948	\$32,848	10.62%
Great Lakes	267,440	285,529	18,089	2.25%	\$14,569	\$15,843	\$1,274	2.92%
West Coast	617,785	655,522	37,737	2.04%	\$53,309	\$54,896	\$1,587	0.99%
North Pacific	44,367	48,756	4,389	3.30%	\$12,713	\$11,581	(\$1,132)	-2.97%
Pacific	100,215	109,279	9,064	3.01%	\$5,602	\$6,634	\$1,032	6.14%
All Coastal States	2,738,948	3,001,400	262,452	3.19%	\$264,827	\$307,663	\$42,836	5.39%

Table 8: Regional Changes in the Ocean Economy 2010-2013

Not surprisingly, the large contribution of offshore oil and gas to the ocean economy GDP meant that the Gulf of Mexico region had the largest share of ocean economy GDP, though the Mid Atlantic states had the largest share of employment and the West Coast had the second largest share of GDP. (Figure 5) Oil and gas also accounts for the fact that the share of GDP exceeds the share of employment for the Gulf of Mexico and also for the North Pacific (Alaska). The share of employment exceeds the share of GDP in all other regions (Table 8. See Appendix Table A-4 for data).

The importance of the minerals sector in the ocean economy is also apparent in the changes in the economy in the various regions. The Gulf of Mexico region led all regions in both employment and GDP growth in the ocean economy over 2010-2013 (Table 9). The Gulf of Mexico regional lead was in both the absolute change (the number of jobs and amount of GDP) and in growth rates. The weakest economic growth, taking into account both employment and GDP was in the North Pacific (Alaska). (State level detail in Appendix A-5).

The Ocean Economy Coincident Index shows that the growth in the ocean economy continues to outpace overall U.S. economic growth, rising by 4.1% from 2013 to 2014 compared with the U.S. economy which grew at 2.3% on the same measure. (Figure 6).

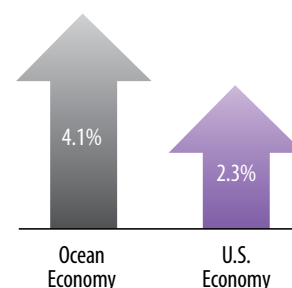


Figure 6: The Ocean Economy Coincident Index Change 2013-2014

The ocean economy sectoral composition of the changes in the OEI are generally consistent with the 2010-2013 period (Figure 7), with the minerals sector still leading, though at a slower pace, and living resources showing difficulty. Sectors that struggled the most during the recession such as construction, transportation, and ship & boat building appear to have had strong performances in 2014. More details are provided in the sectoral sections below.

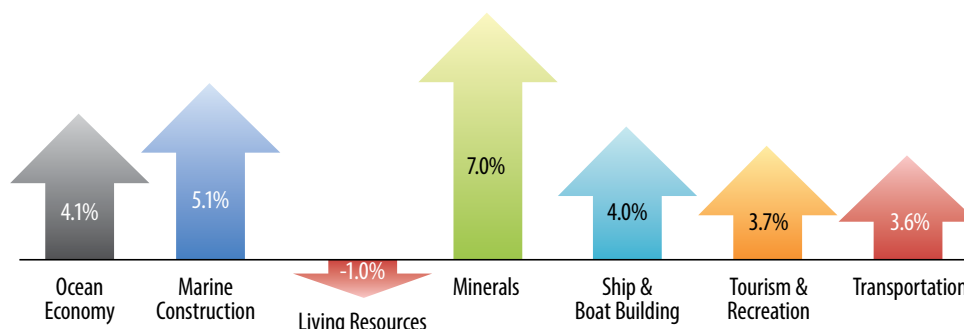


Figure 7: Ocean Economy Coincident Index by Sector 2013-2014



## Marine Construction



The marine construction sector consists of the marine construction industry, which is a heavy construction industry engaged in activities such as harbor dredging, pier and marine construction, beach nourishment, and estuary restoration. The industry was significantly adversely affected by the recession. Between 2008 and 2010, the industry lost 12.4% of employment and output (GDP) declined by 5.6%. Decline continued through 2013, with employment down another 0.3% and output down a further 1.5%.

The reasons for this are not clear, but much of the funding for marine construction projects originates with the federal, state, and local governments and capital infrastructure projects that are typical of marine construction are often cancelled or delayed during recessions as revenues fall.

A growing market for marine related construction is beach nourishment. Erosion of beaches, particularly those impor-

Marine Construction 2010 - 2013

	Employment				GDP (\$billion 2009)			
	2010	2013	Change	Annual Average % Change	2010	2013	Change	Annual Average % Change
Marine Related Construction	44,567	44,151	-416	-0.31%	\$5.70	\$5.45	-\$0.25	-1.46%

Table 9

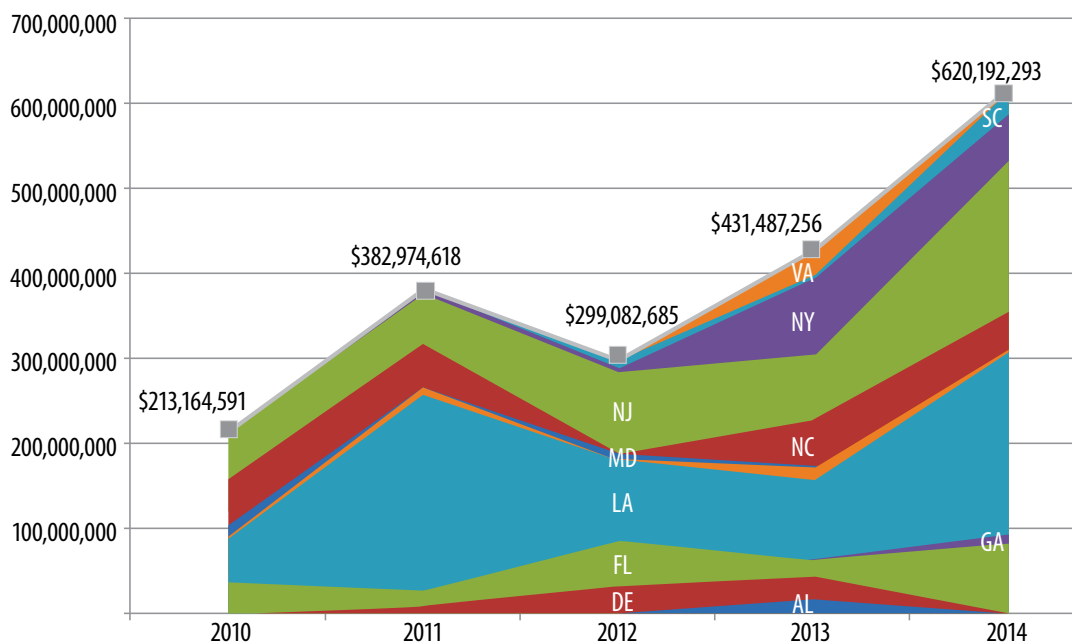


Figure 8: Beach Nourishment Expenditures 2010-2014

tant for tourism and recreation, has been a long standing problem in many areas, requiring communities who want to assure the presence of a wide sandy beach to artificially replenish beach sand. From 2010 to 2014, expenditures on beach nourishment nearly tripled from \$213 million to \$620 million<sup>5</sup>. (Figure 8) Louisiana led the growth in expenditures. Accounting for 12% of historical nourishment expenditures, Louisiana accounted for 36% of expenditures from 2010 to 2014. Recovering from Hurricane Sandy, New Jersey also saw significant growth, accounting for 24% of expenditures from 2010 to 2014 compared with 12% historically. The state with the largest history of beach nourishment, Florida at 29% of expenditures, was below its historical share in 2010-2014 at 11%.

The Ocean Economy Coincident Index update to 2014 (Figure 9) indicates that the marine construction sector appears to have finally turned the corner out of the recession. The index growth from 2013 to 2014 actually exceeded the U.S. ocean economy's indexed growth.

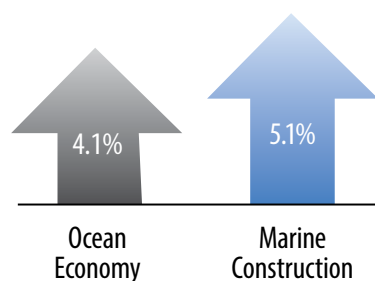


Figure 9: OECl Index For Construction 2012-2014

## Living Resources



The living resources sector comprises four industries: fish hatcheries & aquaculture, commercial fishing<sup>6</sup>, seafood markets and seafood processing. Overall, the sector has grown in employment because growth at the secondary and tertiary stages of seafood processing and seafood markets offset losses in employment in the primary stages of production (commercial fisheries and aquaculture). This pattern is repeated with GDP, except that the fishing industry did show a very small percentage of growth in GDP.

