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IT'S NOT JUST AN OFFSHORE WIND FARM: COMBINING MULTIPLE USES AND MULTIPLE VALUES ON THE OUTER CONTINENTAL SHELF

by Robin Kundis Craig*

ABSTRACT

Marine aquaculture and marine-based alternative energy, especially offshore wind, are increasingly competing for space on the Outer Continental Shelf and the water column above it with each other and with more traditional ocean uses. The laws governing this increasingly crowded space need to become better aware of changing uses of and values for the ocean and to promote rational planning of how this space is used in the future.

In one approach, various regions of the U.S. coast are actively engaged in comprehensive marine spatial planning. Marine spatial planning is a process designed to prioritize, balance, and rationally allocate the wide variety of values that a number of interested communities place on the ocean. It is, to be sure, a complex endeavor, but it currently offers the best process *available for identifying, negotiating, and ameliorating value and use conflicts in the ocean.*

However, technology is increasingly offering other options. Planned "multiple use" is a familiar concept for terrestrial public lands, but it has a less robust history in the marine realm. New technologies allow the potential for some of the more creative designs in offshore renewable energy, especially offshore wind, to alleviate several possible conflicts by allowing multiple uses (energy production, aquaculture, potentially recreation and living space) in the same physical space, freeing up other areas of the ocean for environmental and cultural protection. Permitting laws and regulations need to evolve to recognize and promote these multiple-use marine technologies, streamlining the multijurisdictional bureaucracy that exists to govern offshore structures.

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I. INTRODUCTION

On April 26 and April 28, 2017, President Trump issued two Executive Orders that sought to, respectively, undo several of the large marine reserves created and expanded under the Antiquities Act[1] by a number of prior Presidents (including President George W. Bush) and under the Outer Continental Shelf Lands Act by President Obama,[2] in the name of promoting commercial marine fisheries[3] and offshore oil and gas

[1] President Donald J. Trump, *Presidential Executive Order on the Review of Designations under the Antiquities Act* (Exec. Order No. 13792) (April 26, 2017), *available at* https://www.whitehouse.gov/the-press-office/2017/04/26/presidential-executive-order-review-designations-under-antiquities-act. The Executive Order requires review of "all Presidential designations or expansions of designations under the Antiquities Act made since January 1, 1996, where the designation covers more than 100,000 acres, where the designation after expansion covers more than 100,000 acres, or where the Secretary determines that the designation or expansion was made without adequate public outreach and coordination with relevant stakeholders." *Id*. § 2. In response to this Executive Order, the Secretary of Commerce, acting through the National Oceanic and Atmospheric Administration (NOAA), initiated a review of all marine national monuments and national marine sanctuaries designated or expanded after 2007. Office of National Marine Sanctuaries (ONMS), National Ocean Service (NOS), National Oceanic and Atmospheric Administration (NOAA), *Review of National Marine Sanctuaries and Marine National Monuments Designated or Expanded Since April 28, 2007; Notice of Opportunity for Public Comment*, 82 Fed. Reg. 28,827, 28,827 (June 26, 2017). Eleven federal marine protected areas and 12 federal actions were subject to this review: the 2007 expansion of the Channel Islands National Marine Sanctuary; the 2008 expansion of the Monterey Bay National Marine Sanctuary; the 2009 designations of the Marianas Trench Marine National Monument, the Pacific Remote Islands Marine National Monument, and the Rose Atoll Marine National Monument; the 2012 expansion of the National Marine Sanctuary of American Samoa; the 2014 expansions of the Pacific Remote Islands Marine National Monument and the Thunder Bay National Marine Sanctuary; the 2015 expansions of the Cordell Banks National Marine Sanctuary and Greater Farallones National Marine Sanctuary; and the 2016 designation of the Northeast Canyons and Seamounts Marine National Monument and expansion of the Papahānaumokuākea Marine National Monument. *Id*. at 28,828.

[2] President Donald J. Trump, Presidential Executive Order Implementing an America-First Offshore Energy Strategy (Exec. Order No. 13795) (April 28, 2017), *available at* https://www.whitehouse.gov/the-press-office/2017/04/28/presidential-executive-order-implementing-america-first-offshore-energy.

