The Sustainable Working Waterfronts Toolkit

History, Status and FUTURE Trends of Working Waterfronts

HISTORY, STATUS, AND FUTURE TRENDS OF WORKING WATERFRONTS

PREPARED BY THE URBAN HARBORS INSTITUTE,
UNIVERSITY OF MASSACHUSETTS BOSTON

MARCH 2013

This report was prepared by the Urban Harbors Institute, University of Massachusetts Boston as part of the Sustainable Working Waterfronts Toolkit project funded under Investment Number 99-07-13873 from the U.S. Commerce Department's Economic Development Administration. The statements, findings, conclusions, and recommendations are those of the authors and do not necessarily reflect the views of the EDA, NOAA, or the U.S. Department of Commerce.

Table of Contents:

Figures:

Tables:

I. Introduction

Working waterfronts have been important to the U.S. economy and culture from the earliest days of this country's founding. The origin of many coastal communities is strongly linked to the advantages afforded by their shoreside locations. This report provides a brief history of working waterfronts, describes their major industries, and identifies significant drivers of past changes and future trends.

The term "working waterfront" means different things to different people. For some, the term conjures up images of fishermen unloading their catches onto docks in small and mid-size waterfront communities. For others, the term represents much larger-scale waterfront operations such as cruise ship berths, container shipping, or petrochemical terminals.

While there is no single definition of a "working waterfront," this term refers to areas of land-based water access critical to the operations of water-dependent enterprises. The National Working Waterfront Network[1] uses the term for any lands used for water-dependent activities. Working waterfronts can be located along bodies of fresh or salt water, and can vary considerably in terms of size and infrastructure.

The breadth of the definition makes it difficult to quantify the number of working waterfronts around the country; but it can be said confidently that working waterfronts are found in every major city fronting coastal or navigable inland waterways and in most smaller, similarly situated communities.

Working waterfronts are often essential assets to the economies and characters of their communities and regions. As explained in greater detail in the section on waterfront industries (see page 22), working waterfronts support a variety of water-dependent[2] and water-enhanced businesses[3].

Despite their long histories, many working waterfronts have been, and continue to be in various states of transition. Changes in technologies, national interests, economies, and environmental conditions impact the way people use and value these places. While the exact future of any working waterfront is not always predictable, what is known is that they are unique pieces of real estate that support and preserve future economic opportunities, recreational access, and our cultural heritage. That is why there is so much local, regional and national interest in them.

[1] The National Working Waterfront Network (NWWN) is a nationwide network with a mission to increase the capacity of coastal communities and stakeholders to make informed decisions, balance diverse uses, ensure access, and plan for the future of their working waterfronts and waterways.

[2] Examples of some water-dependent industries include: oil and gas pipeline installation; oil and gas extraction; offshore renewable energy; offshore mineral harvesting; marine transportation; shipping; port and harbor operations; warehousing; commercial fishing; recreational fishing; seafood processing; aquaculture; recreational boating; boat building, sales, and repair; coastal tourism; and water-based recreation.

[3] Water-enhanced businesses benefit from an attractive waterfront location but are not dependent on waterfront access as a requirement for operation.

II. A Brief History of Working Waterfronts

The waterfronts of the United States were essential to the nation's birth, fundamental to its character and growth, and important to its prosperity. The activities that depend on waterfront access (such as shipping, fishing, and transportation) have played a central role in shaping our nation's history, culture, economy, growth patterns, and environment. Early on, working waterfronts emerged to serve the different needs of different regions. After World War I, however, national needs increasingly began to shape waterfronts from coast to coast. Waterfront activities, regardless of their geographical location, felt the impact of national changes and events related to technologies, the economy, wars, and environmental conditions.

A. Early Atlantic Working Waterfronts

Beginning in the early 1600s, the country's earliest urban settlements along the sheltered estuaries and small bays of the Atlantic coast were mercantile outposts of Europe's maritime nations (Delaney & Wiggin, 1989). Native Americans were already well familiar with the important resources afforded by the ocean and coast when the first immigrants from England came to settle Jamestown, VA, and Plymouth, MA. These pioneers were soon joined by others seeking economic opportunity or freedom (political or religious) and spreading new settlements along the New England coast. The Dutch landed in the area around present day New York City and established fur-trading outposts along the Hudson River to the north. By the mid- to late-1600s, coastal settlements had been established in the mid-Atlantic area from New Jersey to South Carolina.

Though the new land was rich in natural resources, many of the goods needed by the colonists continued to be obtained from Europe. On the Atlantic coast, the 13 colonies provided raw materials to England and colonists received manufactured goods in return. Under this mercantile system, England essentially controlled everything that went to or came from the colonies.

Shipping was not only essential for trade with Europe, it was also central to the movement of goods among the colonies, and later the states. Land-based transportation by horse on poor roads often made for slow travel. Shipping provided a much more efficient means of moving goods and people between cities. While the ports of New York and Philadelphia led the way in domestic shipping, more than half of the major colonial seaports were located in New England (Institute for Global Maritime Studies Inc., 2008). Cities grew up around these ports and their waterfronts became commercial and industrial centers flanked by inland residential neighborhoods.

Fishing and shellfishing were central to the development of early communities and economies. Cod drew Europeans to North America as early as the 15th century. Throughout the 17th and 18th centuries, as New England's natural harbors supported growing trade, rich cod stocks were the basis for a flourishing groundfish industry that provided an important source of food and commerce. The magnitude of the industry is evident in an observation made in 1833 about Gloucester Harbor that described 433 vessels anchored in the harbor beside those boats at the wharves (Garland, 1990).

Whaling contributed to the expansion of waterfront activity along the Atlantic coast during the first half of the 19th century. Towns such as Nantucket, MA, and Southampton, NY, thrived during the early days of whaling. As the industry grew, the port of New Bedford, MA, became the largest whaling center in the country. Its fleet grew from 10 vessels in 1815 to 329 vessels in 1857, making it the richest city per capita in the world in the mid-1800s. Whaling ceased during the Civil War and shortly thereafter declined precipitously following the development of a method to distill kerosene from petroleum.

Immigration from the 1600s through the 1800s kept the nation's ports bustling. Early immigrants to the colonies came from England, France, Germany and other northwest European countries. Later, between 1815 and 1915, some 30 million Europeans arrived in the U.S. traveling on sailing ships in the early years, and later, on steamships. African slaves also arrived by ship. During the 1700s and ending in the mid-1800s, an estimated one-half million Africans arrived at east coast and Gulf ports as slaves, part of the "triangle trade" among Europe, Africa and the Americas.

As steam replaced wind power, waterfronts changed to accommodate new vessels. Throughout the 1800s, coastal harbors were filled with boats. Waterfronts of any size bristled with docks and piers. In the 1850s, New York City had 112 piers; by 1870, over 10,000 vessels were berthed there (Buttenwieser, 1987). Beginning in the mid-1800s, steam power made crossing the ocean much quicker, safer and reliable, and ocean liners made regular crossings between European and U.S. ports (until supplanted by airliners in the mid-1900s.) Ferries and their passenger terminals were also prominent features of city waterfronts before bridges and tunnels became the norm.

The rise and fall of lumber resources, especially those of the Northeast, had a significant influence on the Atlantic coast's working waterfronts. In the 1840s, wooden shipbuilding was common in ports throughout New England, but as timber resources dwindled, this industry lived on in just New Hampshire and Maine. By the 1880's, Maine was the only state producing large wooden square-rigged vessels.

As train transport emerged, access to rail lines began to determine port dominance on the Atlantic coast. In 1842, a rail line from Boston to Albany was established (Albany was already connected via rail to Buffalo). By 1852, New York, Baltimore, and Philadelphia were all connected with cities to their west.

B. Early Pacific Working Waterfronts

The sites of today's major ports along the southern Pacific coast, e.g., Los Angeles and San Diego, were largely undeveloped until the mid-1700s, when Spain took an interest in colonizing the west coast. These southern ports, in what was then part of Mexico, served largely as trading posts for Spanish missionaries who wanted to bring western religion and civilization to the local Indian populations. Increased trade came to the area, largely from Boston, England, and Russia, when California became known for its horse and cowhides, tallow, and cattle horns. Much later, when the Panama Canal opened in 1914, it gave significant new trade advantages to the Port of Los Angeles.

Further north, in 1849, the Gold Rush brought tens of thousands of gold prospectors by boat to the previously underutilized San Francisco Harbor (Cellineri, 1976). Activity within the port itself, which had previously been used for whaling and fur trading, grew somewhat haphazardly in the following decades, as private entities built up wharfs around the city's waterfronts. Trade to California during this period inspired the construction of the California Clippers, the fastest and largest merchant ships built up to that time. Following the Gold Rush, the city became the gateway for European and eastern manufactured goods, which were often traded for lumber and grain (Bauer, 1988). In the mid-1800s, drawn by the discovery of gold in California, people began emigrating from China to the U.S., arriving at the west coast ports.

As more and more newcomers were flooding into California, earlier settlers began to take a growing interest in Washington and Oregon. Drawn by the area's vast timber and fish resources, many early communities were dominated by sawmills, boat building operations, and family-run commercial fishing operations, especially salmon fishing and canning. Waterfronts in Puget Sound were clogged with ferry traffic between the sound's many islands. Larger ports such as Tacoma, Seattle, and Olympia established their significance in the late 1800s and early 1900s with the development of the northwestern lumber trade.

As the wood products industry took off, eastern rail systems finally reached the Pacific Northwest. The importance of these ports continued to build in the 20th century as their proximity to Alaska and Asia gained significance. Then, around World War II, the growth of tuna fishing and canning further elevated the area's significance.

Alaska & Hawaii

Native Alaskans were the first to understand the importance of living close to the sea, which was the mainstay of their life and culture. Not until the 18th and 19th century were they joined by others. Russian fur hunters and traders were the first non-natives to establish coastal communities. Then, when Alaska became part of the United States in the late 1950's, coastal canneries were built in villages to support efforts to industrialize the U.S. salmon industry.

Native Hawaiians also had a long-established relationship to the sea before non-natives discovered its riches. Early European settlers who came in the late 1700s developed port operations, such as those in Honolulu, to engage in trade of sandalwood and to serve as supply depots for the whaling industry. When Hawaii joined the United States in the late 1800s, the U.S. sought to take advantage of its location to develop military ports such as Pearl Harbor.

C. Early Mid-West Working Waterfronts

Great Lakes

Working waterfronts along the Great Lakes started to develop in earnest during the mid- to late 1700s. Ports such as Green Bay were important to the local fur trade. Movement of goods and people through the Great Lakes was key to westward expansion.

The War of 1812 spurred shipbuilding on the Great Lakes. At the end of the border disputes between the U.S. and Great Britain, settlement began to increase. Activity levels rose further with the opening of the Erie Canal from Albany to Buffalo in 1825, and the Illinois and Michigan Canal in 1848. By providing direct access to the Mississippi River and Hudson River, these man-made waterways connected Great Lake ports to important destinations such as New York and New Orleans.

Development of the canals effected an increase in grain shipments on the Great Lakes, and contributed to Chicago's significant population growth between 1830 and 1860, increasing from fewer than 5,000 people to more than 100,000 (Bauer, 1988). This population growth spurred new building activity, which contributed to a growth in lumber shipments from Wisconsin and Michigan ports. Most lumber moved by schooner or barge, though rafting was also a common sight in the 1860s and 1870s.

Commercial fishing activity on the Great Lakes was slow to start. After the introduction of refrigeration, however, fishing activity such as the whitefish and herring industries on Lake Superior became a significant use of the water and waterfront.

In the late 1800's, ore docks sprouted up along the Great Lakes. The primary minerals were copper and iron. Shipment of this ore led to the development of new shoreside technology and vessel designs that enabled faster unloading and safer passage. These changes in turn spurred the growth of shipyards capable of building these new vessels.

Inland Rivers and Canals

Waterfronts along rivers and canals contributed greatly to the nation's economy and movement of populations. Inland waterways were a useful means of transportation to early settlers, explorers, and traders, and led to the development of many riparian communities.

Canoes, flatboats[4], and keelboats[5] were used by early river travelers. The demand for river travel was great. Between 1800 and 1810, approximately 35 ocean-going vessels were built at boat yards along the Ohio River (Bauer, 1988).

While these early vessels were important forms of river transportation, steamboats, which appeared on rivers in the early 1800s, had a tremendous impact on the movement of goods and people along inland waterways. According to Haites, Mak, & Walton (1975)

> *The total amount of freight and passengers carried in 1849 by western river steamboats was 3.32 billion freight-ton miles and 1.1 billion passenger miles. In that one year, western river steamboats carried about 1 billion freight-ton miles more and only about 700 million passenger miles less than the amounts carried by railroads in the entire United States in one year a whole decade later.*

Development of the Erie Canal, ceremoniously opened in October 1825, was responsible for the enormous growth of the Port of New York, as it provided the first practical means for bulk

[4] A flatboat is a "large, oblong wooden box that floated with the river current." (Haites, et al., 1975)
[5] Powered by oar, ropes, setting poles, and sometimes sail, keel boats were used to carry cargo upstream.

transportation between the Atlantic seaboard and the agricultural activity taking place in the country's interior (Bunting, 1971). And because the Erie Canal caused the freight rate between Albany and Buffalo to rapidly fall from $100/ton to $10/ton (Bauer, 1988), Buffalo saw a tremendous increase in cargo. By 1838, Buffalo shipped more grain than New Orleans; by 1845, it had surpassed all other U.S. cities in volume of grain, flour, and livestock (Bauer, 1988).

Based on the successes of the Erie, Illinois, and Michigan canals, additional canals were built throughout the Midwest. By 1837, more than 705 miles of canals had been built in Ohio alone. Ohio Valley farmers benefited greatly from this cheaper and faster means of transporting their goods. Ultimately, canals (and later the railroads) contributed greatly to westward expansion, diminishing the drive to locate along a river, and reducing populations of river ports such as Louisville, Kentucky.

D. Early Gulf of Mexico Working Waterfronts

Like Southern California, many coastal areas along the Gulf of Mexico were colonized by Spain. Settlers in early colonies such as Pensacola, FL, relied on the ocean to support their diets and economies. Red snapper, grouper and sponges were particularly important fisheries for the Florida panhandle, just prior to the Civil War. Fishing was also central to the development of many other ports along Florida's Gulf coast, such as Cortez and Fort Meyers.

East of Pensacola, Apalachicola became a major port facility in the early and mid-1800's as trade shifted from cotton to timber, which was an abundant resource along the forested Apalachicola River. As the Great Depression came to an end, commercial fishing and shellfishing began to dominate this port.

The port of New Orleans began as a colonial supply depot. It became increasingly significant as agriculture and access grew along the Mississippi River in the early 1800s. By 1820, New Orleans was the second busiest port in the United States (Upton, 2008). Goods traveled down the Mississippi where they were shipped up to the colonies or to ports in Europe and Latin America. Development of the steamboat and two-lane shipping on the Mississippi led to additional activity on the New Orleans waterfront, with steamboat arrivals increasing from 20 per year in 1814 to as many as 1,200 per year by 1834. Around the same time that domestic shipping was increasing, products such as coffee from the Caribbean and South America started to flow into the port. The City's southern location and position on the Mississippi made it a logical port to receive and transport goods from Latin and South America.

E. Ports and Harbors in the 20th Century

As the 20th century began, national events and conditions began to have a greater influence on the activities and development of working waterfronts from coast to coast. The two World Wars, the Cold War, economic calamities, the birth of new industries, changes in our national ethos, and technological advancements all contributed to how Americans used and valued their ports, wharves, landings, and piers.

Military events such as World War I and World War II shifted the focus of waterfront activities, especially at larger ports, to support wartime efforts. Places like New York Harbor became critical to supplying forces with munitions during World War I. For 1.5 years, more than 1,600 vessels left New York loaded with munitions. Then, when World War II broke out, shipbuilding became a prime economic industry in waterfronts large and small. Many boat repair and shipbuilding companies assisted in the construction, conversion and repair of vessels for the war effort. Huge numbers of workers were employed at shipyards. In California's San Pedro Bay, for example, more than 90,000 workers produced thousands of war-time vessels. During the Cold War era of the 1950s and 1960s, military cargoes constituted more than half of the Pacific coast break bulk cargo loadings for some U.S. steamship lines.

National economic conditions also influenced the shape of working waterfronts. During the Great Depression there was a decline in coastal shipping activity and international trade; a decrease that was intensified by the nation's increasing reliance on trucks. Following World War II, many Americans experienced a rise in leisure time and disposable income. As a result, waterfronts experienced a growth in businesses catering to the vacation and tourism industries. Cruise ship activity increased in larger harbors while recreational boating grew in harbors both large and small. These shifts put pressure on many of the more traditional uses of working waterfronts, such as fishing and boat building. This trend continues today, with many harbors supporting recreational boating activities, charter fishing operations, and eco-excursions.