Living Resources 2010 - 2013

Industry	Employment				GDP (\$billion 2009)			
	2010	2013	Change	Annual Average % Change	2010	2013	Change	Annual Average % Change
All Living Resources	59,355	61,753	2,398	1.35%	\$6.60	\$6.42	-\$0.18	-0.92%
Fish Hatcheries & Aquaculture	5,328	5,308	-20	-0.13%	\$0.80	\$0.70	-\$0.10	-4.33%
Fishing	6,207	5,648	-559	-3.00%	\$1.20	\$1.22	\$0.02	0.58%
Seafood Markets	12,248	13,625	1,377	3.75%	\$0.70	\$0.71	\$0.01	0.45%
Seafood Processing	35,570	37,171	1,601	1.50%	\$3.90	\$3.79	-\$0.11	-0.93%

Table 10

<sup>5</sup> Data provided by the Program for the Study of Developed Shorelines at Western Carolina University. The dataset covers 1923-2015, but has not been updated with data from California for 2010-2014. California has historically accounted for about 3.8% of beach nourishment expenditures.

<sup>6</sup> The commercial fishing industry is only partially measured in the data sources for the NOEP data because of certain provisions of federal employment law.

These trends imply a shift in seafood supply. A fall in domestic production but growth in seafood markets suggests that the fall in production is not reducing seafood consumption. In fact, this is what has happened for more than a decade (Figure 10). Domestic fisheries landings and landed value have remained essentially unchanged since 1997 at about 9.5 billion pounds. Meanwhile there

has been a significant increase in imported seafood, which has increased by more than 80% in weight and 70% in value from 1997-2013. Seafood remains very popular, but the increased demand is being met with imported seafood rather than domestically caught or raised. (See Appendix Table A-6 for data).

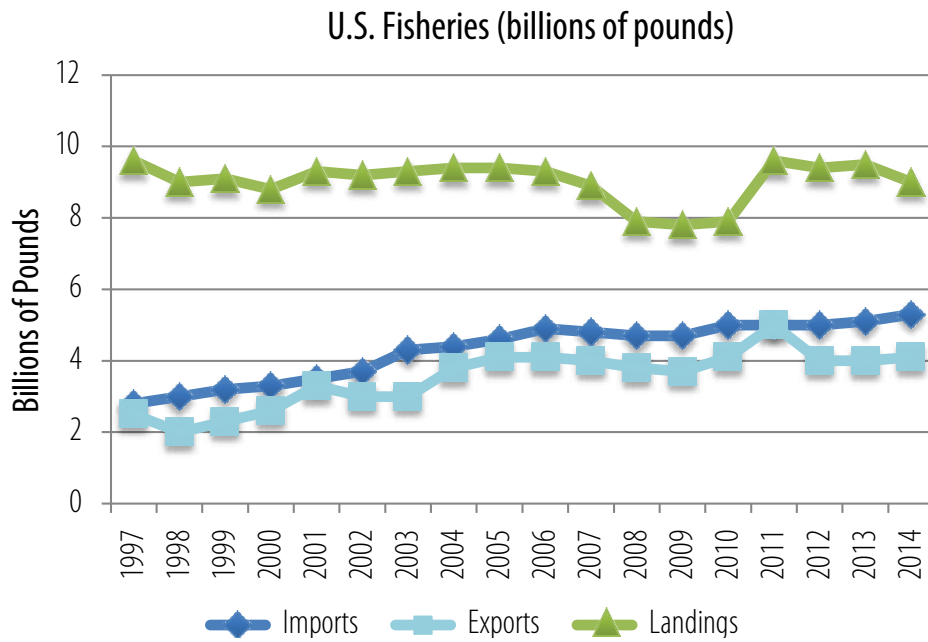


Figure 10: U.S. Fisheries Production and Trade 1997-2014 (See also Appendix Table A-6)

Regional Commercial Landings, 2010-2014

Region	Landed Weight (million pounds)				Value (\$million, 2009)			
	2010	2014	Change	% Change	2010	2014	Change	% Change
New England	577.8	643.1	65.3	11.3%	\$942.8	\$1,088.1	\$145.3	15.4%
Mid-Atlantic	806.9	591.3	(215.6)	-26.7%	\$501.4	\$426.6	-\$74.7	-14.9%
South Atlantic	89.8	82.2	(7.6)	-8.5%	\$112.4	\$118.6	\$6.2	5.5%
Gulf of Mexico	1,284.5	1,142.8	(141.8)	-11.0%	\$629.8	\$930.7	\$300.9	47.8%
Great Lakes	19.1	15.8	(3.3)	-17.2%	\$17.5	\$18.9	\$1.4	8.0%
Pacific	828.8	841.2	12.4	1.5%	\$527.7	\$651.2	\$123.5	23.4%
North Pacific	4,347.4	5,671.3	1,323.9	30.5%	\$1,559.1	\$1,550.9	-\$8.2	-0.5%
Western Pacific (Hawaii)	28.1	33.5	5.4	19.3%	\$82.7	\$91.7	\$9.0	10.9%
<b>Total Landings</b>	<b>7,982.5</b>	<b>9,021.2</b>	<b>1,038.7</b>	<b>13.0%</b>	<b>\$4,373.4</b>	<b>\$4,876.8</b>	<b>\$503.4</b>	<b>11.5%</b>

Table 11: U.S. Fisheries Landings by Region (See also Appendix Table A-6)



The North Pacific (Alaska) region is the largest domestic source of seafood by weight and value. In 2013, Alaska landings comprised 61% of U.S. landings and 34% of landed value. The Gulf of Mexico was second with 15% of landings and 17% of value, but New England had the most valuable fishery with 7% of landings by weight but 21% of value. The higher values of the Gulf of Mexico and New England fisheries relative to weight is primarily due to the larger proportion of shellfish such as oysters and lobsters in these regions' fisheries. (Table 11)

Of the top ten fishing ports by landed weight, all but two are in Alaska or the Gulf of Mexico. New Bedford, Massachusetts ranked ninth in landed weight but first in landed value. Only two other Atlantic ports on the Virginia shore of Chesapeake Bay, Reedville and Hampton Roads, were in the top ten in landed weight and value. All other major fishing ports were in either Alaska or the Gulf of Mexico. (Table 12) Data on state fisheries landings is available in Appendix Table A-7.

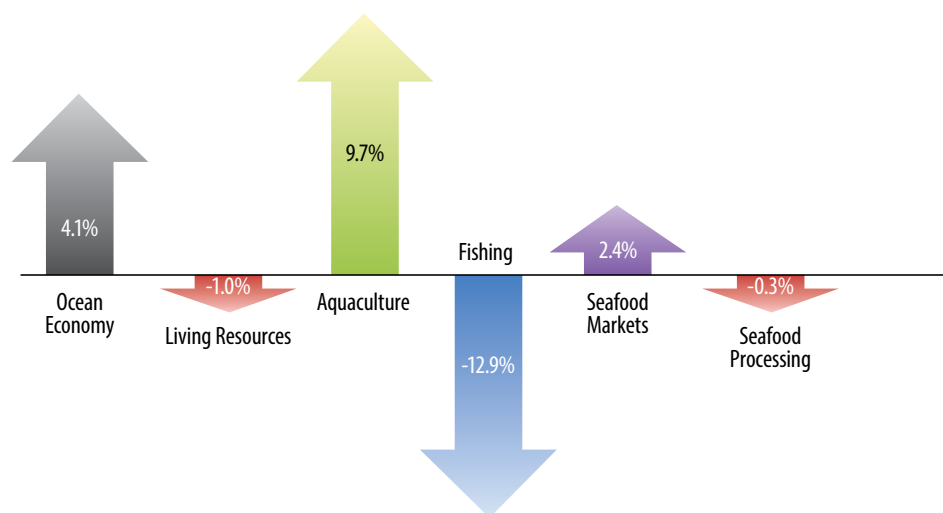
Changes in landings from 2010 to 2013 reflected changes from a relatively low period of landings to a level consistent with recent historical patterns. The North Pacific and Pacific led the recovery in landings and the Pacific region showed the fastest growth in landed value. In contrast, fisheries in the mid and south Atlantic showed declines in both weight and value.

The OECI indicates that the fishing sector continued to struggle in 2014, with an overall decline in the index of 1%. (Figure 11) Though aquaculture showed growth along with seafood markets, processing and fisheries harvesting showed declines in the index. Total U.S. commercial fisheries landings grew by 2.5% in 2014 over 2013, but landed value was unchanged. Imported seafood increased 4% by weight and 12% by value from 2013 to 2014.