[3] In September 2017, according to *The Washington Post*, Interior Secretary Zinke recommended that President Trump reduce the size of the Pacific Remote Islands and the Rose Atoll Marine National Monuments. Juliet Eilperin, "Shrink at least 4 national monuments and modify a half-dozen others, Zinke tells Trump," *The Washington Post*, https://www.washingtonpost.com/national/health-science/shrink-at-least-4-national-monuments-and-modify-a-half-dozen-others-zinke-tells-trump/2017/09/17/a0df45cc-9b48-11e7-82e4-f1076f6d6152_story.html?hpid=hp_hp-top-table-main_monuments-10pm%3Ahome&utm_term=.a7666acfcb56 (Sept. 17, 2017). In addition, Secretary Zinke recommended that commercial fishing be allowed in what remained of these two marine national monuments and in the Northeast Canyons and Seamounts Marine National Monument. *Id*. *See also* Julie Turkewitz, Nadja Popovich, & Matt McCann, "Here Are the 10 National Monuments the Interior Department Wants to Shrink or Modify," *The New York Times*, https://www.nytimes.com/interactive/2017/09/18/climate/bears-ears-changes-monuments.html (Sept. 18, 2017) (reporting the same information).

development.[4] These Executive Orders demonstrate that the offshore marine areas under federal control raise many of the same issues that traditional public lands do regarding the perceived conflict between environmental protection and extractive industries.

However, as the kinds of uses of the United States' offshore territories continue to multiply, these offshore waters and lands are increasingly experiencing a multiple use dilemma also reminiscent of traditional public lands.[5] As is true of terrestrial public lands, moreover, not all offshore activities are mutually compatible, resulting in a recognized need for increased ocean planning, a process generally known as marine spatial planning, which Part IV will discuss in more detail.[6]

However, marine spatial planning cannot operate as a complete answer to the increasing use of ocean space and the multiple use dilemma. In particular, two of the newest but rapidly expanding uses of offshore waters and continental shelf, offshore wind farms and deepwater marine aquaculture, can require significant amounts of space. Currently, these two types of offshore installations are subject to two completely different permitting regimes and sets of regulations, as Part III will explore. However, technological innovation in the construction of offshore wind turbines is increasingly allowing those structures to function as aquaculture facilities, allowing double use of the same ocean space. To acknowledge and encourage these efficiencies, ocean law and policy should steamline the permitting of dual-use offshore wind farms, recognizing that such facilities allow more space for other uses—including marine protected areas and biodiversity conservation, a use of the ocean that should also be expanding.

This Article proceeds in five parts, including this introduction. Part II looks at the various uses of the United States' marine territory before focusing more particularly on

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[4] Under the Executive Order, "It shall be the policy of the United States to encourage energy exploration and production, including on the Outer Continental Shelf, in order to maintain the Nation's position as a global energy leader and foster energy security and resilience for the benefit of the American people, while ensuring that any such activity is safe and environmentally responsible." Exec. Order No. 13795, *supra* note 2, § 2. The Executive Order requires the Secretary of the Interior to "give full consideration to revising the schedule of proposed oil and gas lease sales . . . so that it includes, but is not limited to, annual lease sales, to the maximum extent permitted by law, in each of the following Outer Continental Shelf Planning Areas, as designated by the Bureau of Ocean Energy Management (BOEM) (Planning Areas): Western Gulf of Mexico, Central Gulf of Mexico, Chukchi Sea, Beaufort Sea, Cook Inlet, Mid-Atlantic, and South Atlantic." *Id*. § 3(a).

[5] I have argued that the Outer Continental Shelf should be considered a form of federal public lands. *See generally* Robin Kundis Craig, *Treating Offshore Submerged Lands as Public Lands: A Historical Perspective*, 34 PUBLIC LAND & RESOURCES L. REV. 51 (2013).