The environmental movement that swept the nation in the 1970s had an impact on working waterfronts too. Following World War II, many smaller coastal communities began to feel the effects of natural resource deterioration caused by human activities. In some communities, the environmental impacts were significant enough to reduce the use of waterfronts or shut down their primary businesses. Laws were passed to reduce these impacts and create a better balance between human use and environmental protection. As a result, waterfront development such as port expansions and harbor maintenance began to come under closer scrutiny. Water-dependent businesses unable to achieve the balance between economic gain and environmental impact diminished, while others found more sustainable ways to prosper.

National trends in technology have made a mark on working waterfronts as well. Short and long distance travel by boat has been greatly displaced by airplanes, trains, and automobiles, along with corresponding infrastructure improvements, bringing an end to many ferry services and port activities specializing in ocean crossings. Advances in fish harvesting technology, e.g., electronic fish-finding equipment, improved on-board fish processing and storage capabilities. This changed the face of waterfronts, bringing bigger and more powerful boats, as well as new kinds of processing plants. Containerization of cargo allowed for easier transfer of shipments between vessels, rail cars, and trucks. Ports physically poised to handle these changes (i.e., those with access to land for container storage and access to deeper water to accommodate larger vessels) grew, while those without these assets lost business. Some have since became highly specialized (serving unique market niches or offering special handling techniques for specific commodities such as fresh produce), or have found alternative uses for the waterfront.

III. Drivers of Change to Working Waterfronts

Just as the settlement of the nation's waterfronts can be considered regionally, so too can some of the uses currently found along the waterfront. Shipping and fishing activities are important waterfront uses throughout the country, but wooden boat building is concentrated near the vast lumber resources in the Pacific Northwest and New England. Oil and gas related activities are largely concentrated in the western Gulf of Mexico and southern California. Recreational boating, though popular along all waterfronts, is especially important to waterfronts such as those in Florida[6].

Presently, some water-dependent uses are becoming more concentrated in specific locations for economic efficiencies, while other water-dependent uses are becoming harder to maintain due to environmental and regulatory conditions and competition for waterfront space. This leaves some coastal communities with vacant or underutilized waterfront properties. Many of these coastal communities are now working to strike a balance between maritime traditions and new non-water-dependent use pressures for coastal properties.

Throughout history, working waterfronts have repeatedly undergone revision. Some of the more recent drivers of those changes can be identified as (1) demographic, (2) economic, (3) environmental, (4) regulatory, or (5) technological. A review of each kind of driver follows.

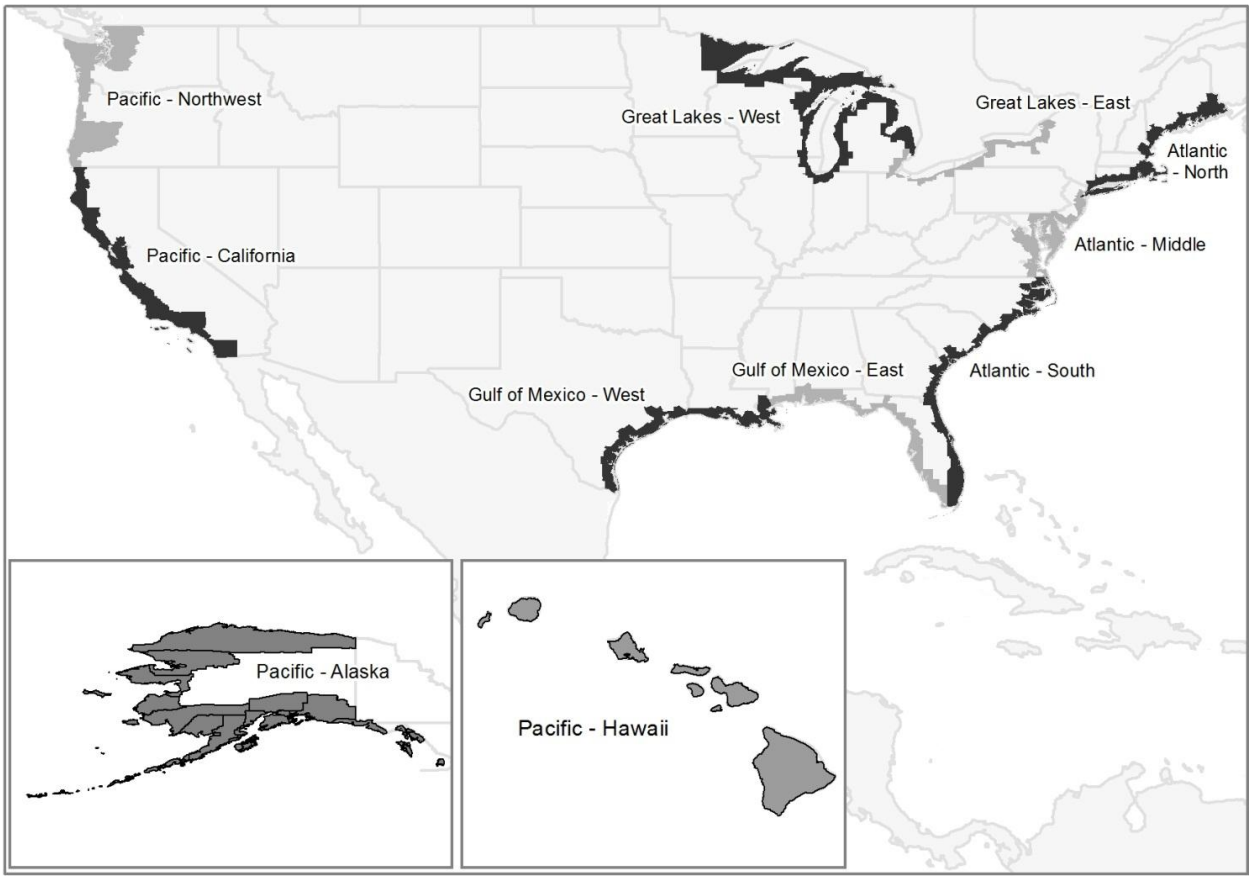
A. Demographic Drivers of Change

Before considering the impact of population growth, it helps to review how it is measured. There are several ways in which the population of the U.S. coastal area is compiled and reported. Though all rely on decennial census data, they all define "U.S. coastal area" differently because they are designed for and appropriate to different types of policy and management analysis, e.g., water quality, economic impact, coastal storm vulnerability or sea level rise. Some reports use "coastline," counties, which are counties that border on the oceans and territorial seas, including principal bays and estuaries. Others use the coastline counties, plus counties within coastal watersheds or within the CZMA coastal-zone, or within the 100-year coastal flood hazard area. Some definitions include the Great Lakes. Others do not.

For this project, decennial census population data have been compiled and tabulated based on the CZMA coastal zone definition. It includes the 444 counties (in 30 states, organized into 11 coastal regions in Figure 1) bordering the U.S. shorelines of the Atlantic, Pacific, Gulf of Mexico and Great Lakes[7].

[6] A 2009 study by the Florida Fish and Wildlife Conservation Commission revealed that in 2007 the state's boaters spent $3.38 billion on boating trips and $5.15 billion in watercraft expenses, which together supported 97,000 jobs.
[7] This and other compilations do not include data for counties bordering the nation's navigable waterways, along which are located important concentrations of population and working waterfronts. Nor does it include U.S. Territories.

Figure 1: Map of 11 U.S. Coastal Regions (Wilson, S. G., & Fischetti, 2010)



Over the 40 years from 1970 to 2010, the nation's coastal area population increased by just over 47 percent. The rates of change varied considerably among the regions, with the Southeast states (especially Florida) experiencing the greatest percent increase and among highest numbers of people. Alaska had the highest percent increase in population over this period, though its numbers and density of population are quite low. The Great Lakes West region had the lowest percent increase, while the Great Lakes East region lost a bit more than ten percent of its population.

As evident from these data, the nation's coastal area supports a disproportionately large share of the population, and economic and social activities, relative to its land area. Further, the percentage increase in population (and population density) in coastal areas has been greater than that of both the entire country and of the non-coastal counties (Wilson & Fischetti, 2010). Significantly, the population data do not include or reflect seasonal variations, which is a defining characteristic of some coastal areas.

These population increases and associated land uses have resulted in intense development pressure on coastal lands. For traditional working waterfront areas, this pressure can cause the displacement or conversion of water-dependent uses to non-water-dependent uses such as residential and commercial development.

Table 1. Population for coastal counties, by state and region from 1970 to 2010, and percent change (Wiggin, 2012).

Coastal Counties	State/Region	1970	1980	1990	2000	2010	Percent change 1970-2010
4	CONNECTICUT	1,882,926	1,935,906	2,030,017	2,120,734	2,219,037	17.85%
10	MAINE	685,582	794,944	885,703	944,847	990,425	44.46%
9	MASSACHUSETTS	4,259,558	4,299,427	4,494,398	4,783,167	4,924,916	15.62%
2	NEW HAMPSHIRE	209,382	275,753	350,078	389,592	418,366	99.81%
13	NEW YORK	12,213,788	11,543,590	11,888,471	12,867,414	13,221,319	8.25%
5	RHODE ISLAND	946,725	947,154	1,003,464	1,048,319	1,052,567	11.18%
43	**ATLANTIC NORTH**	**20,197,961**	**19,796,774**	**20,652,131**	**22,154,073**	**22,826,630**	**13.01%**
3	DELAWARE	548,104	594,338	666,168	783,600	897,934	63.83%
17	MARYLAND	2,974,397	3,088,070	3,339,056	3,592,430	3,861,557	29.83%
17	NEW JERSEY	6,563,733	6,669,284	6,996,313	7,575,546	7,913,312	20.56%
3	PENNSYLVANNIA	2,965,372	2,722,397	2,674,402	2,666,049	2,710,234	-8.60%
48	VIRGINIA	2,693,998	3,131,640	3,851,978	4,437,012	5,012,466	86.06%
88	**ATLANTIC MIDDLE**	**15,745,604**	**16,205,729**	**17,527,917**	**19,054,637**	**20,395,503**	**29.53%**
21	FLORIDA	3,961,697	5,607,872	7,463,047	9,309,074	10,883,322	174.71%
11	GEORGIA	328,074	386,027	460,233	538,469	630,681	92.24%
20	NORTH CAROLINA	509,457	595,852	710,903	826,019	988,911	94.11%
8	SOUTH CAROLINA	530,260	685,986	833,519	981,338	1,219,958	130.07%
60	**ATLANTIC SOUTH**	**5,329,488**	**7,275,737**	**9,467,702**	**11,654,900**	**13,722,872**	**157.49%**
2	ALABAMA	376,690	443,536	476,923	540,258	595,257	58.02%
45	FLORIDA	2,820,927	4,128,286	5,464,629	6,659,862	7,902,453	180.14%
3	MISSISSIPPI	239,944	300,217	312,368	363,988	370,702	54.50%
50	**GULF OF MEXICO EAST**	**3,437,561**	**4,872,039**	**6,253,920**	**7,564,108**	**8,868,412**	**157.99%**
18	LOUSIANA	1,738,788	2,013,416	2,022,157	2,147,329	2,084,823	19.90%
19	TEXAS	2,986,675	3,925,937	4,447,727	5,281,168	6,197,133	107.49%
37	**GULF OF MEXICO WEST**	**4,725,463**	**5,939,353**	**6,469,884**	**7,428,497**	**8,281,956**	**75.26%**
5	**HAWAII**	**768,733**	**964,691**	**1,108,229**	**1,211,537**	**1,360,301**	**76.95%**
23	**PACIFIC CALIFORNIA**	**16,741,426**	**19,351,296**	**23,522,473**	**26,215,856**	**27,825,195**	**66.21%**
12	OREGON	742,828	989,182	1,085,935	1,326,072	1,492,348	100.90%
15	WASHINGTON	2,322,010	2,773,433	3,389,033	4,070,515	4,615,192	98.76%
27	**PACIFIC NORTHWEST**	**3,064,838**	**3,762,615**	**4,474,968**	**5,396,587**	**6,107,540**	**99.28%**
23	**PACIFIC ALASKA**	**226,049**	**323,879**	**440,227**	**513,208**	**593,424**	**162.52%**
2	ILLINOIS	5,875,007	5,694,027	5,621,485	6,021,097	5,898,137	0.39%
3	INDIANA	738,709	751,413	711,592	741,468	771,815	4.48%
40	MICHIGAN	1,703,658	1,891,858	1,916,600	2,087,290	2,099,824	23.25%
4	MINNESOTA	265,539	269,300	241,755	248,425	251,654	-5.23%
15	WISCONSIN	1,914,483	1,881,956	1,907,781	1,992,393	2,049,934	7.08%
64	**GREAT LAKES WEST**	**10,497,396**	**10,488,554**	**10,399,213**	**11,090,673**	**11,071,364**	**5.47%**
3	MICHIGAN	3,410,539	3,167,150	2,962,687	2,995,256	2,813,583	-17.50%
11	NEW YORK	2,748,226	2,656,288	2,649,661	2,662,283	2,633,320	-4.18%
9	OHIO	3,021,663	2,852,436	2,752,987	2,767,328	2,659,770	-11.98%
1	PENNSYLVANNIA	263,654	279,780	275,572	280,843	280,566	6.41%
24	**GREAT LAKES EAST**	**9,444,082**	**8,955,654**	**8,640,907**	**8,705,710**	**8,387,239**	**-11.19%**
444	**TOTAL**	**76,384,167**	**83,873,050**	**94,195,697**	**105,046,089**	**112,565,051**	**47.37%**

B. Economic Drivers of Change

There are many different kinds of economic drivers that affect how working waterfronts are used. Two ubiquitous examples are described below.

Cost of Coastal Property

Though initial development of waterfronts was primarily related to the proximity to food and transport, people have since discovered other advantages to developing waterfront properties.

Many of these "new" waterfront values, which include access to more temperate weather and scenic views, have led to increasing interest in coastal property for leisure, tourism, and residential uses.

Elevated demand for waterfront properties over time has resulted in a general increase in coastal property values. In some communities, the demand issue is exacerbated by zoning regulations that limit water-dependent industries to a specific area of waterfront, further reducing the amount of space available for their development (Johnson & Orbach, 1990). One early study of coastal real estate prices in the Florida Keys described a fisheries zoned waterfront lot whose value increased from its original purchase price of $7,000 to a 1985 market value of $40,000 and $50,000 (Johnson & Orbach, 1990), while in 1985, a similar lot outside of this zone was valued at $25,000. These prices, although dated, demonstrate how expensive it can be for new water-dependent businesses to acquire waterfront property. Today, commercial waterfront properties in the Florida Keys can sell for hundreds of thousands, if not millions of dollars, depending on features like location, size, and existing infrastructure.

The rising value of coastal property is also associated with higher real estate taxes. Escalating tax burdens (along with other factors) can increase the cost of existing waterfront business operations to a point where a business is no longer profitable. Business owners in this situation must then decide whether to explore other opportunities or sell the property.

Cost of Infrastructure Maintenance and Dredging

Much of the existing infrastructure of the nation's working waterfronts was created at a time when maritime industries were more robust and before many of the laws protecting coastal and marine environments were in existence. The bulkheads, seawalls, wharfs and piers and dredged waterways essential to waterfront activities are extremely costly to rebuild and repair. Many waterfront businesses and municipalities lack the revenue to make these investments.

One major cost is regular maintenance dredging, which for many communities is critical to the existence of their fishing, shipping, and boating related businesses. More than 300 million cubic yards of dredged material are removed from navigation channels each year. Another 100 million cubic yards are dredged from berths and private terminals (America Association of Port Authorities, 2008). The federal government has, since 1789, authorized navigation channel improvement projects. The General Survey Act of 1824 established the U.S. Army Corps of Engineers' role as the agency responsible for the navigation system. Since then, the Corps of Engineers has worked with ports and harbors of all sizes to maintain waterside access to facilities.

The Harbor Maintenance Trust Fund (HMTF) and the Harbor Maintenance Fee (HMF) was established in 1986 to help fund maintenance dredging, dredged material disposal areas, jetties, and breakwaters for ports and harbors. The HMT is a fee paid by importers, domestic shippers, and passenger vessel operators based on the value of commercial cargo and passenger tickets. Since 2003, despite the fact that many harbors and ports continue to have acute dredging needs, the HMTF has retained a large surplus of funds (Government Accountability Office, 2008). The slow release of these funds means that communities and businesses must find other ways to

finance dredging and other repair activities. If they don't take action, they face the possibility that their waterfronts will slip into a state of disrepair and become unsafe or impractical to use.