**Top Commercial Fishing Ports for All Coastal States in 2014**

Rank	Port	Weight	Port	Landed Value
1	Dutch Harbor-Unalaska, AK	761,800,000	New Bedford, MA	\$328,800,000
2	Kodiak, AK	477,100,000	Dutch Harbor-Unalaska, AK	\$191,400,000
3	Aleutian Islands (Other), AK	470,900,000	Kodiak, AK	\$143,100,000
4	Empire-Venice, LA	326,900,000	Hampton Roads Area, VA	\$136,600,000
5	Reedville, VA	323,900,000	Naknek-King Salmon, AK	\$135,100,000
6	Intracoastal City, LA	300,200,000	Empire-Venice, LA	\$127,300,000
7	Pascagoula-Moss Point, MS	184,400,000	Aleutian Islands (Other), AK	\$106,800,000
8	Alaska Peninsula (Other), AK	169,700,000	Honolulu, HI	\$88,000,000
9	New Bedford, MA	140,000,000	Alaska Peninsula (Other), AK	\$86,500,000
10	Naknek-King Salmon, AK	133,000,000	Bristol Bay (Other), AK	\$82,100,000

**Table 12: Top 10 U.S. Fisheries Ports by Weight and Value**



**Figure 11: Ocean Economy Coincident Index 2013-2014 Living Resources**

## Offshore Minerals



Offshore oil and gas comprises 96% of the employment and 99% of the GDP for the offshore minerals sector. The “hard” minerals industries, comprising limestone, sand, and gravel mining, are primarily involved in the production of materials for construction and thus are affected by overall patterns of construction in coastal states and the U.S. As a result, the limestone, sand & gravel industry remained weak through 2013, with a slight decline in employment accompanying a modest rise in output. (Table 13)

The offshore oil and gas industries, on the other hand, saw significant growth over these three years, adding more than 32,000 jobs (an average of 8% per year) and increasing output by nearly \$30 billion (an average of 11% per year). This increase in employment and GDP was driven primarily by rising oil prices associated with the overall recovery from the recession. From 2009 to 2014 crude oil prices increased from \$61.95/bbl to \$97.98/bbl (58%)<sup>7</sup>. This rise in price offset a fall in output of 118 billion barrels (18.7%) from the U.S. offshore and encouraged additional exploration and production development activity. (Table 14) Moreover, it was oil rather than natural gas that drove the sector. Natural gas production from the offshore contributed little to the growth in output and employment, as gas production from the offshore fell by over a trillion cubic feet (1334.2tcf or 42.1 %). (See Table 15) Unlike oil prices, natural gas prices over the period declined along with production. From 2009 to 2014, wellhead natural gas prices fell by 27%.<sup>8</sup>

7 Source: Energy Information Administration. West Texas Intermediate annual average spot price

8 Source: Energy Information Administration.

Offshore Minerals 2010 - 2013

Industry	Employment				GDP (\$billion 2009)			
	2010	2013	Change	Annual Average % Change	2010	2013	Change	Annual Average % Change
All Offshore Minerals	138,833	170,537	31,704	7.61%	\$92.50	\$122.18	\$29.68	10.69%
Limestone, Sand & Gravel	6,295	5,907	-388	-2.05%	\$1.40	\$1.61	\$0.21	5.03%
Oil & Gas Exploration and Production	132,537	164,630	32,093	8.07%	\$91.10	\$120.57	\$29.47	10.78%

Table 13

US Total Offshore Oil Production 2004-2013

Year	US Offshore Total Oil Production (Million bbl)	US Total Oil Production (Million bbl)	Offshore % of US Total	% Change
2004	680.73	2,457.51	27.70%	
2005	628.26	1,890.11	33.20%	20.00%
2006	622.32	1,862.26	33.40%	0.50%
2007	609.2	1,848.45	33.00%	-1.40%
2008	552.02	1,811.82	30.50%	-7.60%
2009	640.02	1,954.24	32.80%	7.50%
2010	634.4	1,998.58	31.70%	-3.10%
2011	543.34	2,057.61	26.40%	-16.80%
2012	522.74	2,370.11	22.10%	-16.50%
2013	520.5	2,720.78	19.10%	-13.30%
2014	573.63	3,182.58	18.00%	-5.80%

Table 14: Offshore Oil Production

US Total Offshore Gas Production 2004-2010

Year	US Offshore Total Gas Production (Million mcf)	US Total Gas Production (Million mcf)	Offshore % of US Total	% Change
2004	3,594.43	18,776.09	19.10%	
2005	3,223.95	18,050.60	17.90%	-6.70%
2006	2,982.64	18,503.61	16.10%	-9.80%
2007	2,870.13	19,266.03	14.90%	-7.60%
2008	2,386.71	20,158.60	11.80%	-20.50%
2009	3,113.02	21,647.94	14.40%	21.50%
2010	2,893.16	22,381.87	12.90%	-10.10%
2011	2,451.73	24,036.35	10.20%	-21.10%
2012	2,079.08	25,283.28	8.20%	-19.40%
2013	1,799.35	25,690.88	7.00%	-14.80%
2014	1,763.27	27,271.33	6.50%	-7.70%

Table 15: Offshore Gas Production

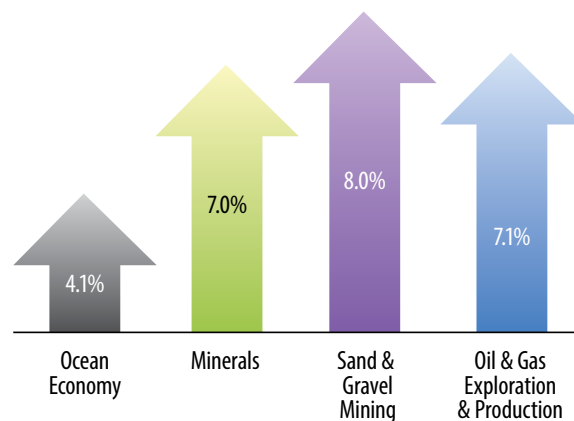


Figure 12: Ocean Economy Coincident Index 2013-2014 Minerals

The minerals sector continued strong performance from 2013 to 2014, leading growth in the ocean economy as measured by the OEI. The rapid growth noted above in oil and gas employment over 2010 to 2013 continued into 2014, though at a slower pace. The OEI for oil and gas increased by more than 9% per year from 2010 to 2013, but by only 7.0% over 2013-2014. As was the case in 2010-2013, oil production from the offshore continued to expand (by 9.7%) in 2014, while gas production continued to decline (by 15.2%). But this expansion took place along with a small decline in oil prices (5%) from 2013 to 2014. This suggests the ocean economy minerals sector will see little or no growth in GDP in 2015, reversing recent trends.

## Ship & Boat Building



The ship & boat building sector is divided into two industries: ship building & repair, which primarily builds ships for the United States Navy, and the boat building & repair industry which primarily builds boats for recreational uses, but also builds working boats for the fishing and transportation industries. Almost all cargo and passenger ships are built outside the United States.

Because it is primarily building for one customer, the ship building industry is most heavily influenced by the levels of government appropriations and by schedules for naval ship construction and repair. Each naval ship typically takes three or more years to complete and major rehabilitation projects can take one to two years. Ship building thus tends to be relatively stable over time, with small increases or decreases in employment and output over several years. From 2010 to 2013, employment in ship building increased a modest 1.7% or just over 6200 jobs, while output slightly increased by 0.24%.

Boat building is a much more diverse industry, but its heavy dependence on the recreational boating market makes it highly subject to business cycle influences. Employment in boat building declined by more than half from 2008 to 2010 as the recession took hold. The 2010 to 2013 period was thus the beginning of recovery for the industry. Employment increased by an annual average of 5%, but this resulted in less than ten percent of the jobs lost between 2008 and 2010 coming back. The value of output declined even as jobs increased, indicating that it may have been the lower priced end of the boating market that was driving up demand.

The coincident index indicates that the recovery in the boat building industry apparent in the 2013 ocean economy data may be uneven; the index declines moderately for the boat building industry, but remains strong for the ship building industry.

Ship & Boat Building 2010 - 2013

Industry	Employment				GDP (\$billion 2009)			
	2010	2013	Change	Annual Average % Change	2010	2013	Change	Annual Average % Change
All Ship & Boat Building	144,067	153,480	9,413	2.18%	\$16.50	\$16.31	-\$0.19	-0.39%
Boat Building & Repair	21,230	24,444	3,214	5.05%	\$2.70	\$2.41	-\$0.29	-3.64%
Ship Building & Repair	122,836	129,036	6,200	1.68%	\$13.80	\$13.90	\$0.10	0.24%

Table 16

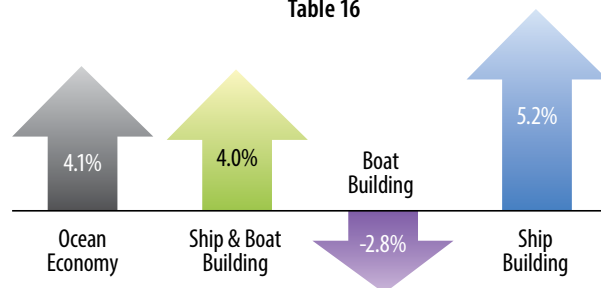


Figure 13: Ocean Economy Coincident Index 2013-2014 Ship & Boat Building



## Tourism & Recreation



The NOEP defines ocean based tourism & recreation on the basis of the industry and location of an establishment in a shore-adjacent zip code<sup>9</sup>. The tourism & recreation sector is the largest sector by employment in the ocean economy and also has the largest number of industries included within the sector.

Overall, the sector showed relatively robust growth from 2010 to 2013, averaging 3.8% growth in employment and 5.5% growth in GDP. Leading sectors were restaurants and other eating and drinking places, and hotels. There were also strong annual average growth rates in scenic

water tours, marinas, and the general category of amusement and recreation services, although the latter industry saw a decline in the value of output. The weakest sector in tourism & recreation was boat dealers, which continued to shed employment as during the recession years, though GDP did show some growth. Boat dealers' performance was another indicator of the continued issues facing the recreational boating industry in the wake of the recession.

All told, however, the data indicate America's fondness for a vacation and recreational activity along the shores of the oceans and Great Lakes.