[6] For discussion of marine spatial planning in the United States, see Robin Kundis Craig, *An Historical Look at Planning for the Federal Public Lands: Adding Marine Spatial Planning Offshore*, 6 J. ENERGY & ENVTL. L. 1, 9-20 (Winter 2015); Robin Kundis Craig, *Ocean Governance for the 21st Century: Making Marine Zoning Climate Change Adaptable*, 36 HARV. ENVTL. L. REV. 305, 308-14 (2012); Robin Kundis Craig, *Avoiding Jellfish Seas, or, What Do We Mean by "Sustainable Oceans," Anyway?*, 31 UTAH ENVTL. L. REV. 17, 43-44 (2011).

the expansions of offshore wind farms and marine aquaculture. Part III provides an overview of the fragmentation of ocean regulation in the United States before detailing the widely disparate regulatory and permitting regimes for offshore wind and marine aquaculture, respectively.

In Part IV, this Article explores two ways of making more rational use of the United States' offshore territories. It first reviews marine spatial planning in the United States, which serves the primary goals of: (1) reconciling conflicting uses of ocean space (for example, fishing and recreational diving); and (2) providing space and protection for marine ecosystems and their healthy functioning. However, while marine spatial planning can determine which uses can be productively co-located, the process (at least as implemented in the United States) does not usually rationalize federal regulatory and permitting regimes. Part IV thus proceeds to discussing technological developments that are allowing offshore wind turbines to simultaneously function as aquaculture facilities, providing the practical means for these two ocean uses to share space. Such technological innovation, this Article concludes, should prompt legal innovation, as well, making it easier for offshore wind farms and marine aquaculture to share ocean space.

II. THE CROWDING OF THE UNITED STATES OFFSHORE TERRITORY AND THE EXPANSION OF OFFSHORE WIND AND AQUACULTURE

A. The Basics of United States Jurisdiction over the Ocean

The 1982 United Nations Convention on the Law of the Seas (UNCLOS III), which came into force in 1994, allows coastal nations control of up to a 200-nautical-mile-wide band of marine waters extending from a coastal baseline.[7] (A nautical mile is 1.1508 miles.[8]) This band of offshore jurisdiction is known as a nation's "Exclusive Economic Zone," or "EEZ,"[9] and within its EEZ the coastal nation has: (1) "sovereign rights to explore, exploit, conserve, and manage" the natural resources in the waters, seabed, and subsoil, "whether living or non-living"; (2) the right to explore and exploit those resources economically; and (3) jurisdiction over marine research and conservation.[10] Below the water column, UNCLOS III gives coastal nations jurisdiction over the continental shelf, which extends throughout "the natural prolongation of [the nation's] land territory to the outer edge of the continental margin, or to a distance of 200

[7] Convention on the Law of the Sea, Dec. 10, 1982, arts. 56.1, 57, 1833 U.N.T.S. 397 (entered into force Nov. 16, 1994), *available at* http://www.un.org/Depts/los/convention_agreements/texts/unclos/UNCLOS.pdf [hereinafter UNCLOS III].
[8] National Ocean Service, National Oceanic & Atmospheric Administration, *What is the difference between a nautical mile and a knot?*, https://oceanservice.noaa.gov/facts/nauticalmile_knot.html (as viewed Nov. 6, 2017).
[9] UNCLOS III, *supra* note 7, at arts. 56.1, 57.
[10] *Id*. arts. 56.1, 57.

miles," giving signatory nations control of at least two hundred miles of the continental shelf and its subsoil resources.[11]

The United States has not ratified UNCLOS III.[12] However, in 1983, President Reagan proclaimed a 200-nautical-mile EEZ for the United States for all purposes,[13] amounting to an assertion of U.S. control over 3.4 million square nautical miles of ocean.[14] Notably, the United States has been asserting its interests in its continental shelf for even longer—and largely in the interests of energy development.[15] In 1945, President Harry Truman asserted U.S. control over its continental through presidential proclamation.[16] The United States now controls more continental shelf submerged lands than the country has terrestrial territory; the Outer Continental Shelf under federal control constitutes 1.7 billion acres.[17]

However, the federal government and the states also share jurisdiction in the ocean. Under the federal Submerged Lands Act of 1953,[18] coastal states received title to the lands beneath coastal waters three miles out to sea.[19] In addition, title to the submerged lands gives states regulatory control over activities such as fishing in the

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[11] *Id*. art. 76.1.