C. Environmental Drivers of Change

Throughout the 20th century, waterfronts have weathered both positive and negative impacts from the nation's growing environmental consciousness. Today, they face one of their most significant environmental challenges of all time, climate change impacts.

Climate Change

A 2012 report of the National Oceanic and Atmospheric Administration (NOAA), authored by a panel of scientists from multiple federal agencies and academic institutions, offers an updated estimate of global mean sea level rise over the next century based on a comprehensive synthesis of existing scientific literature. The scientists indicate very high confidence (greater than 90 percent chance) that global mean sea level will rise at least 8 inches (0.2 meters) and no more than 6.6 feet (2.0 meters) by 2100 (NOAA, 2012a).

Sea level rise, greater frequency and severity of storm events, ocean acidification, species migration, and other products of climate change will have a significant impact on coastlines across the world. As sea levels rise, coastal infrastructure (including working waterfronts) will be inundated over time or, in the case of severe storm events, overnight. Coastal communities will face difficult decisions about how to adapt to these changing ocean conditions.

While sea level rise is one issue related to climate change, many freshwater bodies are experiencing the opposite problem; water levels are dropping, making it difficult, and in some areas, unsafe to access and use. Water level decreases in and around the Great Lakes, for example, have been associated with drought and rising temperatures. Lakes Erie, Ontario, and Superior are below their historical averages, while Lakes Michigan and Huron are at near-record lows (Associated Press, 2012). As a result of lower water levels, cargo vessels have had to lighten their loads and recreational boaters have been restricted to places with adequate water depth. Some towns are looking to dredging as a means to cope with the low water levels. Securing funding for dredging, however, especially in smaller communities, has been a challenge (as noted above).

D. Regulatory Drivers of Change

Environmental Regulations

In the 1960s, environmental degradation became a significant collective problem across the nation. Events such as the Santa Barbara oil spill, the pollution-based fire on the Cuyahoga River in Ohio, and the publication of Rachel Carson's Silent Spring spurred the emergence of the environmental movement. In the following decades, substantial and comprehensive environmental protection laws were passed. Modern day disasters, such as the BP/Deepwater

Horizon Oil Spill in the Gulf of Mexico and ominous events attributed to climate change, necessitate new law and policy attempts to rectify unsustainable practices.

Dozens of federal laws and regulations govern the terrestrial and marine environment. Their provisions have an impact on working waterfronts. Below, several of the federal regulations with the most significant waterfront effects are reviewed.

Clean Water Act (CWA)

As the first major U.S. law to address the national interest in water pollution and water quality, the Clean Water Act (CWA) made possible an enormous effort to clean waterways, harbors, and coastlines across the country after years of pollution. Prior to the advent of this environmental legislation, dredging and filling were used frequently to alter the shape of the waterfront to suit community development needs, including increasing waterfront space, adding dock areas, and expanding shoreside work areas. Once the CWA and its rules were in operation, however, the ability of communities or developers to modify the coastline for growing commercial purposes, often without regard to environmental impacts, was significantly curtailed.

Congress enacted the CWA in 1972 "…to restore and maintain the chemical, physical, and biological integrity of the nation's waters…" (33 U.S.C. § 1251). The Act achieves these goals through several methods, including the prevention of point and nonpoint pollution sources, providing financial assistance to construct and improve publicly owned wastewater treatment works, and maintaining healthy functioning wetlands. In particular, Section 404 of the CWA regulates discharges into "waters of the United States," including the filling of wetlands and the disposal of dredge material. In addition, Section 401 of the CWA provides the local state agency with Water Quality Certification oversight over any federal permit applicant seeking to engage in an activity that could discharge fill or pollutants into navigable waters.

The CWA and its regulations had and will continue to have an immensely positive impact on the quality of the coastal environment. While development is certainly constrained by regulation, it is likely this dramatic improvement in environmental quality in many areas of the country has made waterfront property even more valuable. In addition, the regulatory limitations on waterfront expansion underscore the scarcity of available space and the need to preserve those areas in use today.

Coastal Zone Management Act (CZMA)

In response to population growth and coastal resource declines, Congress enacted the Coastal Zone Management Act (CZMA) in 1972 to ensure the "effective management, beneficial use, protection, and development of the coastal zone" (16 USC § 1451). The CZMA mandates a national policy "…to preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone for this and succeeding generations" (16 USC § 1452). The Act has the explicit goal to achieve not only healthy and productive coastal ecosystems, but also environmentally, economically, and socially vibrant and resilient coastal communities. It balances economic development for the waterfront community with environmental conservation, while maintaining a forward-looking perspective.

The CZMA established the National Coastal Zone Management (CZM) Program, which created an incentive for states to consider and plan how they wanted their coastline and waterfronts to look and function. Participation by states and tribes is voluntary. Today, 34 states have federally approved coastal zone management programs. The Act identifies multiple goals to be reflected in state CZM programs such as: assigning priority consideration to "coastal-dependent uses" and providing an orderly process for siting major facilities, e.g., those related to fisheries development, recreation, ports, and transportation. Today each state's actions in the coastal zone are guided by these and other principles, which help to support and maintain working waterfronts.

National Environmental Policy Act (NEPA)

The National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. §4321-4347) was the first major piece of national legislation to address environmental issues in a wholesale way. NEPA directs all branches of government to consider the environmental impact of any major federal action, including issuing a permit to a private entity for an action that could significantly affect the environment. NEPA does not mandate that environmental considerations trump all other interests, including construction and development. It does, however, require that the environmental impact of such actions be considered. Overall, NEPA seeks to balance environmental concerns with other social, economic, and technical requirements.

NEPA can place significant limitations on waterfront development because it may trigger the review of and call attention to environmental impacts during the planning stages of certain actions, like those that alter natural or man-made structures or those that impose new management practices on waterfront industries. In some cases, waterfront developers may need to conduct an environmental investigation in the form of an Environmental Assessment (EA) or Environmental Impact Statement (EIS). While seen by some as a regulatory roadblock to development, NEPA also is a powerful tool to increase public awareness and involvement in decisions that impact the local community.

Resource Conservation and Recovery Act (RCRA) & Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or Superfund)

The Resource Conservation and Recovery Act (RCRA) (42 U.S.C. §6901) was enacted in 1976. It was designed to manage the generation, transportation, treatment, storage, and disposal of hazardous waste. Enacted in 1980, the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (42 U.S.C. §9601) was created to clean releases or threatened releases of specific hazardous substances that posed a risk to public health or the environment. Similar to the CWA, the Superfund Act and RCRA made possible an effort to clean up and decontaminate many coastal areas and waterfront sites that had become degraded after years of neglect. This restoration made many waterfront sites healthy and safe to visit again. As a result, these laws helped to spur interest in coastal redevelopment of once derelict places.

Fishery Management Regulations

Following World War II, and particularly in the 1960s to 1970s, there was tremendous growth in foreign vessels fishing off the U.S. coast. Under pressure to protect the U.S. fishing fleet, expel foreign fishermen, and limit the threat of overexploitation, Congress passed the Fishery Conservation and Management Act of 1976, now known as the Magnuson-Stevens Fishery Conservation and Management Act. This Act established a fishery conservation area that extends 200 miles off the U.S. coast and gave the U.S. the exclusive right to exercise fishery management authority over this area. In 1996, the Sustainable Fisheries Act reauthorized and amended the Magnuson-Stevens Act to include a focus on increasing conservation and ending overfishing. The Act required that fisheries be managed to rebuild overfished fish stocks within 10 years. In 2006, the Magnuson-Stevens Act was reauthorized again and this time included additional measures to address continued stock declines.

To achieve its purposes of preventing overfishing and achieving optimum fishery yield, the Act provides for (1) the preparation and implementation, in accordance with national standards, of fishery management plans (FMPs); and (2) the establishment of Regional Fishery Management Councils (RFMCs) to prepare, monitor, and revise such plans. There are eight Regional Fishery Management Councils that encompass the oceanic coastline of U.S. states, commonwealths, and territories.

U.S. fisheries policy addresses both allocation and conservation, although the precise focus of the policy and of fisheries management efforts have evolved over time. The policy focus, initially concerned with the number of fish caught, has broadened to include the impact of other uses on fish and fishing grounds, as well as the ecosystems that sustain fish stocks, including essential fish habitat, bycatch, interconnection of species, and the need for scientific research and involvement.

The decisions made by fishery management entities have a direct and fundamental impact on the health and sustainability of fish stocks and their related fishing industry elements. Environmental changes and fluctuations will occur inevitably and at times unpredictably, but it is the management decisions that most reliably shape the future of the fishing industry, as well as the fishermen and fishing communities who depend on it.

Among other societal and cultural reasons, a successful fishery provides an additional strong economic rationale for protecting working waterfronts for local fishermen. Fishermen, however, cannot create or sustain such a successful fishery without first having the critical working waterfront. The availability of working waterfronts is integral to the continued success of the fishing industry. This symbiotic relationship, in turn, will support the fishermen and communities who depend on the waterfronts to earn a living and make a home. Forward-thinking and community-oriented management decisions are needed to sustain the long-term health of our nation's valuable and cherished resources: fish, fishermen, and their place on the working waterfront.

E. Technological Drivers of Change

Offshore Renewable Energy

Wind energy emerged (windmills have been used throughout the world for thousands of years) as land-based electric generation projects in the U.S. in the 1970s. It was one alternative source of energy promoted by the U.S. Department of Energy in response to the oil crisis of that era. Thousands of wind turbines were constructed on land until federal support for investment ended in the 1980s. Over the decades that followed, the industry grew more quickly and steadily in Europe.

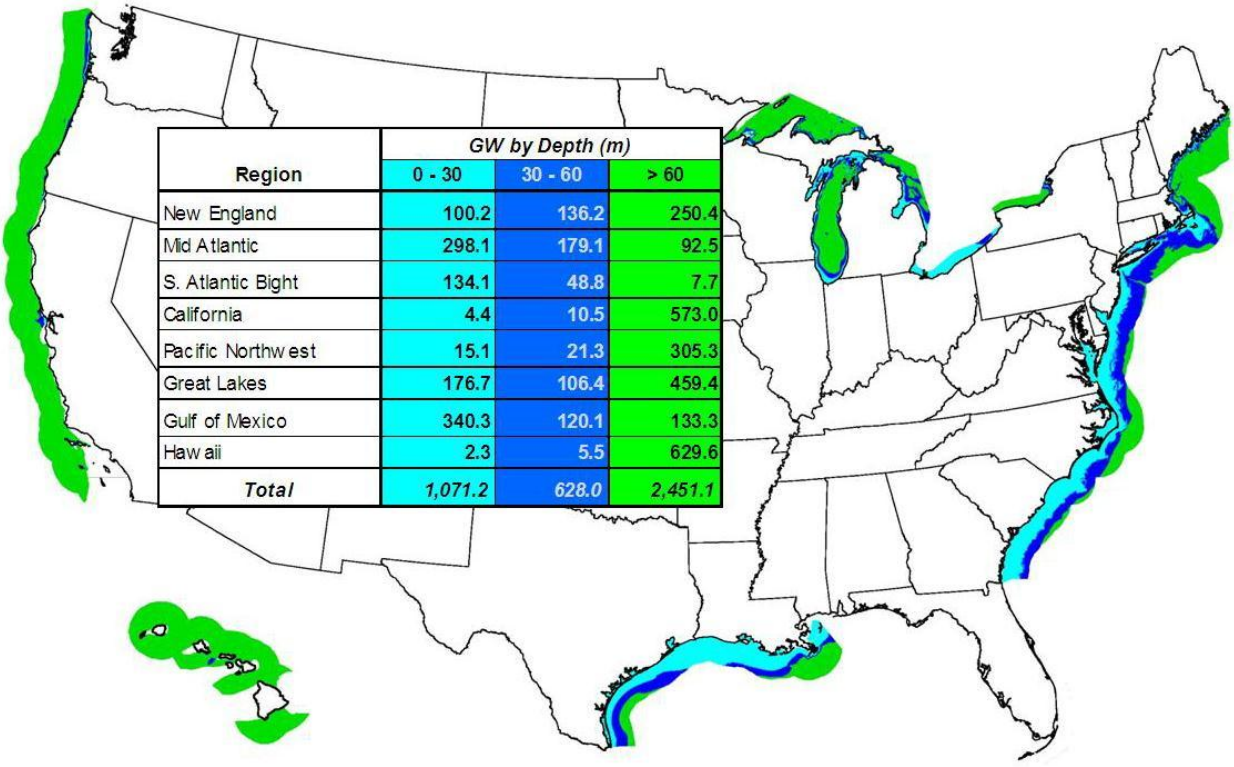
The first offshore wind project was installed off the coast of Denmark in 1991. Since then, numerous commercial-scale offshore wind projects have been developed in coastal waters of Europe and around the world. German wind developers talk today of how the wind industry has transformed rusting homeland harbors into bustling ports (Jackson, 2012).

The United States does not yet have any operational offshore wind projects, but there are thousands of megawatts (MW) in the planning stages, mostly in the Northeast and Mid-Atlantic regions because of the shallower waters. These areas also have dense population centers where energy costs and demands are high. Projects are also being considered along the Great Lakes, the Gulf of Mexico, and the Pacific Coast. The National Renewable Energy Laboratory estimates a gross wind power resource of 4,223 GW off the coast of the United States, an amount roughly four times the generating capacity of the current U.S. electric grid (Lopez, 2012).

The offshore renewable energy industry's need for waterfront land for deployment and ongoing maintenance represents a significant new opportunity for working waterfronts. Waterfronts near population, i.e., load centers with the necessary landside and waterside physical attributes, are candidates. Offshore wind development will require landside facilities to support construction, operations and maintenance. Staging areas need to be at least 10 acres (and perhaps much more depending on throughput) of laydown space for delivery, storage and assembly of turbine components. Desirable waterside characteristics include minimum depth of 24-feet at low tide; minimum 450 foot berth (ideally, multiple berths); and minimum horizontal channel clearance to a harbor of 130 feet (TetraTech EC, Inc., 2010).

Wave power devices extract energy directly from the surface motion of ocean waves. Areas with abundant wave power resources include the northwestern coast of the United States. Wave energy developments have only seen sporadic progress since the 1970's and a variety of technologies have been proposed to capture that energy (Bureau of Ocean Energy Management, 2012).

It was announced in October 2012, that a utility-scale wave energy harvester is to be deployed off the coast of Reedsport, Oregon. It is expected to include 10 buoys producing a total of 1.5 megawatts, enough to power about 1,000 homes; the largest wave-power installation in the U.S. Future plans by the same company include an installation 10 times larger off Coos Bay, Oregon.



Region	GW by Depth (m)		
	0 - 30	30 - 60	> 60
New England	100.2	136.2	250.4
Mid Atlantic	298.1	179.1	92.5
S. Atlantic Bight	134.1	48.8	7.7
California	4.4	10.5	573.0
Pacific Northwest	15.1	21.3	305.3
Great Lakes	176.7	106.4	459.4
Gulf of Mexico	340.3	120.1	133.3
Hawaii	2.3	5.5	629.6
Total	*1,071.2*	*628.0*	*2,451.1*

Figure 2. United States offshore wind resource by region and depth (National Renewable Energy Laboratory, 2010).

Ocean currents also contain an enormous amount of energy that can be captured and converted to a usable form. Some of the ocean currents on the Outer Continental Shelf are the Gulf Stream, Florida Straits Current, and California Current. While technology is still at an early stage of development, it is likely that submerged water turbines similar to wind turbines would be employed to extract energy from ocean currents.

In September 2012, the first of a new generation of underwater turbines was tested in the East River off New York City. If successful, a group of 30 turbines, each capable of generating 35 kilowatts of energy will be installed in the river over the next five years. The project is the first licensed commercial tidal power project in the U.S. As with offshore wind, wave and tidal power technologies require working waterfront land for deployment and ongoing maintenance.

The Panama Canal

Shipping routes are constantly changing in response to such things as new markets, improved technologies, and increases in vessel capacities. As routes change, so too do waterfront activities at the nation's larger shipping ports and harbors, with some of these larger waterfronts benefitting from changes and others being put in a position of needing to re-invent themselves for new uses.

One of the most influential historical changes to shipping patterns in the U.S. was the opening of the Panama Canal in 1914, which saved companies tremendous time and money by removing the

need for ships to travel around South America. The opening of the Panama Canal not only increased shipping traffic in the U.S. (Southern Legislative Conference, 2010), it also created a need for ports and harbors to make changes necessary to accommodate larger vessels and more cargo.