The strength of the tourism and recreation sector in the coastal economy is also shown by the changes in the Ocean Economy Coincident Index from 2013-2014. All of the industries in the sector showed moderate growth. Rises in the indicators for boat dealers and marinas are a signal that recreational boating is beginning a sustained recovery from the recession, though the trends in boat building may show a continued drag on the industry. Growth in recreational services, including scenic water tours, and zoos/aquaria suggest travelers and recreationists are opening their wallets to spend on diverse services.

Tourism & Recreation 2010 - 2013

Industry	Employment				GDP (\$billion 2009)			
	2010	2013	Change	Annual Average % Change	2010	2013	Change	Annual Average % Change
All Tourism & Recreation	1,928,141	2,149,892	221,751	3.83%	\$86.80	\$101.04	\$14.24	5.47%
Amusement and Recreation Services NEC	47,102	56,309	9,207	6.52%	\$2.70	\$2.52	(\$0.18)	-2.20%
Boat Dealers	12,531	12,376	-155	-0.41%	\$1.00	\$1.13	\$0.13	4.41%
Eating & Drinking Places	1,433,207	1,613,862	180,655	4.20%	\$49.80	\$57.82	\$8.02	5.37%
Hotels & Lodging Places	378,448	407,504	29,056	2.56%	\$29.10	\$35.06	\$5.96	6.82%
Marinas	18,007	19,694	1,687	3.12%	\$1.10	\$1.33	\$0.23	7.01%
Recreational Vehicle Parks & Campsites	5,816	6,026	210	1.20%	\$0.30	\$0.37	\$0.07	8.13%
Scenic Water Tours	8,947	9,980	1,033	3.85%	\$0.40	\$0.54	\$0.14	11.39%
Sporting Goods Retailers	4,774	4,803	29	0.20%	\$0.70	\$0.72	\$0.02	0.83%
Zoos, Aquaria	19,304	19,334	30	0.05%	\$1.60	\$1.55	(\$0.05)	-1.02%

Table 17

<sup>9</sup> The tourism & recreation sector does not include the cruise ship industry. Employees and the cruise ships are typically not American and so are generally not counted in U.S. data. Some portions of the cruise ship industry is included in marine passenger transportation in the Transportation sector

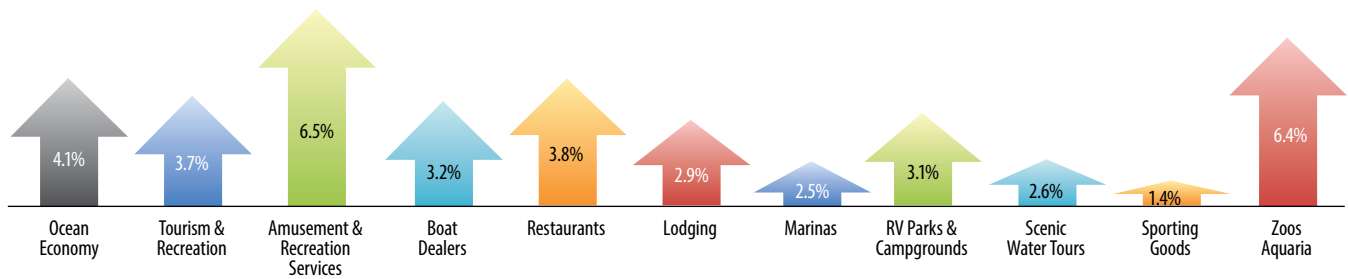


Figure 14: Ocean Economy Coincident Index 2013-2014 Tourism & Recreation

## Marine Transportation



Marine transportation comprises five industries involving the movement of goods and people across the oceans and Great Lakes. Freight and Passenger transportation directly provide transportation services, while marine transportation services and warehousing support transportation. Search and navigation equipment is a manufacturing sector that brings information and communication technologies to marine transportation<sup>10</sup>.

The sector as a whole showed a slight decline in employment and a modest increase in GDP. However, there are two distinct trends that make up this sectoral performance. Freight and passenger transportation along with their support services increased employment by 9,800 (1.0 % annual average) and output by \$2.9 billion (3.0%). At the same time, the search and navigation equipment industry shed 12,000 jobs (6.5%), although output increased by one percent. Thus the “core” marine transportation industries showed positive performance throughout the period.

The amount of goods moved through America’s ports increased slightly from 2010 to 2014, and the real value increased. Exports were the primary source of increased value of shipments and accounted for all the growth in the volume of shipments. Bulk and break bulk cargo declined, primarily in imports. This import decline was primarily because of a large drop in oil imports, which fell by 28% in tonnage from 2010 to 2014

Marine Transportation 2010 - 2013

Industry	Employment				GDP (\$billion 2009)			
	2010	2013	Change	Annual Average % Change	2010	2013	Change	Annual Average % Change
All Marine Transportation	423,986	421,585	-2,401	-0.19%	\$56.80	\$59.09	\$2.29	1.35%
Deep Sea Freight Transportation	21,458	22,699	1,241	1.93%	\$6.10	\$7.11	\$1.01	5.49%
Marine Passenger Transportation	16,962	17,384	422	0.83%	\$3.20	\$3.59	\$0.39	4.01%
Marine Transportation Services	89,591	94,299	4,708	1.75%	\$9.90	\$11.71	\$1.81	6.09%
Search and Navigation Equipment	116,707	104,511	-12,196	-3.48%	\$23.60	\$22.96	-\$0.64	-0.91%
Warehousing	179,266	182,690	3,424	0.64%	\$14.00	\$13.74	-\$0.26	-0.63%

Table 18

<sup>10</sup> The recreational boating sector is a major customer for search and navigation equipment, but there are no data that separate the output of the industry by recreational and non-recreational markets.

The trends in the transportation sector discussed above essentially continued over from 2013 to 2014 as measured by the OECI. The sector showed modest growth in the index, with the indexes for both freight and passenger transportation showing solid growth. Support industries

of transportation services and warehousing showed index growth higher than the deep sea freight industry. The downward trend in the search and navigation equipment industry continued.

Marine Shipping 2010-2014

	Shipping Weight (million tons)			Shipping Value (\$billion, 2009)		
	2010	2014	Annual Average % Change	2010	2014	Annual Average % Change
Imports	971.8	894.3	-2.0%	\$1,493.9	\$1,682.9	3.2%
Exports	675.5	768.9	3.5%	\$642.7	\$769.4	4.9%
<b>Total</b>	<b>1,647.2</b>	<b>1,663.2</b>	<b>0.2%</b>	<b>\$2,136.6</b>	<b>\$2,452.3</b>	<b>3.7%</b>
Bulk/Break Bulk	1,400.6	1398.1	0.0%	\$1,381.2	\$1,085.1	-5.4%
Container	246.7	284.8	3.9%	\$755.4	\$886.3	4.3%