[12] Over the last two decades, various entities have recurringly advocated that the U.S. finally ratify UNCLOS III, including the U.S. Commission on Ocean Policy. See U.S. Commission on Ocean Policy, Resolution on United Nations Law of the Sea Convention (Nov. 14, 2001), *available at* http://oceancommission.gov/documents/los_resolution.pdf; Brett Wagner & Philip Lofrumento, "It's Time for the United States to Ratify the Law of the Sea Treaty," *Salt Lake Trib*., Sept. 19, 1999, at AA6; John H. Dalton, "Ratify the Law of the Sea Treaty," *Portland Oregonian*, July 20, 1998, at B7; George Galdorsi, "Time to Ratify the Law of the Sea Treaty," *Christian Sci. Monitor*, Apr. 5, 1996, at 19; Carl Hartman, "U.S. Military Wants Law of the Sea Ratified," *Associated Press*, June 30, 1995; Press Release, Senator Claiborne Pell, *United States Ratification of the Law of the Sea Convention Will Enhance Our National Security Interests*, June 28, 1995; Press Release, Senator Claiborne Pell, *Ratification of the United Nations Convention on the Law of the Sea Will Promote the Economic Interests of the United States*, May 16, 1995; Editorial, "Time to Ratify the Law of the Sea," *St. Louis Post-Dispatch*, Aug. 19, 1994, at 6C. However, the United States still has not ratified the treaty. United Nations, Status of the United Nations Convention on the Law of the Sea 10, *available at* http://www.un.org/Depts/los/reference_ files/status2002.pdf (last revised Sept. 27, 2002). One square nautical miles equals 1.3 square miles. *Id*.

[13] Exclusive Economic Zone of the United States of America, Proclamation No. 5,030, 48 Fed. Reg. 10,605 (Mar. 10, 1983).

[14] U.S. COMMISSION ON OCEAN POLICY, AN OCEAN BLUEPRINT FOR THE 21ST CENTURY iii (2004), *available at* https://oceanconservancy.org/wp-content/uploads/2015/11/000_ocean_full_report-1.pdf [hereinafter 2004 USCOP FINAL REPORT].

[15] Robin Kundis Craig, *Treating Offshore Submerged Lands as Public Lands: A Historical Perspective*, 34 PUBLIC LAND & RESOURCES L. REV. 51, 52, 57-80 (2013).

[16] Pres. Procl. 2667, 10 Fed. Reg. 12303 (Sept. 28, 1945).

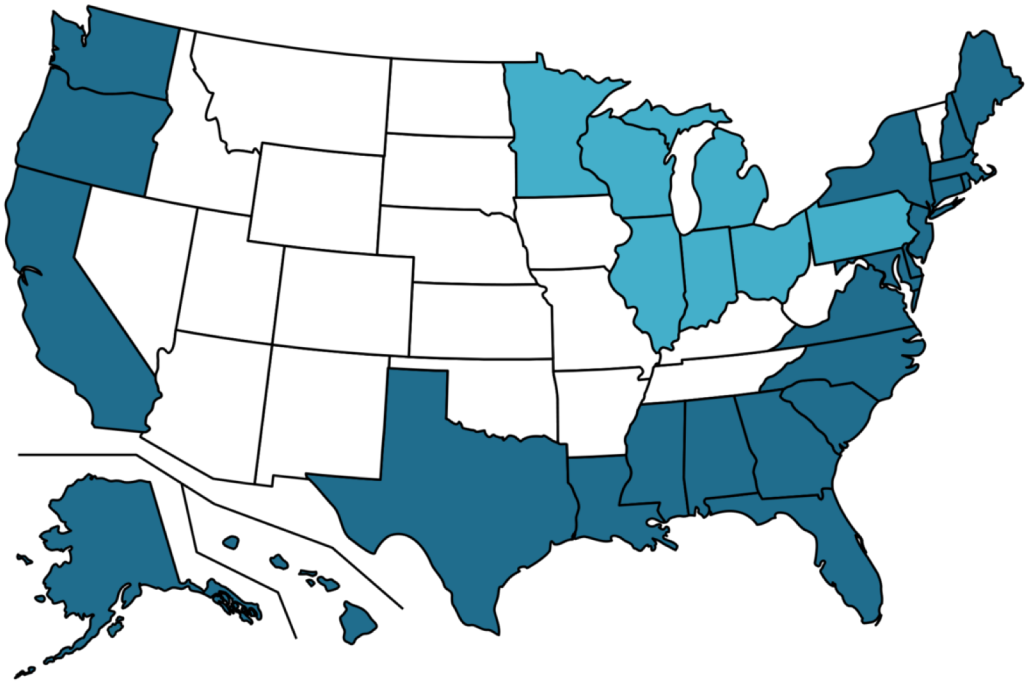
[17] BUREAU OF OCEAN ENERGY MANAGEMENT, OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF 2 (2013).