Today, the Panama Canal is undergoing an expansion, slated for completion in 2014. The maximum size ship that can safely pass through the canal today (known as the "Panamax Standard") is 965 feet long and 106 feet wide, with a draft of approximately 39.5 feet (Knight, 2008). The current expansion will enable the Canal to accommodate "New Panamax" vessels 1,200 feet long, 160 feet wide, with a draft just under 50 feet (Benítez, 2009). This may nearly triple the potential capacity of vessels transiting the canal; reduce the cost of container shipment between Asia and the U.S. by up to $1,000/container; and, re-route as much as 25 percent of the current volume from ports on the west coast of the U.S. to ports on the east coast (National Association of Development Organizations, 2012).

Few U.S. ports already have the capacity to handle these larger vessels. Accommodating larger ships may mean ports will need to increase dock length, create more storage area, increase capacity to move containers, and provide deeper water in channels and at docks. Several ports are currently taking steps to accommodate the larger vessels and increased cargo, including the Ports of New York and New Jersey, Miami, Savannah, Charleston, Los Angeles, Long Beach, Tacoma, and Seattle (Conway, 2012; NADO, 2012). Additionally, rail and truck infrastructure improvements are underway in places such as the Ports of Los Angeles/Long Beach and New York/New Jersey to reduce congestion and increase accessibility in anticipation of the changes brought by the Panama Canal expansion (NADO, 2012).

While some U.S. ports look to expand their capabilities to handle larger vessels, Caribbean ports such as Freeport, Bahamas, are exploring their options for serving as hub ports where the large vessels could transfer their cargo onto smaller vessels bound for the United States (Knight, 2008). This may result in less need for U.S. ports to accommodate larger vessels, but may increase the volume of goods handled by some east coast ports, and may have implications for short-sea shipping.

IV. A Description of Working Waterfront Industries

Working waterfronts support a variety of industries. These businesses define each waterfront's structure and character. As industries change so to do the face of waterfronts. Below is a description of some of the most common industries on our waterfronts today.

A. Marine Living Resources

Working waterfronts are vital to the preservation and prosperity of coastal communities and to the support of marine living resources industries such as fishing, shell fishing, aquaculture, seafood processing, and the many other businesses that support these trades. The value of these industries extends far beyond providing food for an increasing global population with a growing per capita seafood consumption rate. It is part of a centuries old tradition and culture. On a

smaller scale, these businesses are much more than occupations; they are a way of life and the foundation of their coastal communities.

Commercial Fishing

All along our nation's coastline, commercial fishing is a principal feature of waterfront activity. In 2011, U.S. commercial fishermen landed over 10 billion pounds of seafood valued at more than $5 billion (NOAA, 2012b).

Commercial fishermen depend on healthy and sustainable fish stocks to maintain the fishing industry and earn a living. In 2012, the Annual Report to Congress on the Status of U.S. Fisheries reported on the overall state of U.S. fisheries, concluding that 21 percent of stocks are "overfished"[8] and that 14 percent are "subject to overfishing."[9] It also said that six stocks have been recently "rebuilt"[10] (bringing the total to 27), and that 51 stocks are being managed under rebuilding plans. As compared to 2010 data, the 2011 Status of Stocks showed improvement, with the number of stocks subject to overfishing decreasing by four and the number of stocks in an overfished condition reduced by three (NOAA, 2012c). These stock status numbers are encouraging in part and indicate that for some stocks, real progress is being made toward achieving sustainability of the fishery resource and the fishing businesses that depend on it.

Examine the issue more closely by region, however, and the picture becomes more complicated. Some areas of the country are experiencing significant hardship, while others continue to prosper. New England, for example, offers both good news and bad news. Overall, Massachusetts and Maine ranked 2nd ($565.2 million) and 3rd ($424.7 million) respectively among the top U.S. states by value of commercial fishery landings (NOAA, 2012b).

In September 2012, however, the Secretary of Commerce declared a commercial fishery failure in the Northeast groundfish fishery for the 2013 fishing season (NOAA, 2012d). Although in recent years fishermen have complied with catch limits intended to rebuild the fishery, several important groundfish stocks are not rebuilding. Due to these diminished fish stocks, further reductions in catch limits likely will be necessary in the 2013 season. Fishermen and the shore-based businesses that support the fishing industry will face significant financial hardship due to these reductions. In December 2012, the Atlantic States Marine Fisheries Commission, responsible for management of northern shrimp in the Gulf of Maine, reduced the total allowable catch (TAC) for the fishery by 72 percent. The Commission's Technical Committee had recommended a complete moratorium on northern shrimp for the coming season. In contrast, the

[8] "Overfishing" is occurring when the rate of removal is too high. A population is subject to overfishing when more fish are being removed from a given population over a particular time period than the population can replace naturally through reproduction. A fish stock may be subject to overfishing without yet reaching an overfished condition because the population is significantly large enough to sustain short-term overfishing or higher rates of mortality.

[9] "Overfished" is a condition when a fish population is too low, which means that the population has fallen below a sustainable level or below a prescribed biological threshold established in its fishery management plan. A fishery can become overfished due to fishing activity as well as other factors such as natural mortality, disease, natural variations and cycles in population, and physical and chemical environmental changes to fish habitat. A fish stock may be overfished without being subject to overfishing because of past overfishing or higher mortality rates in previous years from which the stock is still recovering.

[10] "A "rebuilt" stock is a previously overfished stock which has increased its population to a specific target level.

sea scallop industry in the region continues to thrive, a primary factor in making New Bedford, MA, the leading U.S. port in terms of value in 2011 for the 12th consecutive year (NOAA, 2012b).

The Mid-Atlantic also has significant ports. In 2011, Reedville, VA, was ranked 4th among the top U.S. ports by volume of commercial fishery landings. The same year, Cape May-Wildwood, NJ, was ranked 5th among the top U.S. ports by value of commercial fish landings (NOAA, 2012b). As a whole, this region has also suffered a difficult challenge. In November 2012, the Secretary of Commerce declared a fishery resource disaster and a catastrophic regional fishery disaster for New York and New Jersey following the substantial destruction caused by Hurricane Sandy (NOAA, 2012e).

Further south, the Gulf of Mexico is home to several leading ports. In 2011, Louisiana ranked 2nd (1.3 billion pounds) among top U.S. states by volume of commercial fishery landings and 4th ($332.3 million) by value of commercial fishery landings, due in large part to the substantial shrimp industry. Several of the state's ports, including Empire-Venice, LA, and Intracoastal City, LA, are among the top ports by volume (NOAA, 2012b). Here, however, fishermen face perplexing environmental challenges as well. In September 2012, the Secretary of Commerce declared a commercial fishery failure due to a fishery resource disaster for the oyster fishery from 2011-2013 and the blue crab fishery in 2011 in Mississippi (NOAA, 2012f). These declarations were primarily due to flooding on the Mississippi River, which decreased salinity levels in important fishery areas.

Many North Pacific fisheries, including several groundfish species, continue to be sustainably managed and serve as a management example to fisheries across the nation. Among the states, Alaska was the national leader both for commercial fish landings by volume (with 5.4 billion pounds) and by value (with $1.9 billion in 2011). Dutch Harbor-Unalaska, AK, was the top U.S. port by volume of commercial fish landings for the 15th consecutive year, with Akutan, AK, and Kodiak, AK, also in the top 5 ports by volume in 2011. All three of these ports were in the top five U.S. ports by value of commercial fish landings in 2011 (NOAA, 2012b).

Some Alaskan fisheries do face management challenges, however. In September 2012, the Secretary of Commerce declared a commercial fishery failure on Alaska's Yukon River, Kuskokwim River, and in the Cook Inlet due to low Chinook salmon returns during the 2012 fishing season and previous years (NOAA, 2012g). In 2012, some salmon fisheries in the Cook Inlet suffered a significant decrease in revenue, up to 90 percent of the historical average (NOAA, 2012g). Both commercial and subsistence salmon fisheries are vital to communities on the Yukon and Kuskokwim rivers (NOAA, 2012g).

In 2011, U.S. fishermen in the Great Lakes reported landings of approximately 17.7 million pounds with a value of nearly $17 million (NOAA, n.d.a). Some of the top species by pounds landed and by value include whitefish, perch, herring, and trout (NOAA, n.d.a). The Great Lakes, however, face significant economic and ecosystem threat from aquatic invasive species, such as the zebra mussel and Asian carp. Zebra mussels first appeared in 1988 and today are found throughout the Great Lakes. They are filter feeders and therefore, in large quantities they rapidly consume vital algae and organisms on which other species feed. In addition, zebra mussels will attach themselves to nearly any hard surface, thereby posing a significant threat to

other organisms, navigation, boating, industry, and outdoor recreation (National Atlas of the United States, 2012). The Asian carp – a generic term for several species such as bighead and silver carp that originate in Asia – has overwhelmed the Mississippi and Illinois River systems (Hansen, 2010). Asian carp have not yet been found in the Great Lakes, and these states are focused on maintaining this separation. Its diet, which includes plankton, can destroy this foundation of the food web and outcompete native fish for food (Hansen, 2010).

Seafood Processing

In addition to working waterfront availability for commercial fishermen, seafood processing is another important waterfront use directly connected to the commercial and farmed fishing industry. The seafood processing industry converts whole fish and shellfish into consumer goods to be sold to retail establishments or restaurants. Processors source their seafood product from both commercial fishermen and domestic and foreign aquaculture operations (NOAA, 2012b). Seafood processors are dependent on the sustainability of wild stocks and the successful production of farmed stocks to maintain their industry.

In 2011, the domestic processing value of edible fishery products was $8.9 billion and the value of industrial products was $672.8 million. As expected, states with the greatest number of seafood processing plants correspond to states with access to a significant commercial fishing industry. The top states by number of seafood processing plants include Alaska, Washington, Louisiana, Massachusetts, California, Virginia, Maine, Alabama, Florida, and Texas (NOAA, 2012b).

Aquaculture

Aquaculture is defined by NOAA as the breeding, rearing, and harvesting of animals and plants in all types of water environments including ponds, rivers, lakes, and the ocean. Aquaculture is used primarily for producing seafood for human consumption, although other uses include enhancing wild fish, shellfish, and plant stocks for harvest; restoring threatened and endangered aquatic species; and producing nutritional and industrial compounds (NOAA, n.d.b). The largest production states for marine aquaculture are Maine, Washington, Virginia, Louisiana, and Hawaii.

The U.S. aquaculture industry is relatively small and meets only five to seven percent of U.S. seafood demand. The majority (75 percent) of U.S. aquaculture produces freshwater-farmed catfish, trout, and tilapia. In contrast, the marine aquaculture industry comprises only 20 percent of U.S. aquaculture production. Approximately two-thirds of the marine aquaculture industry is devoted to shellfish, including oysters, clams, and mussels, while other species include shrimp and salmon. Overall the U.S. aquaculture industry has a value of $1.2 billion, whereas world aquaculture production has a value of nearly $100 billion (NOAA, n.d.b). With ever increasing national and global demand for seafood, and natural limitations on wild-caught seafood production, the U.S. aquaculture industry has significant potential for growth and use of working waterfronts.

B. Marine Transportation

Commercial shipping is probably the most prominent and economically important activity on the nation's working waterfronts. International trade via seaports accounts for more than 32 percent of U.S. Gross Domestic Product. According to industry data, U.S. seaports are responsible for moving more than 99 percent of the country's overseas cargo by volume and 65 percent by value. International trade via seaports accounts for more than 32 percent of the U.S. GDP and is expected to increase to 60 percent by 2030 (Kleszczewsk, 2013). Total tonnage of marine port shipments for all waterfront counties increased from approximately 1.1 billion tons in 1997 to more than 1.4 billion tons in 2010, a 31 percent increase, and is forecast to increase to more than 1.8 billion tons in 2020.

According to the U.S. Coast Guard, more than 360 commercial ports serve the United States with approximately 3,200 cargo and passenger handling facilities (AAPA, 2008). The breadth of activities at these ports varies considerably, but may include facilities accommodating ocean-going cargo and passenger ships, coastwise shipping, barges, ferries, and recreational watercraft. Characteristics of these ports, including the location, capabilities, size, and the depth of entrance channels and berths, have a fundamental impact on the patterns of shipping by ocean carriers and coastwise vessels.

Oceangoing vessels are engaged in international trade and include container ships, tankers, crude oil tankers, dry bulk carriers, multi-purpose cargo, car carriers, and roll-on roll-off ("Ro-Ro") vessels. These vessels may make several ports-of-call in the United States. Domestic vessels also move along the coast (coastwise trade) between U.S. ports using smaller ships and barges, tugs, and towboats.

The increased use of containerships in transporting U.S. international trade continues to affect port operations and the distribution of total maritime trade among U.S. ports. Containerization of cargo has led to a concentration of cargo handling and shipping in a smaller number of "load center" ports. This is a function of the need for increasingly deeper channels to accommodate ever larger ships, large expanses of land to store and marshal containers, and the importance of good rail and highway connections to move the containers inland. Older ports, or ports without these attributes, have fewer visits by ocean-going vessels, but may become feeder ports receiving cargo from the larger ports.

Before the mid-1980s, east coast ports handled the majority of U.S. international maritime trade. As U.S. trade with Asia-Pacific countries grew, the east coast ports' share of international maritime trade declined and west coast ports' share increased. In 1986, the west coast surpassed the east coast in maritime cargo handled. This trend has continued, although the gap between the two regions has narrowed (U.S. Department of Transportation, 2011).

Over the past decades, technological changes in cargo transportation and handling, particularly short sea shipping, which moves cargo between ports on the east coast using smaller ships, towboats and barges, is predicted by many to have the potential to grow significantly in the future. The U.S. Maritime Administration defines short sea shipping "as a form of commercial waterborne transportation that does not transit an ocean and utilizes inland and coastal waterways to move commercial freight" (Perakis & Denisis, 2008). The U.S. Department of

Transportation has designated 29,000 nautical miles of navigable waterways as America's Marine Highways for short sea shipping (Figure 3). These all-water routes can serve as extensions of the surface transportation system, offering relief to landside corridors that suffer from traffic congestion, excessive air emissions or other environmental concerns and other challenges. The Marine Highway system is considered the most underutilized transportation mode, carrying only 13 percent of the nation's ton-miles of domestic freight in 2007.

In addition to coastal ports, the working waterfronts along the country's 12,000 miles of commercially navigable inland waterways handle about 15 percent of the country's domestic bulk commodities on a fleet of towboats and barges (Army Corps of Engineers, 2012). Each year, these facilities handle nearly 200 million tons of coal and 125 million tons of crude and refined petroleum, and liquid and gaseous chemicals (AAPA, 2012). The Mississippi River system is the primary route for grains from the Midwest to Gulf of Mexico ports.

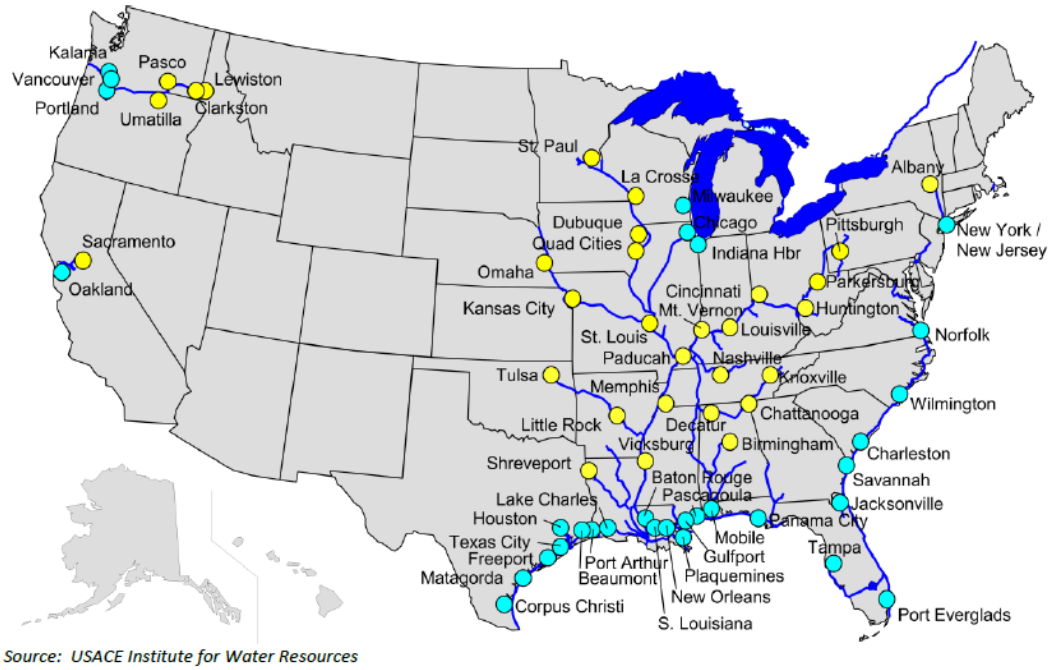


Figure 3. The Inland Waterway Connection: Linking the Heartland to the Coasts (Army Corps of Engineers, 2012).