Table 19: Shipping Trends

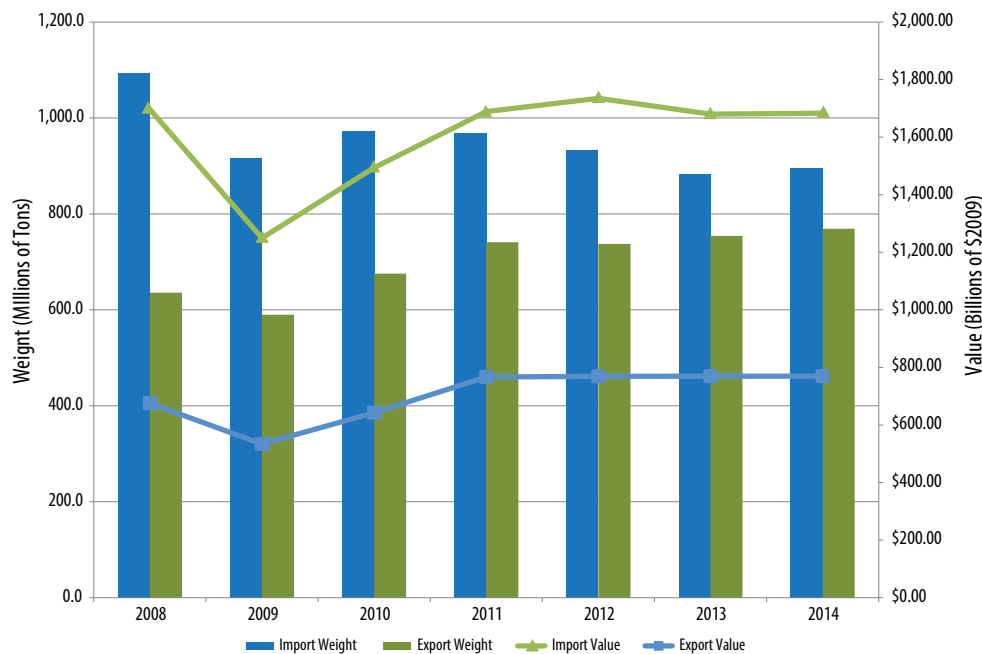


Figure 15: Imports and Exports by Marine Transportation

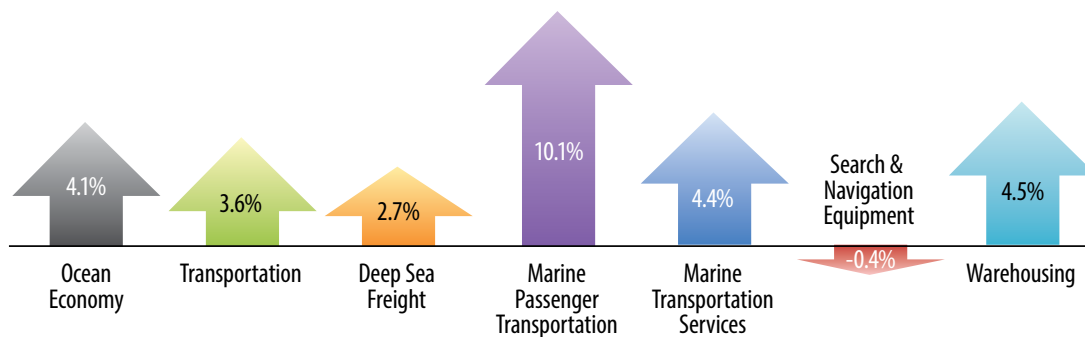


Figure 16: Ocean Economy Coincident Index 2013-2014 Transportation

# Chapter 4 Federal Government Ocean Related Expenditures

Since 2000, the Federal Government has been required by statute to submit a biannual report to Congress on expenditures related to the oceans and coasts. The most recent report released in December 2015 provides details on ocean related expenditures for fifteen government agencies. The activities covered in the report include marine related science, resource and environmental protection and management, land and resource conservation, the Coast Guard, flood mapping, and hazard mitigation. The report does not include the military operations of the U.S. Navy.

Table 20 shows the expenditures<sup>11</sup> for FY10 and FY15 for the agencies covered in the report. The largest agency by expenditure level is the Department of Homeland Security, primarily because of the Coast Guard. The Department of Commerce, primarily the National Oceanic and Atmospheric Administration, is the second largest followed by the Department of Defense, the largest portion of which is the Army Corps of Engineers construction and maintenance

programs. The Environmental Protection Agency is the fourth largest ocean related agency by expenditure, and the Department of the Interior the fifth largest. Together these four agencies comprise 86% of Federal ocean and coastal related expenditures.

Figure 17 shows total ocean expenditures for each of the years from FY10 to FY16 and these expenditures' proportion of the total federal budget. The effects of the "sequester" agreement related to federal discretionary spending between the President and Congress are clearly visible as ocean related expenditures declined steadily from FY12 to FY15. The slight growth in FY16 reflects the proposals to begin growing federal discretionary spending again this year. Nonetheless, the relatively small share of the federal budget related to oceans continues to decline even in FY16, as other parts of the federal budget receive greater attention than oceans and coasts.

Agency	FY09	FY15	Change	Percent Change	Share of Federal Ocean Budget 2015
Agriculture	\$537.5	\$395.1	-\$142.4	-26.5%	3.2%
Commerce	\$2,514.7	\$2,373.8	-\$140.9	-5.6%	19.5%
Defense	\$2,530.3	\$2,236.9	-\$293.4	-11.6%	18.4%
Energy	\$93.5	\$152.8	\$59.3	63.5%	1.3%
Environmental Protection Agency	\$2,038.3	\$1,533.0	-\$505.3	-24.8%	12.6%
Health and Human Services	\$80.6	\$71.9	-\$8.7	-10.8%	0.6%
Homeland Security	\$3,515.3	\$3,451.7	-\$63.6	-1.8%	28.3%
Interior	\$722.0	\$934.5	\$212.5	29.4%	7.7%
NASA	\$103.3	\$87.5	-\$15.8	-15.3%	0.7%
National Science Foundation	\$525.4	\$457.4	-\$68.0	-12.9%	3.8%
Smithsonian Institution	\$3.1	\$3.1	\$0.0	1.2%	0.0%
State	\$104.3	\$110.4	\$6.1	5.8%	0.9%
Transportation	\$567.4	\$373.4	-\$194.0	-34.2%	3.1%
Treasury	\$7.9	\$5.5	-\$2.4	-30.4%	0.0%
Total U.S. Government	\$13,343.7	\$12,187.0	-\$1,156.7	-8.7%	100.0%

Table 20: Federal Ocean and Coastal Related Expenditures

<sup>11</sup> Data reported are for Federal fiscal year, which runs October 1 to September 30. The figures reported are for appropriations enacted by Congress, except for FY 16 which is based on the President's budget submitted to Congress. Actual expenditures at the end of the fiscal year may differ.