[18] 43 U.S.C. §§ 1301-1303, 1311-1315 (2012).

[19] *Id*. § 1301(a)(2). States with historical claims to more ocean territory were also free to press those claims against the Federal Government. *Id*. §§ 1301(a)(2), 1312.

coastal waters above those lands,[20] although this control is subject to the federal government's regulation of "commerce, navigation, national defense, and international affairs . . . ."[21] Thirty-five states and territories in the United States, including the Great Lakes, are considered coastal states.[22]

Figure 1: Coastal States in the United States
SOURCE: Wikipedia (public domain)



B. Crowding of the U.S. Oceans

The Oceans Act of 2000 called for the creation of the United States Commission on Ocean Policy,[23] which issued its final report to Congress in 2004.[24] In this Report, the Commission noted the increasing crowding of activities into U.S. ocean waters, calling for a more centralized governance process to rationalize what activities were allowed and where:

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[20] *Id*. §§ 1311-1312.
[21] *Id*. § 1314(a).
[22] Office for Coastal Management, National Oceanic & Atmospheric Administration, *Coastal Zone Management Programs*, https://coast.noaa.gov/czm/mystate/ (as updated Nov. 21, 2016, and viewed Nov. 5, 2017).
[23] Pub. L. No. 106–256, § 3, 114 Stat. 644 (Aug. 7, 2000).
[24] 2004 USCOP FINAL REPORT, *supra* note 14.

> The nation's vast offshore ocean areas are becoming an increasingly appealing place to pursue economic activities. Well-established institutional frameworks exist for longstanding ocean uses, such as fishing and energy extraction; however, authorities governing new activities, such as the placement of wind farms or aquaculture facilities, need to be clarified. A comprehensive offshore management regime is needed that enables us to realize the ocean's potential while safeguarding human and ecosystem health, minimizing conflicts among users, and fulfilling the government's obligation to manage the sea in a way that maximizes long-term benefits for all the nation's citizens.[25]

The Commission used the example of New England coastal waters to demonstrate the myriad of activities taken place in this relatively small patch of ocean, including a national marine sanctuary and other marine protected areas; shipping lanes; several proposed offshore wind farms; areas of offshore dumping, including hazardous waste and munitions; telecommunications cables; dredging projects; fisheries regulatory areas, such as fishery closures; recreational activities; and artificial reefs; other areas of the ocean have oil and gas development, as well.[26]

The Commission also noted that "[u]ser conflicts can and do arise when incompatible activities take place in the same area," concluding that "[a] comprehensive offshore management regime is needed for the balanced coordination of all offshore uses."[27] As an example of these user conflicts, shipping lanes in the United States were moved for Boston Harbor in 2007[28] and for San Francisco and Los Angeles Harbors in 2013[29] to reduce collisions with whales.

Finding precise information regarding how much of the United States' ocean is being used is difficult, especially because many uses do overlap. Nevertheless, some "ballpark" figures provide a sense of the amount of activity occurring in U.S. marine waters. America's Marine Highway System, run by the U.S. Department of Transportation, "consists of over 29,000 nautical miles of navigable waterways including rivers, bays, channels, the Great Lakes, the Saint Lawrence Seaway System,

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[25] *Id*. at 9.
[26] *Id*. at 9 fig. ES.4.
[27] *Id*.
[28] National Marine Sanctuaries, National Oceanic & Atmospheric Administration, Press Release: "NOAA & Coast Guard Help Shift Boston Ship Traffic Lane to Reduce Risk of Collisions with North Atlantic Right Whales," https://sanctuaries.noaa.gov/news/press/2007/pr062807.html (June 28, 2007).
[29] Nadia Drake, "California Shipping Lanes Moved in Attempt to Avoid Killing Whales," *Wired*, https://www.wired.com/2013/05/whales-and-shipstrikes/ (May 31, 2013).