U.S. ports and their terminal partners plan to invest approximately $46 billion into infrastructure projects in and around their facilities (AAPA, 2012).

C. Coastal Tourism and Recreation

The coastline has always been an appealing location for recreational activities. Many businesses have developed in order to capitalize on the natural tendency for people to be attracted to the ocean.

Businesses in the coastal tourism and recreation sector include marinas and boat dealers (catering to recreational boaters); cruise ships; on-the-water tour operations; hotels and motels; restaurants and bars; businesses providing sports and recreational opportunities, e.g., water skiing; campgrounds; amusement and recreation services, e.g., coastally located golf courses and amusement parks; and aquaria. While some of these businesses, such as cruise lines, are considered "water-dependent," others, such as hotels and motels, are considered "waterfront-enhanced" because they benefit from an attractive waterfront location but are not dependent on waterfront access as a requirement for operation.

Some communities welcome coastal tourism businesses along the waterfront, while other communities worry that such businesses will out-compete existing water-dependent uses or create situations where the existing waterfront uses are deemed incompatible with neighboring tourism and recreation uses, e.g., the smells from a fishing dock may be unattractive to diners at a waterfront restaurant.

A few types of businesses in the coastal tourism and recreation sector are described below, with emphasis placed on those businesses that are water-dependent, as opposed to water-enhanced.

Marinas and Boat Dealers

Recreational boating is a common waterfront activity throughout the country, with 34.8 percent of the U.S. population (or 83 million people) having participated in some form of recreational boating in 2011 (Gabriel, 2012).

Recreational boating supports a variety of water-dependent businesses such as marinas and boat dealers. Boat dealers sell new and used boats and boat-related equipment, e.g., outboard motors, and in some cases, provide boat repair services. While access to water is an advantage for boat dealers, some have their primary establishment at a land-locked location and have water access off-site for test-driving boats. Marinas, which rent boat slips and moorings, also store boats and sometimes perform boat sales, repair, and cleaning services. Often they serve as social gathering places for boaters and their guests. Marinas may also provide important services to other water-dependent businesses, e.g., slips for commercial fishermen and pump-out services for local excursion vessels.

The recreational boating industry saw great growth from the 1980s through 2000, as reflected in the number of registered boats presented in Figure 4. The number of marinas also increased nationally, growing 26 percent between the years 1992-1997. Around 2005, however, numbers of registered boats began to drop, likely as a result of the economic downturn in the United States. Fewer people were using their boats and/or buying new boats or boat-related items due to the increased difficulties accessing credit, and the general reduction in spending on luxury items. Many boat dealers went out of business or scaled down their staff and inventory levels in response to decreased boat sales (Associated Press, 2008), and many marinas saw less demand for slips (Schmidt, 2009). In some cases, struggling waterfront business that supported recreational boating activities were purchased and converted to other uses.

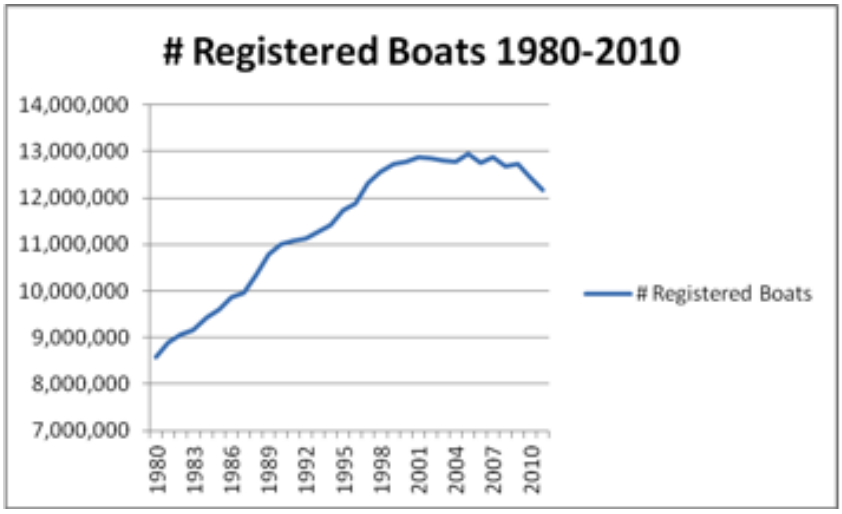


Figure 4. While states have different policies regarding which types of boats must be registered, the data can be useful in showing general trends in boating activity. These data suggest boating activity increased between 1980 and 2000, leveled off for a few years, and then began to decrease, likely due to the economic downturn (U.S. Coast Guard, 2011).

Table 2. The U.S. Coast Guard's Office of Auxiliary and Boating Safety maintains data regarding the number of recreational vessels registered each year, by State. The following data shows the distribution of boat registrations by state for the year 2011.

State	Number of Registered Vessels (2011)	Percent Total
FL	889,895	7.3%
CA	855,243	7.0%
MN	808,783	6.6%
MI	803,391	6.6%
WI	628,743	5.2%
TX	577,174	4.7%
NY	467,828	3.8%
SC	447,745	3.7%
OH	432,696	3.6%
NC	392,566	3.2%
IL	371,365	3.1%
PA	331,590	2.7%
GA	322,346	2.6%
LA	302,974	2.5%
MO	302,271	2.5%
AL	265,526	2.2%
TN	259,904	2.1%
VA	242,473	2.0%
WA	234,543	1.9%
IA	228,743	1.9%
IN	217,297	1.8%
AR	200,915	1.7%
OK	199,337	1.6%
MD	188,623	1.5%
OR	171,983	1.4%
KY	171,936	1.4%
NJ	166,037	1.4%
MS	156,743	1.3%
MA	139,991	1.1%
AZ	131,665	1.1%
ME	106,679	0.9%
CT	105,499	0.9%
NH	91,950	0.8%
CO	89,321	0.7%
KS	88,041	0.7%
NE	84,471	0.7%
ID	84,290	0.7%
UT	68,427	0.6%
DE	57,687	0.5%
SD	56,615	0.5%
WV	51,752	0.4%
NV	50,864	0.4%
AK	50,219	0.4%
ND	47,537	0.4%
MT	42,985	0.4%
RI	40,989	0.3%
NM	37,469	0.3%
VT	28,807	0.2%
HI	13,375	0.1%
DC	2,889	0.0%
AS	52	0.0%
Total	**12,173,935**	**100%**

Despite the impacts of the downturned economy, more than 12 million boats are registered in the United States. Table 2 shows the breakdown of registered boats by state.[11] Not surprisingly, the two states with the highest numbers of registered boats (Florida and California) also have generally sunny warm weather, and boast long shorelines compared to other states. It is worth noting that these numbers include all registered vessels, not just those berthed at working waterfronts.

[11] Each state has different registration requirements, making it difficult to accurately compare data from state to state.

The Cruise Industry

Cruise ships come in many sizes and are used for a variety of different types of passenger travel, yet they share the common trait of having amenities designed to make the onboard experience enjoyable. For many travelers, the act of going on a cruise is as much about being on the ship as it is seeing the sights along the way. And cruising is become an increasingly popular form of travel, with 9.8 million passengers embarking on a cruise in the United States in 2011 (Business Research and Economic Advisors, 2012).

On the waterfronts, cruise ships require embarkation/debarkation ports where sufficient water-depth is available, and shoreside space can accommodate needs such as parking, ticketing, baggage, a Customs and Border Protection Area and security operations. Many of these locations, especially for international travel, are in larger harbors.

Florida ports such as Port Canaveral, Tampa, Port Everglades, and Miami, account for 60 percent of all U.S. embarkations (5.9 million in 2011), taking passengers to a variety of locations, primarily in the Caribbean and Central America (Business Research and Economic Advisors, 2012). Cruises to Bermuda, Canada, and New England typically depart from Manhattan and Brooklyn. In 2011, passengers embarking at these two ports numbered 611,000 (Business Research and Economic Advisors, 2012). Other leading cruise ports in 2011 (in terms of passengers) included Galveston, TX, Seattle, WA, and New Orleans, LA (Business Research and Economic Advisors, 2012).

In addition to ports of embarkation and debarkation, the U.S. is home to many ports of call, where travelers can enjoy some time on land before returning to their ships. The cruise ports in the City of Boston, for example, serve both as ports of embarkation/debarkation and as ports of call for cruises to Canada and Bermuda. The needs for ports of call include adequate water depth and berthing capacity as well as access to shoreside transportation, local attractions, and shoreside amenities, e.g., restrooms and eating establishments.

While larger ports see the majority of cruise business in terms of numbers of passengers, smaller ports are also engaged in the cruise industry. As new larger cruise ships are deployed in the major markets, the smaller ships they replace are transferred to other budding markets such as the coast of New England or the Chesapeake Bay. This regional business has added an important new activity to a number of smaller working waterfronts.

Some ports such as Seattle, WA, are experiencing declines in passenger travel due to such things as the opening of new ports and shifting destinations, yet many ports are maintaining passenger levels, and some are even experiencing growth despite the recent recession. In fact, the cruise industry in North America added four new ships in 2011, bringing the total number of ocean-going vessels in the North American cruise industry to 180 (Business Research and Economic Advisors, 2012). These new ships were smaller than those added in previous years however, demonstrating that while the industry is growing, its growth is slower than in years past.

Tour Operations & Sports and Recreation Opportunities

Our nation's waterfronts serve as gateways for environmental exploration, offering people opportunities to visit new habitats and see exciting animals. Businesses such as whale and dolphin watches, glass bottom boat tours, charter fishing trips, and SCUBA diving excursions cater to those interested in exploring the marine, brackish, and freshwater environments and wildlife of the United States. In addition, waterfronts offer people opportunities to experience sport and adventure activities such as jet skiing, kayaking, and parasailing. These types of operations require reliable water access from shore, and depending on the nature of an excursion, may run several trips a day and operate several boats at a time.

In some parts of the country these businesses are seasonal, operating during peak tourism months and/or during periods when target species are present. In order to deal with the seasonality issue, some businesses diversify, e.g., offering whaling excursions or charter fishing trips depending on which species are in the area at any given time.

Whale and dolphin watching trips serve as good examples of the different ways in which excursions activities affect waterfront operations. In Alaska, the number of whale watchers grew from 76,700 in 1998 to 519,000 in 2008, while the number of operations decreased from 66 to 60. Some of the increase in numbers of whale watchers can be attributed to an increase in cruise activities, where whale watching is a common activity. Apart from cruise-based whale watching, however, many of Alaska's whale-watching operations are family businesses operating from small (six to ten person capacity) charter boats (O'Connor, Campbell, Cortez, & Knowles, 2009). Whale watching affords these businesses an alternative to charter fishing and helps to diversify and supplement incomes in coastal communities.

As a recreational activity, however, whale watching is highly sensitive to changes in economic and environmental conditions. For example, in California, the drop in whale watchers from 1,774,700 in 1998 to 1,371,467 whale watchers in 2008 has been attributed to both a drop in grey whale sightings and a general decline in school budgets, resulting in a loss of field trip visitors. In New England, a similar drop in whale watchers (from 1,240,000 in 1998 to 910,071 in 2008) was attributed to the downturn in the economy as well the impact of 9/11 on tourism activity (O'Connor et al., 2009).

Charter fishing is also a popular water-based activity, with operations on both fresh and salt water. In Michigan, for example, 580 captains were licensed to run charter boats and took customers on approximately 16,666 excursions in 2008 (Meyerson, 2009). Much like whale and dolphin watching, however, charter-fishing operations are vulnerable to economic and environmental changes. For this reason, many smaller charter fishing operations engage in commercial fishing and hold licenses to fish a variety of species.

Lodging and Dining

Waterfront lodging includes businesses such as hotels, motels, bed and breakfasts, hostels, and campgrounds. While not usually water-dependent, waterfront lodging offers customers a chance to directly experience waterfront living, making it an attractive option for tourists.

Accommodations can range in size and style, from large luxury suites to small campsites with no running water or electricity, thus offering options for different types of travelers.

Many waterfront accommodations offer guests the opportunity to enjoy direct experiences with the water such as swimming, snorkeling, and boating. However, access to these types of water activities is an amenity, and not central to the businesses' ability to provide its guests shelter (or space for shelter in the case of a campground).

Much like waterfront lodging, waterfront dining and drinking establishments offer patrons the opportunity to enjoy being on the water, yet access to the water is not a necessary part of the businesses' operations. In some cases, dockage may be provided as an accessory use so the boating public can have access to the establishment.

Some communities welcome waterfront lodging and dining establishments, especially in locations that do not conflict with working waterfronts but bring in business for working waterfront industries. A waterfront restaurant may serve locally caught fish or a waterfront hotel may offer guests excursions through a nearby charter fishing company. In other communities, however, there is concern that valuable working waterfront property is being consumed by non-water-dependent uses such as restaurants and hotels.

Visitor Attractions

Many coastal communities are known for their local waterfront attractions. Examples include the golf course at Pebble Beach, CA, or the amusement park at Coney Island, NY. In most cases, an attraction's waterfront location enhances a visitor's experience. Water access, however, is not necessary for any of these types of businesses to operate. That being said, these local attractions do not always conflict with other water-dependent uses. In some cases, they occupy sights that would be unsuitable as working waterfronts, yet they attract visitors and can contribute greatly to the local economy.

Like many of the other tourism and recreational industries described above, the success of local area attractions can be affected by economic and environmental conditions. For example, Super Storm Sandy dislodged a rollercoaster and damaged a popular boardwalk in Sea Side Heights, NJ, in 2012, causing devastating damage to the area's local amusement industry and to the community in general.

V. FUTURE Working Waterfront Trends

As mentioned throughout this document, working waterfronts have often been and will continue to be in a state of transition in response to changing technologies, economies, environmental conditions, regulatory requirements, and national priorities. Generally speaking, the three types of futures for a working waterfront are (1) that a working waterfront will continue current activities at a similar scale; (2) that a working waterfront will redevelop or expand to meet new changing needs and conditions; or (3) that available water-dependent use options will no longer be viable and a working waterfront will succumb, in whole or in part, to demands for waterfront property by competing non-water-dependent residential and/or commercial use.

The following trends will have different impacts on different working waterfronts. A consideration of these current issues, however, can inform the direction of strategic planning and suggest what opportunities and challenges may lie ahead.

A. Port Expansion

The U.S. population movement to the west and south[12] has changed the ultimate destination for many imported consumer goods. Shippers are routing more cargo through U.S. South Atlantic and Gulf Coasts, placing inland points and nearby consumers in easy reach. As the population center shifts from the Mid-Atlantic to the Mid-West region of the United States, further long-term changes in freight routing are expected.

The US Army Corps of Engineers' Institute for Water Resources released a report in June 2012 that examined how the nation might address the ports and inland waterway infrastructure needs to accommodate post-Panamax vessels. These vessels currently make up 16 percent of the world's container fleet, but 45 percent of the fleet's capacity, and these numbers are expected to increase. Post-Panamax vessels will make up 62 percent of the capacity of the world's container fleet. The report concluded that, given the size and distribution of the projected population growth in the south and western regions of the U.S., port expansion projects to accommodate post-Panamax vessels in these areas may be economically justified.

B. Recreational Boating

Two primary factors contribute to the future of the recreational boating industry; the economic climate of the country and demographics. As noted in the section on waterfront industries, recreational boating has been hard-hit by the recent economic downturn in the United States. As consumer confidence increases and people have more access to disposable income, it is anticipated that recreational boating activity and the related expenditures will slowly begin to rebound. Changing demographics will also be adding participants. Forecasts[13] suggest an increase of 8.4 million motor boaters (from 52 million to 60.4 million) and 0.5 million sailors (from 10.9 million to 11.4 million) between 2000 and 2020 (Haas, 2010). Some of this growth will come from the increase in people within the 55 to 64 age bracket because boat purchases become more likely near retirement (Freedonia Group, Inc., 2012). While these numbers are encouraging nationally, the recreational boating industry is looking to expand recreational boating activity even further by targeting typically under-represented populations in boating such as women and minority groups.

[12] The U.S. population is expected to grow by almost 100 million over the next 30 years, with most of the growth in southern and western regions of the nation.

[13] Projections were based on key demographic indicators of likeliness to participate in boating activity (age, ethnicity, education, gender, region, and income).