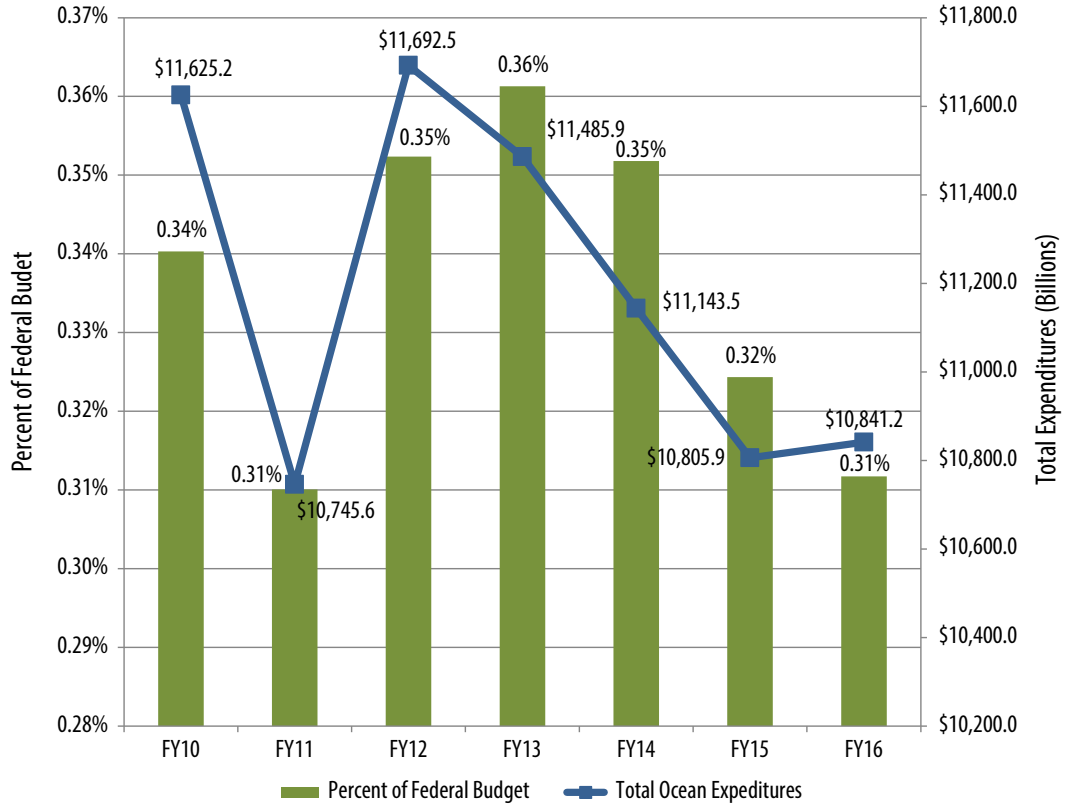


Figure 17: Ocean Expenditure Totals and Percent of Federal Budget

# Chapter 5

## The Arctic Economy

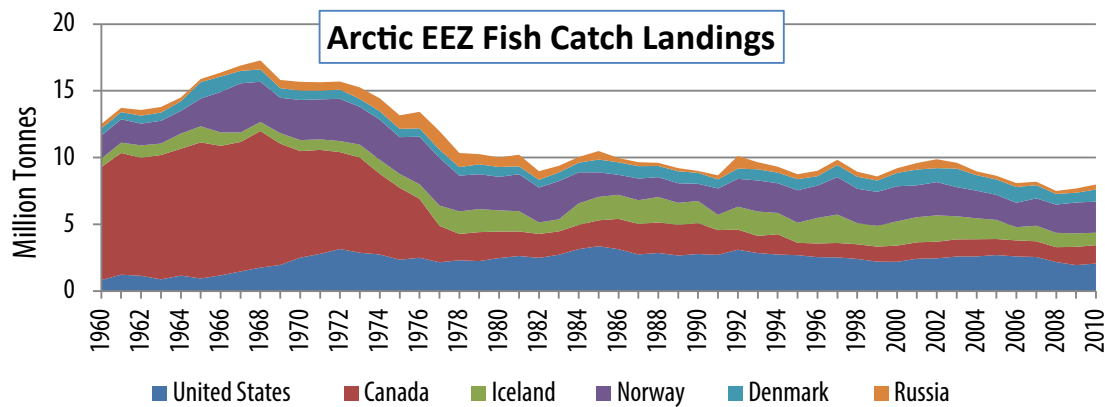


Figure 18a: Source: UBC, Sea Around Us database

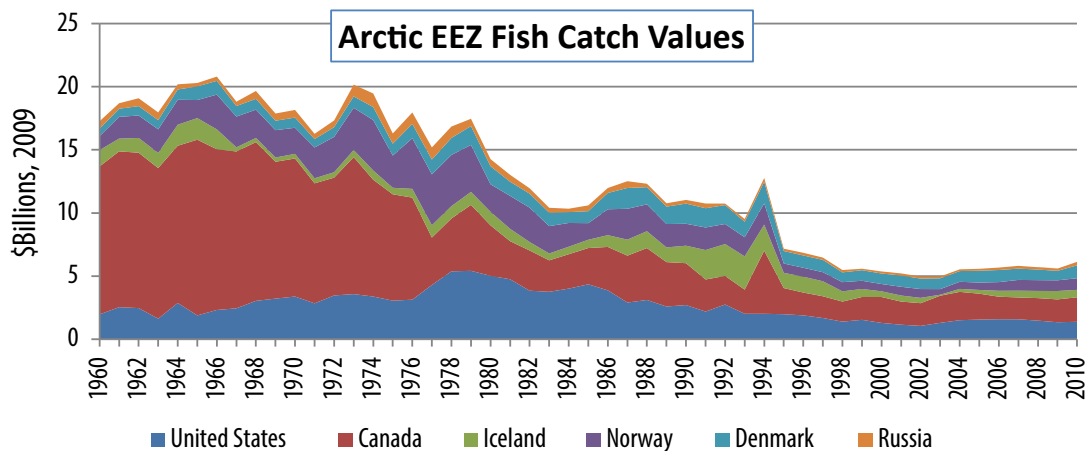


Figure 18b: Source: UBC, Sea Around Us database

The NOEP team began compiling Arctic economic data during the past year. Fisheries data are the first data to be delivered on our website. A summary of those data appear above in Figure 18. Norwegian and American landings are currently the highest of the nations indicated. The Big hump in the '60s and '70s represents the overfishing and eventual collapse in the Eastern Canadian EEZ, which extends south of the Arctic Sea, and was historically exploited by many countries. Since 1979, Canada's Department of Fisheries and Oceans has managed the EEZ in an effort to reverse the stocks' decline. Recently, the 5 nations

that border the Arctic Sea signed a moratorium on fisheries<sup>12</sup>, so that particular area of fisheries will have a time to rebuild until further scientific information becomes available to better inform management and a governing system is put in place to ensure the health of the fisheries. Arctic cod, in particular is of concern.

<sup>12</sup> <http://www.adn.com/article/20150716/5-nations-sign-declaration-protect-arctic-donut-hole-unregulated-fishing>

# Chapter 6

## Non-Market

The economic value of ocean and coastal resources are partly created by transactions in markets of the types that are reflected in the gross domestic product and in such associated measures as employment and wages. But these market-based measures provide only part of the picture of economic values. The value of a day at the beach is different from the value of the hotel where someone stayed or food they bought at a restaurant. What were once considered “wasted” lands such as coastal marshes are now known to be very valuable providers of what we recognize as ecosystem services, such as habitat for commercial fisheries and flood control.

As important as these values are, the problem is that there are neither systematic nor consistent methods to measure the values, nor even standard methods for measurement. There is a large and growing body of studies on the non-market values of coastal and ocean resources. The National Ocean Economics Program maintains a large online annotated bibliographic database, which users can consult to find studies related to resource values, regions, or methods of valuation in which they are interested.

The NOEP non-market bibliography currently has over seven hundred entries. More than three hundred studies were added in the past year. Over half the new studies are from North American and European sites, while 21% address locations in Asia. Within the United States, 34% of the studies are from the Pacific/West Coast region, 34% from the Atlantic/East Coast region (Northeast and Southeast), and 15% from the Gulf of Mexico.

The types of non-market assets valued are shown in Figure 20. The majority of the studies (53%) focus on ecosystems and environmental services. Below are examples that demonstrate the importance of accounting for non-market values and associated implications for the socioeconomic welfare of coastal communities.

*A sample of articles referenced in the NOEP database shows the range of economic values these study measure:*

### Protection from Extreme Weather Events:

Barbier, E.B., Y.I. Georgiou, B. Enchelmeyer, and D.J. Reed. 2013. “The value of wetlands in protecting southeast Louisiana from hurricane storm surges” *PLoS One* 8(13):e58715. This article examined the economic values of wetlands restoration in the wake of the *Deepwater Horizon oil spill* in 2010. The research in Louisiana found that maintaining intact coastal wetlands reduces property damages by \$104.12-\$139.87 per acre, and a 0.001 increase in wetlands vegetation decreases damages by \$25.24-\$45.22 per acre.

### Tourism & Recreation:

From Ghermandi, A. and P.A.L.D. Nunes. 2013. “A global map of coastal recreation values: Results from a spatially explicit meta-analysis”. *Ecological Economics* 86: 1–15. This article has a meta-analysis of 79 studies of coastal recreation values from around the world. The estimated recreational values of the coastal ecosystems range between \$0.15/ha/year and \$70,551.78/ha/year.

### Fisheries

Armstrong, et al. 2013. *Sea Angling 2012 – a survey of recreational sea angling activity and economic value in England*. Department of Environment, Food, and Rural Affairs, United Kingdom. One of the most popular ocean recreational activities in many countries, this study of recreational fishing in England supported \$3.16 billion USD in total spending annually.