C. Commercial Fishing

Along the coasts, in the oceans, and within the Great Lakes, our nation's fisheries and fishermen face a varied future. Some fish stocks are thriving, while others are deteriorating. Some fisheries are ending the year with strong population data and higher market prices. Others are facing disaster declarations and the potential impossibility of stock rebuilding in the short-term, even with a moratorium in place. Some fishermen are earning more money and spending less time and resources being at sea. Other fishermen are being forced out of a fishery after generations of family experience and commitment. Amid the extremes, plenty of fisheries and fishermen are simply managing to survive another year while providing for their families and communities.

Employment of fishermen and related shore-based infrastructure workers is expected to decline by six percent from 2010 to 2020. Most job openings in the fishing industry will be replacement-hires for those workers who leave the occupation, as opposed to additional new-hires in an expanding occupation. Opportunities with small independent fishing establishments are expected to be limited and better prospects are expected with large fishing operations (U.S. Department of Labor, 2012). Working waterfronts of varying sizes will be needed to support both small and large fishing operations.

Fishermen depend on healthy fish stocks that naturally promote their population through growth and reproduction. In addition, fishermen also depend on government management to promote the continued sustainability of fish stocks through regulations and scientific assessment of fisheries. Advancements in fishing technology have allowed fishermen to become much more efficient at finding and catching fish stocks. Combined with the impacts of pollution and environmental changes on fish reproduction, the continued implementation of adequate catch limits to restore and maintain the health of fish stocks will be necessary.

With possible catch limit modifications, changing environmental conditions, and, for some species, decreasing stock population and catch, the potential for detrimental economic impact on the fishing industry persists. As some fishermen face greater economic hardship, the need for and ability to afford shore-based resources (including waterfront dockage, supplies, and processing services) decreases accordingly. This loss of industry can have a devastating effect on the economy and culture of working waterfronts and their associated communities. While the decline of some fisheries may result in deterioration or repurposing of the waterfront, such a result is not inevitable. Some fisheries are benefiting from strengthened stock populations and higher market prices and will continue to utilize their working waterfront in a similar manner. In addition, a thriving fishery may create renewed interest and commitment to preservation of the working waterfront.

With these ongoing challenges in some fisheries, implementation of innovative marketing strategies for sustainable seafood is as important as effective fisheries management. The fishing industry has begun to utilize new marketing techniques, such as Community Supported Fisheries (CSF), which are based on the model of Community Supported Agriculture (CSA). In addition, the fishing industry has begun to consider the promotion of underutilized or alternative species for regular seafood consumption. Consumers have traditional preferences for seafood based on experience and availability. Underutilized species – those not traditionally preferred or even known about by the average consumer – offer the opportunity to modify consumer seafood

preferences and fishing habits of the industry. By promoting the sustainable consumption of an underutilized species, fishing pressure may decrease on a traditionally preferred species while it rebuilds to sustainable levels and consumers can enjoy a new culinary experience.

Dr. Jane Lubchenco, NOAA Administrator, expressed the importance of fishing and hopeful optimism about its future in the following way: "Fishing is the lifeblood of many coastal communities, providing jobs, a continuation of an historic tradition and culture, recreational opportunities for millions of anglers, and contributing to food security for the nation…Finding solutions will not be easy, but by continuing to work together, we can have healthy fish stocks, profitable fisheries, and vibrant fishing communities" (NOAA, 2012d). Fisheries management is a delicate balance of numerous, complicated viewpoints and considerations. There is continued political pressure and paramount societal need to balance fisheries science and the socioeconomic concerns of fishermen. Overall, fishing begins and ends on the working waterfront. Therefore, any consideration of the future of the fishing industry likewise must begin with supporting and maintaining local working waterfronts.

D. Climate Change

As the planet remains on a warming trajectory and sea levels continue to rise, coastal regions are facing new challenges to their infrastructure and waterfront communities. Coastal governments and their residents will face difficult decisions about how to address potential inundation of coastal property, including vital water-dependent industries. Below are several examples of different cities and states that are proactively planning for climate change to better protect their coastal areas and working waterfronts.

Rhode Island

The Rhode Island Climate Risk Reduction Act of 2010 established the Rhode Island Climate Change Commission whose mandate is to (1) study the projected impacts of climate change on Rhode Island; (2) identify and report methods of adapting to these climate change impacts in order to reduce likely harm and increase economic and ecosystem sustainability; and (3) identify potential mechanisms to mainstream climate adaptation into existing state and municipal programs including, but not limited to, policies, plans, infrastructure development and maintenance (Rhode Island Climate Change Commission, 2012).

The Rhode Island Coastal Resources Management Council (CRMC) has begun long-term planning via a Shoreline Change (Beach) Special Area Management Plan (SAMP). Over the multi-year project, CRMC is leading a public analysis of the Rhode Island coastal system and its susceptibility to various types of damage from climate change, such as sea level rise and severe weather. In addition, CRCM has adopted findings and a policy concerning climate change and sea level rise and has developed comprehensive shoreline change maps for the entire Rhode Island coast (Fugate, 2012).

Gulfport, Mississippi

In 2005, Hurricane Katrina caused approximately $80 billion in damage to the Gulf Coast, including $51 million in damage to the Port of Gulfport, MS, which is situated directly on the Gulf of Mexico. During the hurricane, Gulfport sustained a 28-foot storm surge and as a result lost 80 percent of the operational capacity of the port, which caused a 70 percent decrease in port revenues. In 2006, Gulfport received $600 million in funding from the U.S. Department of Housing and Urban Development (HUD) to rebuild (Becker, 2012).

In 2007, Gulfport decided to increase the elevation of the port by 25 feet to remove the port from the floodplain and increase the competitiveness of the port as an attractive center for commerce for larger shipping containers. Following Hurricane Sandy in October 2012, the Mississippi State Port Authority (MSPA) Board of Commissioners voted that Gulfport would not pursue the 25 foot elevation of its West Pier and instead sought recommendations for an alternative lower level elevation, which would be easier to accomplish. After many years of slow action and potential disaster fund mismanagement following Hurricane Katrina, this decision was based on a desire to shorten the time frame for upgrading the port. Commissioners determined it would be better to regain full operational capacity more quickly in order to generate more than one thousand needed jobs in the region (Becker, 2012).

San Francisco, California

In 2011, the San Francisco Bay Area passed regulations governing development in areas prone to sea-level rise. The San Francisco Bay Conservation and Development Commission (BCDC) passed a development plan that allows the agency to deny permits for development in coastal areas susceptible to flooding, specifically any land within 100 feet of the coastline. This plan requires developers and builders to assess the risks of sea level rise and to submit this assessment to the state for a given project. San Francisco is developing planning scenarios for 16 inches of sea level rise at 50 years (approximately 180,000 acres inundated) and 55 inches at 100 years.

In addition, the San Francisco BCDC and the NOAA Coastal Services Center have developed a collaborative planning effort known as Adapting to Rising Tides (the ART Project) to help San Francisco Bay Area communities adapt to sea level rise. The project aims to increase the Bay Area's preparedness and resilience to sea level rise and storm events while protecting critical ecosystem and community services (Adapting to Rising Tides, 2012).

E. Offshore Renewable Energy

As described elsewhere in this report, though the United States does not currently have any operational offshore wind projects, there are thousands of megawatts (MW) in the planning stages, mostly in the Northeast and Mid-Atlantic regions. Projects are also being considered along the Great Lakes, the Gulf of Mexico, and the Pacific Coast. Offshore wind develop ment will require landside facilities to support construction, operations and maintenance. Waterfront staging areas will be needed for delivery, storage and assembly of turbine components. There will be demand for appropriately sited waterfronts with adequate upland area, berthing and navigational depths.

VI. References

Ache, B. W., Crossett, K. M., Pacheco, P. A., Adkins, J. E., & Wiley, P. C. (n.d.) The coast is complicated: A model to consistently describe the Nation's coastal population. Retrieved from: http://coastalsocioeconomics.noaa.gov/assessment/the_coast_is_complicated.pdf

Adapting to Rising Tides (ART Project). (2012). Retrieved from: http://www.adaptingtorisingtides.org/

Aguiar, M. & Hurst, E. (2007). Measuring trends in leisure: The allocation of time over five decades. The Quarterly Journal of Economics, 122(3), 969-1006. doi: 10.1162/qjec.122.3.969. Retrieved from: http://faculty.chicagobooth.edu/erik.hurst/research/aguiar_hurst_leisure_qje_resubmit2_final.pdf

Alessandria, G., Kaboski, J. P., & Midrigan, V. (2010). The great trade collapse of 2008-09: An inventory adjustment? IMF Economic Review, 58(2), 254-94. National Bureau of Economic Research (NBER) Working Paper No. 16059. Retrieved from: http://www.nber.org/papers/w16059.pdf

American Association of Port Authorities (AAPA). (2008). *U.S. public port facts*. Retrieved from: http://www.aapa-ports.org/files/PDFs/facts.pdf

American Association of Port Authorities. (2012). Trade and economic growth. Retrieved from: http://www.aapa-ports.org/Industry/content.cfm?ItemNumber=1024

American Association of Port Authorities (AAPA). (n.d.) *Seaports and the U.S. economy*. Retrieved from: http://aapa.files.cms-plus.com/PDFs/Awareness/US%20Economy%20Fact%20Sheet%2012-4-12.pdf

American Cruise Line. (n.d.) *Charlestown voyage*. Retrieved from: http://www.charlestonvoyage.com/american.html

American Sportfishing Association. (2008). *Today's angler: A statistical profile of anglers, their targeted species and expenditures*. American Sportfishing Association, Alexandria, VA.

Ankersen, T. T., & Ruppert, T. (2006). *Water-dependent use definitions: A tool to protect and preserve recreational and commercial working waterfronts*. Prepared for Waterfronts Florida Partnership Program, State of Florida Department of Community Affairs by Conservation Clinic, Center for Governmental Responsibility, University of Florida Levin College of Law. Retrieved from: http://www.law.ufl.edu/_pdf/academics/centers-clinics/clinics/conservation/resources/water_dependency_test.pdf

Appledorn, B. L., Serokee, B., Ankersen, T. T., & Ruppert, T. (2006). *Creating a recreational and commercial working waterfront program to implement chapters 2005-157 and 2006-220, Laws of Florida: A model comprehensive plan amendment with policy options*. Prepared by The Conservation Clinic at The Center for Governmental Responsibility,

University of Florida College of Law for the Waterfronts Florida Partnership Program, State of Florida Department of Community Affairs. Retrieved from: http://www.law.ufl.edu/_pdf/academics/centers-clinics/clinics/conservation/resources/creating_recreational.pdf

Army Corps of Engineers. (2012). U.S. port and inland waterways modernization preparing for post-Panamax vessels. Retrieved from: http://www.iwr.usace.army.mil/docs/portswaterways/rpt/June_20_U.S._Port_and_Inland_Waterways_Preparing_for_Post_Panamax_Vessels.pdf

Army Corps of Engineers, Navigation Data Center, Waterborne Commerce Statistics Center. (2013). *2010 waterborne container traffic for U.S. ports and all 50 states and U.S. territories, by port name, by port TEUs, by state within region*. Retrieved from: http://www.ndc.iwr.usace.army.mil//wcsc/containers.htm

Army Corps of Engineers, Navigation Data Center, Waterborne Commerce Statistics Center. (2013). *2009, 2008, 2007, 2006, and 2005 waterborne commerce of the United States, by region*. Retrieved from: http://www.ndc.iwr.usace.army.mil//wcsc/wcsc.htm

Army Corps of Engineers, Navigation Data Center, Waterborne Commerce Statistics Center. (2013). *2009, 2008, 2007, 2006, 2005 waterborne tonnage for principal U.S. ports and all 50 states and U.S. territories. Waterborne tonnages for domestic, foreign, imports, exports and intra- state waterborne traffic*. Retrieved from: http://www.ndc.iwr.usace.army.mil//wcsc/wcsc.htm

Ashar, A. (2004). *Long-term development trends of US ports*. MTS Ports. Retrieved from: http://onlinepubs.trb.org/onlinepubs/archive/Conferences/MTS/4C%20AsharPaper.pdf

Associated Press (AP). (2008). Ugly economy torpedoing the boating industry. Retrieved from: http://www.msnbc.msn.com/id/23834188/ns/business-us_business/t/ugly-economy-torpedoing-boating-industry/#.UL9kVeQ70VA

Associated Press (AP). (2012). As Great Lakes plummet, towns try to save harbors. *Wall Street Journal*. Retrieved from: http://online.wsj.com/article/APa4553d0d2ccf4ec0bf399fb5708b89ec.html

Atlantic States Marine Fisheries Commission. (2012). Press release: ASMFC Northern Shrimp section sets specifications for 2013 fishery. Retrieved from: http://www.asmfc.org/press_releases/2012/pr61NorthernShrimp_2013FisherySpecs.pdf

Baltimore Cruise Guide. (n.d.) Retrieved from: http://www.baltimorecruiseguide.com/chesapeake.html

Bauer, J. K. (1988). *A maritime history of the United States*. Columbia, SC: University of South Carolina Press.

Becker, A. (2012*). Hurricane consequences in the face of climate change: Case studies of two seaport clusters, Providence (RI) and Gulfport (MS)*. Bristol, RI: Marine Law Symposium, Roger Williams University School of Law.

Becker, A., Inoue, S., Fischer, M., & Schwegler, B. (2012). Climate change impacts on international seaports: Knowledge, perceptions, and planning efforts among port administrators. *Climatic Change, 110* (1-2), 5-29.

Bellis, M. (n.d.) *The history of steamboats*. Retrieved from: http://inventors.about.com/library/inventors/blsteamship.htm

Benítez, M. E. (2009). *Dimensions for future lock chambers and new Panamax vessels.* Retrieved from: http://www.pancanal.com/common/maritime/advisories/2009/a-02-2009.pdf

Bonacich, E., & Wilson, J. B. (2008). *Getting the goods: Ports, labor, and the logistics revolution*. Ithaca, NY: Cornell University Press. Retrieved from: http://site.ebrary.com/lib/umass/docDetail.action?docID=10457597

Bone, K., Betts, M. B., Bone, E., Pollara, G., & Aquires, D. (1997). *The New York waterfront: Evolution and building culture of the port and harbor*. New York, NY: The Monacelli Press.

Breen, A., & Rigby, D. (1993). *Waterfronts: Cities reclaim their edge*. Washington, DC: The Waterfront Center.

Bunting, W.H. (1971). *Portrait of a port: Boston, 1852-1914*. Cambridge, MA: Harvard University Press.

Bureau of Ocean Energy Management (BOEM). (n.d.) *Offshore wind energy*. Retrieved from: http://www.boem.gov/Renewable-Energy-Program/Renewable-Energy-Guide/Offshore-Wind-Energy.aspx

Business Xpansion Journal (2013) Seaports get ready for supersizing. Retrieved from: http://bxjmag.com/seaports-get-ready-for-supersizing

Business Research and Economic Advisors. (2012). *The contribution of the North American cruise industry to the U.S. economy in 2011*. Retrieved from: http://www.cruising.org/sites/default/files/pressroom/2011EconomicStudies/EconStudy_Full_Report_2011.pdf

Buttenwieser, A. L. (1987). *Manhattan water-bound: Planning and developing Manhattan's waterfront from the seventeenth century to the present*. New York, NY: New York University Press.

Caplow, T., Bahr, H. M., Modell, J., & Chadwick, B. A. (1994). *Recent social trends in the United States, 1960-1990*. Canada: McGill-Queens University Press.

CBCL Limited. (2009). *Our coast: Live work play protect: The 2009 state of Nova Scotia's coast technical report*. Retrieved from: http://www.gov.ns.ca/coast/documents/report/Coastal-Tech-Report-Nov-09.pdf

Cellineri, L. E. (1976). *Seaport dynamics: A regional perspective*. Lanham, MD: Lexington Books.

Center for American Progress (CAP). (2012). *Fish on Fridays: Innovations to increase and stabilize fishing profits*. Washington, DC: Conathan, M. Retrieved from: http://www.americanprogress.org/issues/green/news/2012/09/21/38926/fish-on-fridays-innovations-to-increase-and-stabilize-fishing-profits/

Center for American Progress (CAP). (2012). *The future of America's first fishery: Improving management of the New England groundfishery*. Washington, DC: Conathan, M. Retrieved from: http://www.americanprogress.org/wp-content/uploads/issues/2012/05/pdf/ne_groundfishery.pdf

Chambers, M. (2011). *The changing tide of U.S.-international container trade: Differences among the U.S. Atlantic, Gulf, and Pacific coasts*. RITA Bureau of Transportation Statistics. Retrieved from: http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/special_reports_and_issue_briefs/special_report/2011_12_32/pdf/entire.pdf

City of New York, Department of City Planning. (2011). *Vision 2020: New York City comprehensive waterfront plan*. Retrieved from: http://www.nyc.gov/html/dcp/html/cwp/cwp_2.shtml

Clean Water Act of 1972 (CWA), 33 U.S.C. §1251 et seq.

Coastal Enterprises, Inc. (2002). *Preserving Commercial Fishing Access: A Study of Working Waterfronts in 25 Maine Communities*. Wiscasset, ME: Sheehan, E., & Cowperthwaite, H. Retrieved from: https://www.maine.gov/doc/nrimc/mcp/downloads/workingwaterfront/preservingcommercialfishing.pdf

Coastal Resources Management Council. (2011). *Rhode Island ocean special area management plan*. Retrieved from: http://seagrant.gso.uri.edu/oceansamp/documents.html

Coastal Zone Management Act of 1972, 16 U.S.C. § 1451–1464.

Colgan, C. S. (2004). *The contribution of working waterfronts to the Maine economy*. Retrieved from: http://muskie.usm.maine.edu/Publications/WorkingWaterfronts.pdf

Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs. (2010). *Final Massachusetts Ocean Management Plan*. Retrieved from: http://www.mass.gov/eea/ocean-coastal-management/mass-ocean-plan/final-massachusetts-ocean-management-plan.html

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or Superfund), 42 U.S.C. §9601-9675.

Congressional Budget Office. (1984). *U.S. shipping and shipbuilding: Trends and policy choices*. Retrieved from: http://cbo.gov/sites/default/files/cbofiles/ftpdocs/113xx/doc11317/1984_09_shipping.pdf

Connolly, M. C. (2010). *Seated by the sea: The maritime history of Portland, Maine, and its Irish longshoremen*. Gainsville, FL: University Press of Florida.

Convention on Great Lakes Fisheries, U.S.-Can., signed Sept. 10, 1954, entered into force Oct. 11, 1955, 6 U.S.T. 2836, T.I.A.S. 3326, 238 U.N.T.S. 97. Retrieved from: www.nmfs.noaa.gov/ia/intlagree/docs/GLFC%2005.doc

Conway, K. C. (2012). North American port analysis: Beyond post-Panamax basics to logistics. *Real Estate Issues, 37*(1), 35-47. Retrieved from: http://www.cre.org/memberdata/pdfs/North_American_Port_Analysis.pdf

Crowder, L.B., Osherenko, G., Young, O.R., Airamé, S., Norse, E.A., Baron, N.,… Wilson, J.A. (2006). Resolving mismatches in U.S. ocean governance. *Science, 313*, 617-618.

Crowell, M., Edelman, S., Coulton, K., & McAfee, S. (2007). How many people live in coastal areas? *Journal of Coastal Research, 23*(5), iii-vi.

Delaney, R. & Wiggin, J. (1989). How coastal migration began. *EPA Journal, 15*(6), 48-49.

Dochoda, M.R. & Jones, M.L. (2003). Managing Great Lakes fisheries under multiple and diverse authorities. *The Toledo Journal of Great Lakes' Law, Science and Policy, 5*(1), 405.

Doeringer, P., & Terkla, D. G. (1995). *Troubled waters: Economic structure, regulatory reform, and fisheries trade*. Toronto, Canada: University of Toronto Press.

Dozark, K., Ankersen, T. T., & Ruppert, T. (2006). *A model ordinance establishing a local government tax deferral program for recreational and commercial working waterfront properties*. Prepared by Conservation Clinic, Center for Governmental Responsibility, University of Florida Levin College of Law for the Waterfronts Florida Partnership Program, State of Florida Department of Community Affairs. Retrieved from: http://www.law.ufl.edu/_pdf/academics/centers-clinics/clinics/conservation/resources/annotated_model_tax_deferral.pdf

Ehler, C., & Douvere, F. (2009). *Marine spatial planning: A step-by-step approach toward ecosystem-based management*. UNESCO, Intergovernmental Oceanographic Commission, Manual and Guides No. 53, ICAM Dossier No. 6, 1-99. Retrieved from: http://unesdoc.unesco.org/images/0018/001865/186559e.pdf

Endangered Species Act, Pub. L. 93–205, 87 Stat. 884 (1973), 16 U.S.C. §1531 *et seq*.

Executive Order 13547: Stewardship of the ocean, our coasts, and the Great Lakes. 75 Federal Register 43023 (22 July 2010).

Florida Committee on Community Affairs. (2004). Working waterfronts. Report Number 2005-122 Retrieved from: http://archive.flsenate.gov/data/Publications/2005/Senate/reports/interim_reports/pdf/2005-122calong.pdf

Florida Department of Agricultural and Consumer Services. (n.d.) Florida waterfront communities' commercial fishing heritage. Retrieved from: http://florida-agriculture.com/consumers/recreation/waterfront/pensacola.html

Florida Fish and Wildlife Conservation Commission. (2009). *The Florida Boating Access Facilities Inventory and Economic Study including a Pilot Study for Lee County*. Retrieved from: http://myfwc.com/media/1162720/About_Econ_BAFI_Full_09.pdf

Food and Agricultural Organization of the United Nations. The state of world fisheries and aquaculture. Retrieved from: http://www.fao.org/docrep/016/i2727e/i2727e.pdf

Freedonia Group, Inc. (2012). News release: US demand for recreational boating products to exceed $10 billion in 2016. Retrieved from: http://www.thefreelibrary.com/US+demand+for+recreational+boating+products+to+exceed+%2410+billion+in...-a0301647079

Fugate, G. (2012). *Rhode Island CRMC-planning for climate change and sea level rise*. Bristol, RI: Marine Law Symposium, Roger Williams University School of Law.

FXM Associates. (2010). *The Contribution of Waterfront Land Uses to Municipal Revenues in Newport, Rhode Island*. Prepared for University of Rhode Island Coastal Resources Center. Retrieved from: http://seagrant.gso.uri.edu/ai/nh_documents/nh_newport_econ_study.pdf

Gabriel, J. (2012). Water Access: A key component of economic and industry growth. *The Working Waterfront*. Retrieved from: http://www.workingwaterfront.com/columns/Water-Access-a-Key-Component-of-Economic-and-Industry-Growth/15039/

Garland, J. E. (1990). *The Gloucester guide: A stroll through time and place*. Rockport, MA: Protean Press.

Garofolo, J. (1998). Protecting America's Fisheries. *Coast Guard, 45*(4). Retrieved from: http://www.uscg.mil/history/articles/Fisheries.pdf

Goldberg, B., Firestine, T., & Steve, K. (2010). *Highlights of the 2008 National Census of Ferry Operators*. Bureau of Transportation Statistics, Research and Innovative Technology Administration, U.S. Department of Transportation. Retrieved from: http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/special_reports_and_issue_briefs/special_report/2010_12_01/pdf/entire.pdf

Good, J., & Goodwin, R. F. (1994). *Warrenton, Oregon Waterfront Revitalization Plan*. Warrenton, Oregon: National Sea Grant Program and National Coastal Resources Research and Development Institute.

Goodwin, R. F. (1999). Redeveloping deteriorated urban waterfronts: The effectiveness of U.S. coastal management programs. *Coastal Management, 27*(2/3), 239-269.

Goodwin, R.F. (1994). *Waterfront revitalization: Ways to retain maritime industries*. Seattle, WA: Washington Sea Grant Marine Advisory Board.

Government Accountability Office (GAO). (2008). *Federal user fees: Substantive reviews needed to align port-related fees with the programs they support*. GAO-08-321.

Great Lakes Fishery Commission (GLFC). (1997). A joint strategic plan for management of Great Lakes fisheries (adopted in 1997 and supersedes 1981 original). Great Lakes Fish. Comm. Misc. Publ. 2007-01. Retrieved from: http://www.glfc.org/fishmgmt/jsp97.pdf

Great Lakes Fishery Commission (GLFC). (2011). Strategic vision of the Great Lakes Fishery Commission 2011-2020. Retrieved from: http://www.glfc.org/pubs/SpecialPubs/StrategicVision2012.pdf

Gulf of Mexico Fishery Management Council (GMFMC). (n.d.) Management plans. Retrieved from: http://www.gulfcouncil.org

Haas, G. E. (2010). A snapshot of recreational boating in America. Retrieved from: http://www.nmma.org/assets/cabinets/Cabinet214/USCG%20Recreational%20Boating%20in%20America.doc

Hackett, B. (2003). *National dredging needs study of U.S. ports and harbors: Update 2000*. Prepared for Institute for Water Resources, U.S. Army Corps of Engineers. Retrieved from: http://www.iwr.usace.army.mil/docs/iwrreports/00-R-04.pdf

Haites, E. F., Mak, J., & Walton, G.M. (1975). *Western river transportation: The ear of early internal development 1810-1860*. Baltimore, MD: The Johns Hopkins University Press.

Hansen, M. (2010). Asian Carp and the Great Lakes: Hearing before the Subcommittee on Water Resources and Environment, of the House Committee on Transportation and Infrastructure, 111th Cong. 87 (2010) (testimony of Michael Hansen). Retrieved from: http://www.gpo.gov/fdsys/pkg/CHRG-111hhrg54813/pdf/CHRG-111hhrg54813.pdf and http://www.glfc.org/fishmgmt/Hansen_testimony_aisancarp.pdf

Helling, A., & Polster, T. H. (2000). U.S. maritime ports: Trends, policy implications, and research needs. *Economic Development Quarterly, 14* (3), 300-317.

Hershman, M.J. (1999). Seaport development and coastal management programs: A national overview. *Coastal Management, 27*(2/3), 271-290.

Hershman, M. J. (Ed.) (1988). *Urban Ports and Harbor Management*. New York, NY: Taylor & Francis.

Highbeam Business. (n.d.) Marinas industry report. Retrieved from: http://business.highbeam.com/industry-reports/transportation/marinas

History Channel. (n.d.) *Congress opens all U.S. ports to international trade*. Retrieved from: http://www.history.com/this-day-in-history/congress-opens-all-us-ports-to-international-trade

Institute for Global Maritime Studies. (2008). *America's deep blue highway: How coastal shipping could reduce traffic congestion, lower pollution, and bolster national security*. Gloucester, MA: Perry, J.C., Borgerson, S. G. & Weitz, G. R. Retrieved from: http://www.igms.org/sites/default/files/publishedworks/americas_deep_blue_highway_IGMS_report_sept_2008.pdf

International Monetary Fund. (2011). *Changing patterns of global trade*. Prepared by the Strategy, Policy, and Review Department. Retrieved from: http://www.imf.org/external/np/pp/eng/2011/061511.pdf

Irwin, D. A. (2006). *Research summary: Historical aspects of U.S. trade policy*. The National Bureau of Economic Research. Retrieved from: http://www.nber.org/reporter/summer06/irwin.html

Describes research about early American Trade from pre-Colonial times up through the early 1900s.

Irwin, D. A. (2006). *Research summary: Historical perspectives on U.S. trade policy*. The National Bureau of Economic Research. Retrieved from: http://www.nber.org/reporter/winter99/irwin.html

Island Institute. (2007). *Mapping Maine's Working Waterfront: A Statewide Inventory*. Retrieved from: http://www.islandinstitute.org/publications/Mapping-Maines-Working-Waterfront/12270/

Jackson, D. (2012). Wistful hopes for U.S. offshore wind energy. *Boston Globe*, December 29, 2012. Retrieved from: http://www.bostonglobe.com/opinion/2012/12/29/wistful-hopes-for-offshore-wind-energy/npbaIxVU4sAcnKSlnd3QRP/story.html

Jacob, M. (2009). The West Coast hangover. *Journal of Commerce, 11(2)*, 23. Retrieved from: http://www.pmsaship.com/pdfs/JOC%20Oped%20-%20West%20Coast%20Hangover%201-11-10.pdf

Short article discusses author's views on why west coast shipping in the US is going to be outcompeted by other parts of the country/world.

Johnson, J. C., & Orbach, M. K. (1990). A fishery in transition: The impact of urbanization on Florida's Spiny Lobster fishery. *City & Society*, *4*(1), 88-104.

Jones, B. N., & Decas, K. (2010). *Safe harbor: Berth expansion to support New Bedford's growing commercial fishing fleet*. Proceedings from *Ports 2010: Building on the Past, Respecting the Future*. American Society of Civil Engineers. Jacksonville, FL.

Kildow, J.T., Colgan, C.S., & Scorse, J. (2009). *State of the U.S. ocean and coastal economies*. National Ocean Economics Program. Retrieved from: http://www.oceaneconomics.org/nationalreport/

Kildow, J. T., & Mcllgorm, A. (2010). The importance of estimating the contribution of the oceans to national economies. *Marine Policy 34*(3), 367-374.

Kleszczewski, M. (2013). Seaports get ready for supersizing. *Business Xpansion Journal*. Retrieved from: http://bxjmag.com/seaports-get-ready-for-supersizing

Knight, K. (2008). *The implications of Panama Canal expansion to U.S. ports and coastal navigation economic analysis*. Institute for Water Resources, U.S. Army Corps of Engineers. Retrieved from: http://www.iwr.usace.army.mil/docs/iwrreports/WhitePaperPanamaCanal.pdf

Kruse, C. J., & Hutson, N. (2010). *North American marine highways*. National Cooperative Freight Research Program. Transportation Research Board. Retrieved from: http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_rpt_005.pdf

Korea Maritime Institute. (2005). *Free trade zone and port hinterland development*. United Nations Economic and Social Commission for Asia and the Pacific. Retrieved from: http://www.unescap.org/ttdw/publications/tfs_pubs/pub_2377/pub_2377_fulltext.pdf

Lopez, A., Roberts, B., Heimiller, D., Blair, N., & Porro, G. (2012). *U.S. renewable energy technical potentials: A GIS-based analysis.* National Renewable Energy Laboratory (NREL) Technical Report NREL/TP-6A20-51946. Retrieved from: http://www.nrel.gov/docs/fy12osti/51946.pdf

Louisiana State Museum. (n.d.) *The port of New Orleans in the 19th century*. Retrieved from: http://www.crt.state.la.us/museum/online_exhibits/Coffee_Trade/

Magnuson-Stevens Fishery Conservation and Management Act. Pub. L. 94-265, 90 Stat. 331 (1976), 16 U.S.C. 1801 *et seq*.

Mann, R. B. (1988). Ten trends in the continuing renaissance of urban waterfronts. *Landscape and urban planning*, *16*(1/2), 177-199.

Marine Board, National Research Council. (1985). *Dredging coastal ports: An assessment of the issues*. Washington, DC: National Academy Press. Retrieved from: http://www.gpo.gov/fdsys/pkg/CZIC-tc223-n37-1985/pdf/CZIC-tc223-n37-1985.pdf

Marine Law Institute. (1988a). *Guidebook to the economics of waterfront planning and water dependent uses*. Portland, ME: Marine Law Institute.

Marine Law Institute. (1988b). *Managing the shoreline for water-dependent uses: A handbook of legal tools*. Portland, ME: Marine Law Institute.

Marine Mammal Protection Act, Pub. L. 92-522, 86 Stat. 1027 (1972), 16 U.S.C. 1361 *et seq*.

Massachusetts Oceans Act. 2008 Mass. Acts Ch. 114 §1-25.

McLoughlin, E. S. (2005). *Water dependent uses – Who has priority?* Proceedings of the 14th Biennial Coastal Zone Conference, New Orleans, LA. Retrieved from: http://www.csc.noaa.gov/cz/CZ05_Proceedings/pdf%20files/Mcloughlin.pdf

Meyerson, H. (2009). Charter fishing industry hit hard by poor economy. MLive.com. Retrieved from: http://www.mlive.com/outdoors/index.ssf/2009/05/charter_fishing_industry_hit_h.html

Mid-Atlantic Fishery Management Council (MAFMC). (2013). Management plans. Retrieved from: http://www.mafmc.org

Moore, K. (2009). Tax break offers a bit of help to traditional waterfront businesses. *StarNewsOnline*, August 8, 2009. Retrieved from: http://www.starnewsonline.com/article/20090808/ARTICLES/908089979

National Association of Development Organizations (NADO). (2012). *Freight transportation and economic development: Planning for the Panama Canal expansion.* Retrieved from: http://www.ruraltransportation.org/uploads/panama.pdf

National Atlas of the United States. (2012). Zebra mussels. Retrieved from: http://www.nationalatlas.gov/articles/biology/a_zm.html

National Environmental Policy Act of 1969 (NEPA), 42 U.S.C §4321-4347.