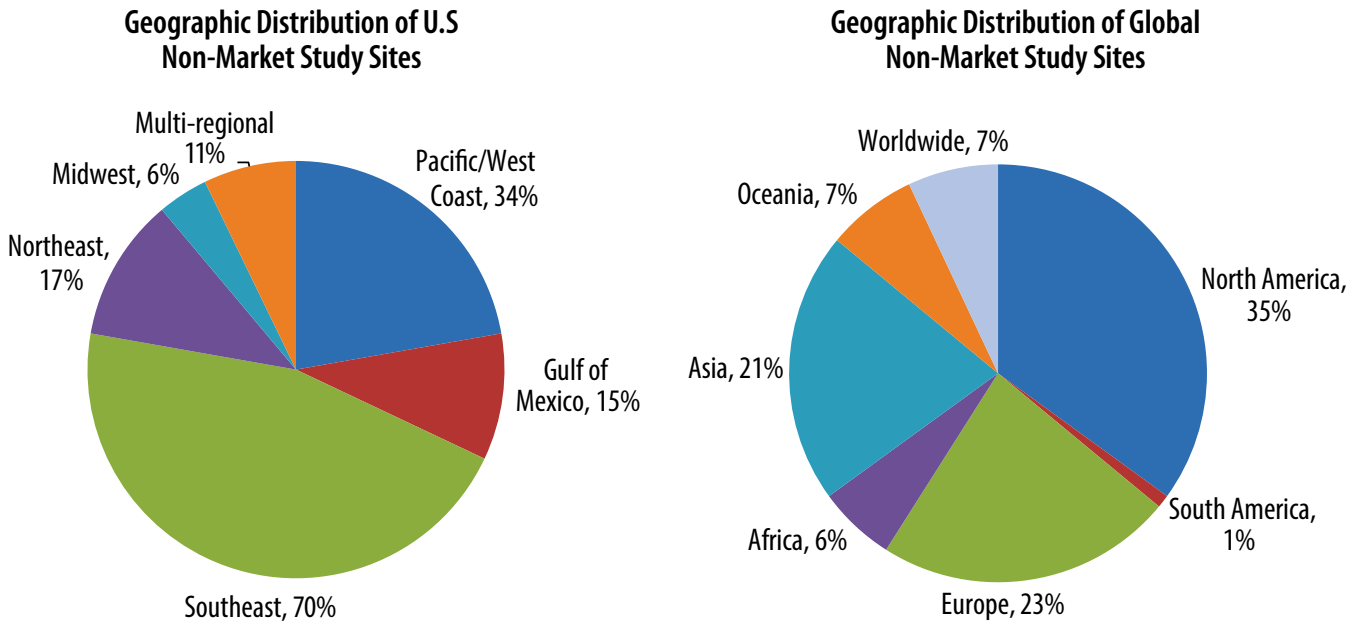


Figure 19: Geographic Distribution of Non-Market Studies in NOEP Database

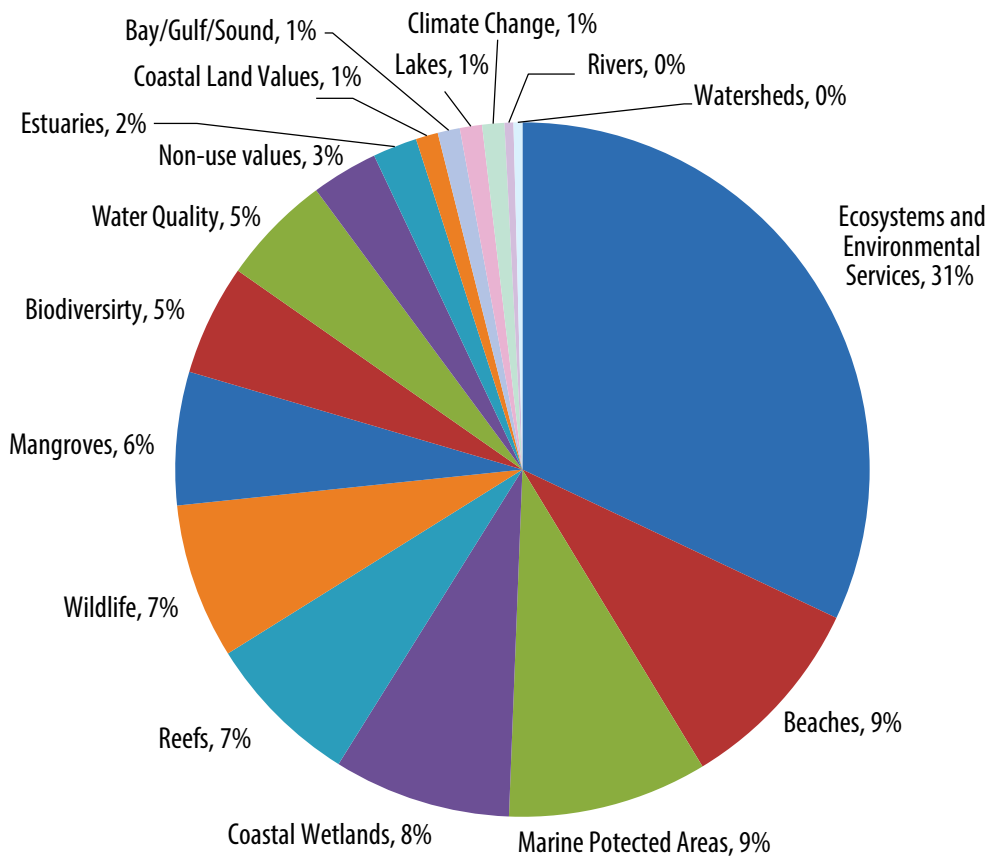


Figure 20: Distribution of Non-Market Studies in NOEP Database by subject matter



# Conclusions

The most recent data on the coastal and ocean economies of the United States show trends consistent with a national economy recovering from the deep recession of 2007 to 2009. Coastal states comprise such a large share of the national economy, that their economic growth essentially leads the way. But within coastal states there are some potentially important changes under way. The historic pattern of faster employment than population growth in those counties adjacent to the shores of the oceans and Great Lakes may be shifting as population growth in major cities, most located in coastal areas, has resumed. If trends suggested by the coastal economy data through 2014 are confirmed with new data, coastal regions' limited land areas will bear more of future growth at a time when natural hazards enhanced by climate change and sea level rise pose significant threats to coastal regions.

At over 2% of U.S. employment and GDP, the ocean economy of the U.S. is significantly larger than other natural resource industries such as agriculture and forestry. The ocean economy showed overall growth outpacing the national economy, but growth within the ocean economy was uneven. The offshore oil & gas industry and the minerals sector showed significant growth fueled by rapidly rising oil prices. Tourism & recreation also showed strong growth. Marine transportation showed employment decline, led by a drop in search & navigation equipment; the core marine transportation industries showed some growth. Living resources showed small employment growth and a small decline in GDP. Marine construction continued to show a decline, although beach nourishment, an important market for this sector showed significant growth. Ship & boat building showed overall growth, but continued weakness in boat building, the industry in this sector most affected by the recession.

Overall economic and population growth occurred in all regions of coastal America, but strongest growth was in the Gulf of Mexico and the Southeast. Weakest growth overall was in the shore areas of the Great Lakes states, though population growth in near shore regions in the west coast regions also lagged. The Gulf of Mexico also was the strongest region for ocean economy growth, consistent with the strength in the minerals sector.

A new tool, the Ocean Economy Coincident Index, permits a first look at more recent trends in the ocean economy than is available from the complete ocean economy data compiled by the Office for Coastal Management. The OEI indicates that the ocean economy in 2014 will likely continue to outpace the national economy in growth, with continued strong performance by the minerals sector. All of the major ocean economy sectors look to have been strong in 2014, with the exception of living resources, where seafood harvesting and processing have declined.

More than 80% of US employment and GDP are in coastal states, 49% in coastal counties, a disproportionate size for the small size of the US land mass they represent. If both employment and population growth in coastal areas continue to exceed overall growth in coastal states and the U.S., pressures on 18% of U.S. land area in coastal counties will only increase as will the population and economic vulnerabilities to the increasing coastal hazards associated with climate change

Despite growth in the coastal and ocean economies, federal resources directed at understanding and managing the resources of these regions have been declining and federal fiscal year 2016 are at essentially the same level in dollars (\$10.8 billion) and in share of the budget (0.31%) as five years earlier in fiscal year 2011.

# Appendix

2013 Coastal Economy, Population and Land Area

Region	Employment		GDP		Population		% Land Area *
	Millions	% of US	\$Trillions	% of US	Millions	% of US	
United States	134.0		\$16.7		316.5		
All Coastal States	109.2	81.5%	\$13.9	83.7%	257.9	81.5%	57.0%
Coastal Zone Counties	56.2	42.0%	\$8.0	48.0%	133.2	42.1%	19.6%
Shore-adjacent Counties	50.2	37.5%	\$7.2	43.2%	118.4	37.4%	18.1%

Table A-1

2013 Coastal Economy, Population and Land Area

State	Employment (Thousand)			GDP (\$Billion, 2009)		
	2010	2014	Annual Change	2010	2014	Annual Change
Alabama	1,813	1,864	0.70%	\$173.5	\$182.3	1.26%
Alaska	317	330	1.06%	\$48.5	\$48.7	0.10%
California	14,414	15,809	2.42%	\$1,936.8	\$2,113.3	2.28%
Connecticut	1,596	1,654	0.91%	\$230.3	\$232.6	0.26%
Delaware	399	424	1.54%	\$56.6	\$56.7	0.03%
District of Columbia	693	729	1.30%	\$102.0	\$105.0	0.73%
Florida	7,110	7,755	2.27%	\$723.5	\$769.7	1.59%
Georgia	3,754	4,032	1.86%	\$407.8	\$435.5	1.70%
Hawaii	587	626	1.68%	\$66.9	\$70.5	1.35%
Illinois	5,502	5,762	1.18%	\$647.5	\$680.4	1.27%
Indiana	2,710	2,891	1.67%	\$279.8	\$289.3	0.86%
Louisiana	1,832	1,924	1.25%	\$221.0	\$216.0	-0.57%
Maine	578	590	0.54%	\$51.1	\$51.0	-0.08%
Maryland	2,453	2,553	1.01%	\$311.1	\$321.3	0.82%
Massachusetts	3,149	3,360	1.67%	\$394.8	\$425.0	1.91%
Michigan	3,770	4,090	2.12%	\$384.4	\$417.3	2.14%
Minnesota	2,558	2,730	1.68%	\$269.4	\$288.1	1.74%
Mississippi	1,075	1,103	0.65%	\$93.8	\$94.5	0.17%
New Hampshire	601	627	1.08%	\$62.4	\$66.3	1.54%
New Jersey	3,736	3,842	0.71%	\$489.4	\$504.2	0.75%
New York	8,341	8,847	1.52%	\$1,183.5	\$1,279.9	2.04%
North Carolina	3,789	4,057	1.77%	\$418.4	\$440.3	1.31%
Ohio	4,909	5,183	1.40%	\$487.9	\$532.0	2.26%
Oregon	1,598	1,726	2.00%	\$190.7	\$203.8	1.71%
Pennsylvania	5,472	5,644	0.79%	\$579.0	\$609.1	1.30%
Rhode Island	447	463	0.89%	\$48.8	\$50.5	0.90%
South Carolina	1,758	1,895	1.95%	\$164.1	\$174.6	1.60%
Texas	10,182	11,379	2.94%	\$1,201.1	\$1,467.3	5.54%
Virginia	3,537	3,655	0.84%	\$420.2	\$427.5	0.43%
Washington	2,809	3,044	2.09%	\$358.1	\$390.5	2.26%
Wisconsin	2,634	2,758	1.19%	\$252.5	\$268.7	1.60%
<b>All Coastal States</b>	<b>104,122</b>	<b>111,347</b>	<b>1.73%</b>	<b>\$12,255.2</b>	<b>\$13,212.0</b>	<b>1.95%</b>

Table A-2

## 2013 Ocean Sectors

Sector	Establishments		Employment		Wages		GDP	
	Establishments	Ocean %	Employment	Ocean %	\$billion	Ocean %	\$billion	Ocean %
Construction	3,077	2.06%	44,151	1.47%	\$2.94	2.60%	\$5.81	1.62%
Living Resources	6,078	4.07%	61,753	2.06%	\$2.50	2.21%	\$7.33	2.04%
Minerals	5,061	3.39%	170,537	5.68%	\$22.90	20.28%	\$168.78	46.97%
Ship & Boat Building	1,768	1.18%	153,480	5.11%	\$9.50	8.41%	\$17.26	4.80%
Tourism & Recreation	123,527	82.68%	2,149,892	71.63%	\$45.70	40.48%	\$101.04	28.12%
Transportation	9,894	6.62%	421,585	14.05%	\$29.30	25.95%	\$59.09	16.45%
All Ocean Sectors	149,405		3,001,400		\$112.90		\$359.32	