National Oceanic and Atmospheric Administration (NOAA). (1998). *Preserving waterfronts for water dependent uses*. State of the Coast Report. Silver Spring, MD: Walker, K., & Arnn, M. Retrieved from: http://oceanservice.noaa.gov/websites/retiredsites/sotc_pdf/WDU.PDF

National Oceanic and Atmospheric Administration (NOAA), National Climatic Data Center. (2012a). *State of the climate in 2011*. Retrieved from: http://www1.ncdc.noaa.gov/pub/data/cmb/bams-sotc/climate-assessment-2011-lo-rez.pdf

National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS). (2012b). *Fisheries of the United States: Current fishery statistics No. 2011*. Office of Science and Technology, Fisheries Statistics Division. Retrieved from: http://www.st.nmfs.noaa.gov/st1/fus/fus11/FUS_2011.pdf

National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS). (2012c). Status of stocks: Annual report to Congress on the status of U.S.

fisheries 2011. Silver Spring, MD. Retrieved from: http://www.nmfs.noaa.gov/sfa/statusoffisheries/SOSmain.htm

National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS). (2012d). Press release: Secretary of Commerce declares disaster in Northeast groundfish fishery. Retrieved from: http://www.nmfs.noaa.gov/mediacenter/2012/09/13_secretary_of_commerce_declares_disaster_in_northeast_groundfish_fishery.html

National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS). (2012e). Press release: Secretary of Commerce declares fisheries disaster for New York and New Jersey in the aftermath of Sandy. Retrieved from: http://www.noaanews.noaa.gov/stories2012/20121116_fisher_declaration.html

National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS). (2012f). Press release: Disaster declaration for oyster and blue crab fisheries in Mississippi. Retrieved from: http://www.nmfs.noaa.gov/stories/2012/09/docs/blank_bryant_9_13_12.pdf

National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS). (2012g). Press release: Secretary of Commerce declares disaster for Alaska King Salmon. Retrieved from: http://www.nmfs.noaa.gov/mediacenter/2012/09/13_secretary_of_commerce_declares_disaster_for_alaska_king_salmon.html

National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS). (n.d.a). Great Lakes commercial fishery landings. Retrieved from: http://www.st.nmfs.noaa.gov/st1/commercial/landings/gl_query.html

National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS). (n.d.b) Basic questions about aquaculture. Retrieved from: http://www.nmfs.noaa.gov/aquaculture/faqs/faq_aq_101.html

National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS). (n.d.). Annual commercial landing statistics. Retrieved from: http://www.st.nmfs.noaa.gov/commercial-fisheries/commercial-landings/annual-landings/index

National Oceanic and Atmospheric Administration (NOAA). (n.d.) *NOAA's list of coastal counties for the Bureau of the Census: Statistical abstract series*. Retrieved from: http://www.census.gov/geo/landview/lv6help/coastal_cty.pdf

National Oceanic and Atmospheric Administration (NOAA), Spatial Trends in Coastal Socioeconomics (STICS). (2012). Spatial trends in coastal socioeconomics. Retrieved from: http://coastalsocioeconomics.noaa.gov/

National Renewable Energy Laboratory (NREL). (2010). *Large-scale offshore wind power in the United States: Assessment of opportunities and barriers*. Golden, CO: Musial, W., & Ram, B. Retrieved from: http://www.nrel.gov/wind/pdfs/40745.pdf

National Research Council, Committee on Contaminated Marine Sediments. (1996). *Contaminated sediments in ports and waterways: Cleanup strategies and technologies*. Washington, DC: National Academy Press.

National Research Council, Transportation Research Board. (1993). *Landside access to U.S. ports*. Prepared for Maritime Administration, U.S. Department of Transportation.

New Bedford Whaling Museum. (n.d.) *The city's evolution – From Old Dartmouth to New Bedford, whaling metropolis of the world*. Retrieved from: http://www.whalingmuseum.org/learn/research-topics/from-old-dartmouth-to-new-bedford/citys-evolution

New England Fishery Management Council (NEFMC). (n.d.) Fishery management plans. Retrieved from: http://www.nefmc.org/

New England Fishery Management Council (NEFMC). (2012). Northeast multispecies: Brainstorming mitigation alternatives for fishing year 2013. Retrieved from: http://www.nefmc.org/nemulti/cte_mtg_docs/120802/FY2013%20Groundfish%20Issues%20Discussion%20Document%20(7-31-2012)%20v4.pdf

North Pacific Fishery Management Council (NPFMC). (n.d.) Fishery management plans. Retrieved from: www.alaskafisheries.noaa.gov/npfmc

Notteboom, T., Ducruet, C., & de Langen, P. (2009). *Ports in proximity: Competition and coordination among adjacent seaports*. Surrey, UK: Ashgate Publishing Group.

O'Connor, S., Campbell, R., Cortez, H., & Knowles, T. (2009). Whale watching worldwide: Tourism numbers, expenditures and expanding economic benefits: A special report from the International Fund for Animal Welfare, prepared by Economists at Large. Retrieved from: http://www.ifaw.org/sites/default/files/whale_watching_worldwide.pdf

Outer Continental Shelf Lands Act (OCSLA), Pub. L. 83-212, 67 Stat. 462 (1953), 43 U.S.C. §1331 *et seq.*

Pacific Fishery Management Council (PFMC). (n.d.) Fishery management plans. Retrieved from: http://www.pcouncil.org/

Parris, A., Bromirski, P., Burkett, V., Cayan, D., Culver, M., Hall, J., . . . Weiss, J. (2012). Global sea level rise scenarios for the US National Climate Assessment. Retrieved from: http://www.cpo.noaa.gov/reports/sealevel/NOAA_SLR_r3.pdf

Perakis, A. N. & Denisis, A. (2008). A survey of short sea shipping and its prospects in the USA. *Maritime Policy & Management, 35*(6), 591-614.

Planning and Management Consultants, Ltd. (2000). *The national dredging needs study of ports and harbors - Implications to cost-sharing of federal deep draft navigation projects due to changes in the maritime industry*. Prepared for the Institute of Water Resources, U.S. Army Corps of Engineers. Retrieved from: http://www.iwr.usace.army.mil/docs/iwrreports/00-R-8.pdf

Port of Los Angeles. (n.d.) *History*. Retrieved from: http://www.portoflosangeles.org/idx_history.asp

Port of San Diego. (n.d.) *Port of San Diego overview*. Retrieved from: http://www.portofsandiego.org/about-us.html

Port of Seattle. (n.d.) *About the port*. Retrieved from: http://www.portseattle.org/About/Our-Story/Pages/default.aspx

Regional Fishery Management Councils (RFMCs). (2009). U.S. Regional Fishery Management Councils: Opportunities and challenges. Retrieved from: http://www.fisherycouncils.org/USFMCsections/USRFMCweb.pdf

Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §6901 et seq.

Rhode Island Climate Change Commission. (2012). Adapting to climate change in the ocean state: A starting point. Retrieved from: http://www.rilin.state.ri.us/Reports/Climate%20Change%20Commission%20Prog%20Report%20Final%2011%2015%2012%20final%202.pdf

Rhodes, R. J., Von Harten, A., & Turner, A. (2008). *Coastal waterfront access challenges & opportunities for South Carolina marine fisheries stakeholders*. Prepared for South Carolina Sea Grant Extension Program. Retrieved from: http://www.scseagrant.org/pdf_files/Waterfront-Access-Report.pdf

Rivers and Harbors Appropriation Act of 1899, 33 U.S.C. § 401, 403, 407.

San Francisco Bay Conservation and Development Commission. (n.d.) San Francisco bay plan: Climate change policy. Retrieved from: http://www.bcdc.ca.gov/laws_plans/plans/sfbay_plan#38

Sawyer, S. (2012). Global offshore: Current status and future prospects. *Energy and Environmental Management*, Guide to the UK Offshore Wind Industry. Retrieved from: http://www.eaem.co.uk/ebook/offshorewind/ebook.php?page=14

Scheina, R. (n.d.) *The Coast Guard at war*. Retrieved from: http://www.uscg.mil/history/articles/h_CGatwar.asp

Schmidt, K. (2009). Economic downturn slows traffic at marina. Daily Comet.com. Retrieved from: http://www.dailycomet.com/article/20091214/ARTICLES/912149973

Serokee, B., Chapin, T., Ankersen, T. T., & Ruppert, T. (2007). *Sovereign submerged lands and public access to Florida waters: A policy analysis*. Prepared by Conservation Clinic, Center for Governmental Responsibility, University of Florida College of Law for the Waterfronts Florida Partnership Program, State of Florida Department of Community Affairs. Retrieved from: http://www.law.ufl.edu/_pdf/academics/centers-clinics/clinics/conservation/resources/SubmergedLandsFINAL07.pdf

Sherman, R. B. (2002). *Seaport governance in the United States and Canada*. American Association of Port Authorities. Retrieved from: http://www.aapa-ports.org/files/PDFs/governance_uscan.pdf

Sibley, M. M. (1968). *The port of Houston: A history*. Austin, TX: University of Texas Press.

Smyth, T. C. (n.d.) *Can state coastal management programs ensure water access? An evaluation of Northeastern coastal programs' policies for mitigating the conversion of marinas and boatyards to residential use*. Retrieved from: http://www.wateraccessus.com/docs/day2/papers/Smythe.pdf

South Atlantic Fishery Management Council (SAFMC). (2013). Fishery management plans. Retrieved from: http://www.safmc.net

South Shore Estuary Reserve Council. (2001). *Long Island South Shore Estuary Reserve comprehensive management plan*. Retrieved from: http://www.dos.ny.gov/communitieswaterfronts/pdfs/SSERCMP.pdf

Southern Legislative Conference. (2010). The Panama Canal expansion and SLC state ports. Atlanta, GA: CanagaRetna, S. M. Retrieved from: http://www.slcatlanta.org/Publications/EconDev/ports_web.pdf

Starr, R. M., Cope, J. M., Kerr, L. A. (2002). *Trends in fisheries and fishery resources associated with the Monterey Bay National Marine Sanctuary from 1981-2000*. La Jolla, CA: California Sea Grant College Program. Retrieved from: http://montereybay.noaa.gov/research/techreports/fisherytrends.pdf

State of Maryland, Department of Transportation. (2010). Press release: Port Of Baltimore selected for further study as marine highway project. *Journal of Commerce*. Retrieved from: http://www.joc.com/port-baltimore-selected-further-study-marine-highway-project_20100826.html

State of New York, Department of State, Division of Coastal Resources. (n.d.) *Coastal Resources Online: Water-Dependent and Water-Enhanced*. Retrieved from: http://nyswaterfronts.com/waterfront_working_ports.asp

Steadman, G. (1999). *Zoning for water dependent uses: Case studies of four South Shore estuary reserve maritime centers*. Prepared for South Shore Estuary Reserve Council. Retrieved from: http://www.lisser.us/Final_Draft_HTML/Tech_Report_HTM/PDFs/Chap5/Zoning_Water.pdf

TetraTech EC, Inc. (2010). *Port and infrastructure analysis for offshore wind energy development*. Prepared for Massachusetts Clean Energy Center. Retrieved from: http://www.masscec.com/masscec/file/MA%20Port%20Study%20Final%20Report_4-20-10.pdf

The Manhattan Rare Book Company. (n.d.) The American Prohibitory Act of 1775. Retrieved from: http://www.manhattanrarebooks-history.com/prohibitory_act.htm

Text and description of the American Prohibitory Act of 1775.

Upton, D. (2008). *Another city: Urban life and urban spaces in the new American republic*. New Haven, CT: Yale University Press.

U.S. Coast Guard (USCG). (2011). *Recreational Boating Statistics 2011*. COMDTPUB P16754.25. Retrieved from: http://www.uscgboating.org/assets/1/Publications/2011BoatingStatisticsreport.pdf

U.S. Commission on Ocean Policy. (2004). *An ocean blueprint for the 21st century*. Retrieved from: http://www.oceancommission.gov/documents/full_color_rpt/000_ocean_full_report.pdf

U.S. Commission on Ocean Policy. (2004). Appendix 5: Inventory of U.S. ocean and coastal facilities, in *An ocean blueprint for the 21st century.* Retrieved from: http://www.oceancommission.gov/documents/full_color_rpt/append_5.pdf

U.S. Department of Commerce. (2007). *Report to Congress on the impacts of Hurricanes Katrina, Rita, and Wilma on Alabama, Louisiana, Florida, Mississippi, and Texas fisheries*. Retrieved from: http://www.nmfs.noaa.gov/msa2007/docs/Fisheries_Report_Final.pdf

U.S. Department of Labor, Bureau of Labor Statistics (BLS). (2012). *Occupational outlook handbook, 2012-13 edition: Fishers and related fishing workers*. Retrieved from: http://www.bls.gov/ooh/farming-fishing-and-forestry/fishers-and-related-fishing-workers.htm

U.S. Department of Transportation (DOT), Maritime Administration (MARAD). (2009). *America's ports and intermodal transportation system*. Retrieved from: http://www.mtsnac.org/docs/2009/America's%20Ports%20and%20Intermodal%20Transportation%20System%20(Jan%2009).pdf

U.S. Department of Transportation (DOT), Maritime Administration (MARAD). (2011). *Vessel calls snapshot, 2010*. Retrieved from: http://www.marad.dot.gov/documents/Vessel_Calls_at_US_Ports_Snapshot.pdf

U.S. Department of Transportation (DOT), Maritime Administration (MARAD). (2011). U.S. DOT's Maritime Administration announces $9.98 million in grants to small shipyards. Retrieved from:

http://www.marad.dot.gov/news_room_landing_page/news_releases_summary/news_release/MARAD_08-11.htm

U.S. Department of Transportation (DOT), Maritime Administration (MARAD). (2013). *U.S. waterborne foreign container trade by U.S. custom ports*. Retrieved from: http://www.marad.dot.gov/documents/Container_by_US_Customs_Ports.xls

U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics. (2007). *America's container ports: Delivering the goods*. Retrieved from: http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/americas_container_ports/2007/index.html

U.S. Department of Transportation (DOT), Research and Innovative Technology Administration (RITA), Bureau of Transportation Statistics. (2009). *America's container ports: Freight hubs that connect our nation to global markets*. Retrieved from: http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/americas_container_ports/2009/pdf/entire.pdf

U.S. Department of Transportation (DOT), Research and Innovative Technology Administration (RITA), Bureau of Transportation Statistics. (2011). *America's container ports: Linking markets at home and abroad*. Retrieved from: http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/americas_container_ports/2011/pdf/entire.pdf

U.S. Geological Survey (USGS). (2012). *Sea level rise accelerating in U.S. Atlantic coast*. Retrieved from: http://www.usgs.gov/newsroom/article.asp?ID=3256&from=rss_home#.T-iGxitYvIw

Watson, G., Ankersen, T. T. (n.d.) Florida Sea Grant and University of Florida Law School partner to support public access policy initiatives. National Sea Grant Law Center. Retrieved from: http://nsglc.olemiss.edu/SandBar/SandBar5/5.1florida.htm

West, R. (2008). *Shifts in global trade patterns*. Presented to American Association of Port Authorities (AAPA) Shifting International Trade Routes and Planning for the Panama Canal Expansion. Tampa, FL. Retrieved from: http://www.aapa-ports.org/files/SeminarPresentations/08_Canal_West_Robert.pdf

Western Pacific Regional Fishery Management Council (WPFMC). (n.d.) Fishery plan & policies. Retrieved from: http://www.wpcouncil.org/

Wiggin, J. (2012). Table 1: Population for coastal counties, by state and region from 1970 to 2010, and percent change (compiled from 2010 U.S. Census county-level data).

Wilson, S. G., & Fischetti, T. R. (2010). *Coastline population trends in the United States: 1960 to 2008*. U.S. Census Bureau. Retrieved from: http://www.census.gov/prod/2010pubs/p25-1139.pdf

White House Council on Environmental Quality. (2010). *Final Recommendations of the Interagency Ocean Policy Task Force*. Retrieved from: http://www.whitehouse.gov/files/documents/OPTF_FinalRecs.pdf

World Port Source. (n.d.) *Navigable rivers & inland waterway systems*. Retrieved from: http://www.worldportsource.com/ports/USA

Work Projects Administration (WPA) Federal Writer's Project. (2004). *A maritime history of New York*. New York, NY: reissued Going Coastal, Inc. 2004, original 1941.

The *Sustainable Working Waterfronts Toolkit* is available at:

http://www.WaterAccessUS.com

We would like to acknowledge Coastal Enterprises, Inc., Florida Sea Grant, Island Institute, Maine Sea Grant, the National Sea Grant Law Center, the Urban Harbors Institute at the University of Massachusetts Boston, and Virginia Sea Grant for assembling the *Sustainable Working Waterfronts Toolkit.*

The *Sustainable Working Waterfronts Toolkit* is a result of research sponsored in part by the U.S. Economic Development Administration under *Investment No.: 99-07-13873*, with additional support from 1772 Foundation, Coastal Enterprises, Inc., Island Institute, Munson Foundation, University of Florida, The University of Maine, University of Massachusetts Boston, University of Mississippi School of Law, and Virginia Institute of Marine Science.