Table A-3

## Ocean Economy by Region 2013

Region	Establishments	Employment	Wages	GDP (Millions)	GDP (Millions \$2009)
Northeast	14,415	235,807	\$8,311.1	\$16,343.68	\$16,016.37
Mid-Atlantic	39,546	699,722	\$24,598.5	\$48,265.82	\$46,987.20
Southeast	18,974	360,322	\$9,158.5	\$20,401.49	\$19,757.63
Gulf of Mexico	25,306	606,460	\$35,926.0	\$177,319.62	\$135,948.05
Great Lakes	14,197	285,529	\$7,560.2	\$16,075.88	\$15,842.71
West	30,597	655,522	\$25,159.2	\$58,537.89	\$54,896.25
Pacific	4,044	109,279	\$3,659.1	\$7,033.63	\$6,633.87
North Pacific	2,325	48,756	\$2,801.3	\$15,338.17	\$11,581.11
<b>Total</b>	<b>149,404</b>	<b>3,001,397</b>	<b>\$117,173.89</b>	<b>\$359,316.19</b>	<b>\$307,663.20</b>

Table A-4

## Ocean Economy by State 2010-2013

	Employment			GDP (\$ Millions 2009)		
	2010	2013	Ann Avg % Ch	2010	2013	Ann Avg % Ch
AK	44,367	48,756	3.3%	\$12,713.07	\$11,581	-3.0%
AL	23,094	28,220	7.4%	\$1,844	\$2,365	9.4%
CA	474,189	502,073	2.0%	\$39,915	\$41,140	1.0%
CT	44,638	50,410	4.3%	\$4,239	\$4,243	0.0%
DE	18,049	23,194	9.5%	\$1,370	\$914	-11.1%
FL	405,676	446,835	3.4%	\$22,961	\$25,677	3.9%
GA	22,036	23,925	2.9%	\$1,082	\$1,173	2.8%
HI	100,215	109,279	3.0%	\$5,602	\$6,634	6.1%
IL	83,397	85,154	0.7%	\$5,933	\$6,302	2.1%
IN	12,005	13,692	4.7%	\$798	\$958	6.7%
LA	104,071	114,786	3.4%	\$17,693	\$18,416	1.4%
MA	79,791	84,403	1.9%	\$5,477	\$6,110	3.9%
MD	84,489	90,729	2.5%	\$6,009	\$6,797	4.4%
ME	43,712	46,319	2.0%	\$2,309	\$2,182	-1.8%
<b>MI</b>	<b>54,252</b>	<b>58,995</b>	<b>2.9%</b>	<b>\$2,352</b>	<b>\$2,499</b>	<b>2.1%</b>

Table A-5 (continued next page)

Ocean Economy by State 2010-2013 (continued from previous page)

	Employment			GDP (\$ Millions 2009)		
	2010	2013	Ann Avg % Ch	2010	2013	Ann Avg % Ch
MN	11,711	12,286	1.6%	\$1,034	\$1,124	2.9%
MS	32,964	31,636	-1.3%	\$2,168	\$1,997	-2.6%
NC	38,183	43,385	4.5%	\$1,765	\$1,991	4.3%
NH	7,583	13,630	26.6%	\$341	\$1,467	110.0%
NJ	119,042	122,324	0.9%	\$7,617	\$7,931	1.4%
NY	281,613	328,718	5.6%	\$19,912	\$21,462	2.6%
OH	41,652	46,245	3.7%	\$1,827	\$2,148	5.8%
OR	30,922	32,317	1.5%	\$2,626	\$2,466	-2.0%
PA	41,936	46,673	3.8%	\$2,505	\$2,750	3.3%
RI	37,649	41,043	3.0%	\$2,005	\$2,014	0.2%
SC	63,011	70,543	4.0%	\$2,879	\$3,240	4.2%
TX	171,374	207,449	7.0%	\$69,843	\$100,847	14.8%
VA	116,568	117,263	0.2%	\$7,548	\$8,220	3.0%
WA	112,674	121,131	2.5%	\$10,768	\$11,290	1.6%
WI	38,074	39,973	1.7%	\$1,691	\$1,726	0.7%
<b>ALL</b>	<b>2,740,947</b>	<b>3,001,386</b>	<b>3.2%</b>	<b>\$266,837</b>	<b>\$309,676</b>	<b>5.4%</b>

Table A-5

Commercial Fisheries Production

Year	Imports		Exports		Landed	
	Billion Pounds	Value (\$Billions, 2009)	Billion Pounds	Value (\$Billions, 2009)	Billion Pounds	Value (\$Billions, 2009)
1997	2.8	\$6.8	2.5	\$3.7	9.6	\$4.8
1998	3.0	\$7.1	2.0	\$3.0	9.0	\$4.2
1999	3.2	\$7.4	2.3	\$3.7	9.1	\$4.6
2000	3.3	\$8.0	2.6	\$3.7	8.8	\$4.5
2001	3.5	\$7.7	3.3	\$3.9	9.3	\$3.9
2002	3.7	\$7.9	3.0	\$3.7	9.2	\$3.7
2003	4.3	\$8.5	3.0	\$3.8	9.3	\$3.9
2004	4.4	\$8.5	3.8	\$4.2	9.4	\$4.2
2005	4.6	\$8.9	4.1	\$4.5	9.4	\$4.3
2006	4.9	\$9.7	4.1	\$4.5	9.3	\$4.3
2007	4.8	\$9.6	4.0	\$4.5	8.9	\$4.1
2008	4.7	\$9.8	3.8	\$4.3	7.9	\$4.2
2009	4.7	\$9.1	3.7	\$4.0	7.8	\$3.7
2010	5.0	\$10.3	4.1	\$4.4	7.9	\$4.2
2011	5.0	\$11.4	5.0	\$5.3	9.6	\$5.1
2012	5.0	\$11.2	4.0	\$5.2	9.4	\$4.7
2013	5.1	\$11.6	4.0	\$5.2	9.5	\$5.1
2014	5.3	\$13.0	4.1	\$5.2	9.0	\$4.9

Table A-6



## State Commercial Fisheries Landings, 2010-2014

State	Thousand Pounds			Value (\$Thousand, 2009)		
	2010	2014	Annual Change	2010	2014	Annual Change
Alabama	14,454	25,268	18.70%	\$25,090	\$53,537	28.34%
Alaska	4,347,449	5,671,337	7.61%	\$1,458,984	\$1,332,472	-2.17%
California	437,869	358,451	-4.53%	\$162,248	\$182,712	3.15%
Connecticut	6,623	7,523	3.40%	\$16,641	\$11,008	-8.46%
Delaware	4,846	3,606	-6.40%	\$6,705	\$5,126	-5.89%
Florida	92,903	98,008	1.37%	\$173,639	\$199,470	3.72%
Georgia	7,351	11,283	13.37%	\$12,352	\$12,003	-0.71%
Hawaii	28,069	33,474	4.81%	\$77,410	\$78,794	0.45%
Louisiana	1,005,289	778,282	-5.65%	\$228,993	\$351,269	13.35%
Maine	199,063	260,358	7.70%	\$348,000	\$427,202	5.69%
Maryland	102,911	49,382	-13.00%	\$96,599	\$70,236	-6.82%
Massachusetts	282,835	274,186	-0.76%	\$440,850	\$408,665	-1.83%
Michigan	10,157	8,289	-4.60%	\$9,031	\$8,959	-0.20%
Minnesota	415	290	-7.53%	\$210	\$145	-7.78%
Mississippi	111,242	190,548	17.82%	\$20,183	\$20,230	0.06%
New Hampshire	11,820	9,691	-4.50%	\$19,023	\$20,882	2.44%
New Jersey	161,844	124,114	-5.83%	\$163,864	\$118,236	-6.96%
New York	27,719	26,068	-1.49%	\$31,388	\$41,957	8.42%
North Carolina	71,989	61,943	-3.49%	\$73,525	\$73,205	-0.11%
Ohio	5,014	4,333	-3.40%	\$3,699	\$3,175	-3.54%
Oregon	201,479	291,623	11.19%	\$96,393	\$122,891	6.87%
Pennsylvania	67	25	-15.77%	\$177	\$65	-15.79%
Rhode Island	77,477	91,379	4.49%	\$57,730	\$67,092	4.05%
South Carolina	10,478	8,946	-3.66%	\$19,337	\$16,701	-3.41%
Texas	89,902	73,491	-4.56%	\$187,969	\$216,622	3.81%
Virginia	509,513	388,069	-5.96%	\$170,467	\$130,928	-5.80%
Washington	189,486	191,142	0.22%	\$235,180	\$253,895	1.99%
Wisconsin	3,520	2,906	-4.36%	\$3,435	\$3,960	3.82%
<b>All Coastal States</b>	<b>8,011,785</b>	<b>9,044,015</b>	<b>3.22%</b>	<b>\$4,139,122</b>	<b>\$4,231,436</b>	<b>0.56%</b>

Table A-7: Commercial Fisheries by State



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## The Economy Relies on a Healthy Ocean

The United States must ensure sustainable use of its marine resources to maintain its place in the global economy.

The nation relies on ocean systems to produce food, energy, and pharmaceuticals.

Large sectors of the U.S. economy depend on the oceans to transport goods.

Energy needs, land use, and climate change will challenge management of our coasts and oceans in the future.



## WE VALUE THE OCEANS

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