coastal, and open-ocean routes."[30] The U.S. Army Corps of Engineers maintains "13,000 miles of deep-draft (14 [feet] and greater) coastal channels, and 400 ports, harbors, and turning basins throughout the United States," most of which require regular dredging.[31] NOAA Fisheries tracks 474 fish stocks or stock complexes subject to commercial and recreational fishing throughout the United States' EEZ,[32] and it noted in 2017 that "[c]ombined, U.S. commercial and recreational saltwater fishing generated $208 billion in sales and supported 1.6 million jobs in 2015."[33] The Bureau of Ocean Energy Management (BOEM) oversees "about 8,000 active" oil and gas leases on the Outer Continental Shelf ("OCS," the part of the continental shelf more than three nautical miles out to sea), and "[t]he almost 36 million leased OCS acres generally account for about 7 percent of America's domestic natural gas production and about 24 percent of America's domestic oil production."[34] According to the National Oceanic & Atmospheric Administration (NOAA), 41 percent of U.S. waters are subject to some form of legal protection and hence constitute a marine protected area ("MPA"), although NOAA also admits that "MPAs that are focused on the protection of ecosystem, biodiversity, and cultural resources cover about eight percent of marine waters."[35] The U.S. Department of State's "Our Ocean" program, in contrast, concludes that "MPAs cover about 32 % of U.S. marine waters (3,930,000 square kilometers). This includes 395,000 sq km of fully protected no-take reserves–about 3% of U.S. waters."[36]

While incomplete, these figures are enough to show that the U.S. ocean is in fact heavily used. Moreover, those uses are continually increasing. Two of the newest uses are offshore wind farms and marine aquaculture, to which this part now turns.

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[30] U.S. Dept. of Transportation, *America's Marine Highways* 1 (2016), *available at* https://www.marad.dot.gov/wp-content/uploads/pdf/AMH-Fact-Sheet-V15.pdf.

[31] U.S. Army Corps of Engineers, *Dredging*, http://navigation.usace.army.mil/CED (as viewed Nov. 1, 2017).

[32] NOAA Fisheries, National Oceanic & Atmospheric Administration, Status of Stocks 2016: Annual Report to Congress on the Status of U.S. Fisheries 2 (2017), *available at* http://www.nmfs.noaa.gov/sfa/fisheries_eco/status_of_fisheries/archive/2016/status-of-stocks-2016-web.pdf.

[33] *Id*. at 1.

[34] Bureau of Ocean Energy Management, *Oil and Gas Leasing on the Outer Continental Shelf* 2 (2014), *available at* https://www.boem.gov/uploadedFiles/BOEM/Oil_and_Gas_Energy_Program/Leasing/5BOEMRE_Leasing101.pdf

[35] National Ocean Service, National Oceanic & Atmospheric Administration, U.S. Department of Commerce, *What percentage of marine areas are protected?*, https://oceanservice.noaa.gov/facts/mpapercentage.html (as updated Oct. 10, 2017, and viewed Nov. 1, 2017).

[36] Our Ocean, U.S. Dept. of State, *Marine Protected Areas*, http://ourocean2016.org/marine-protected-areas/ (2016) (as viewed Nov. 1, 2017).

B. Offshore Wind Farms

Like all wind-generated electricity, offshore wind farms help to reduce greenhouse gas emissions. The relatively small Block Island Wind Farm off the coast of Rhode Island, for example, will purportedly "emit about 40,000 fewer tons of greenhouse gases per year than fossil fuels would to generate the same amount of energy. That's the equivalent of taking 150,000 cars off the road."[37] In addition, offshore winds tend to be both stronger and more constant than terrestrial winds, often making offshore wind farms a more reliable source of renewable energy—and one that can be serve increasing coastal populations and their energy demands.[38]

For these and other reasons, worldwide investment in offshore wind is increasing. At the end of 2016, globally, there were "14,384 [megawatts] of installed offshore wind power capacity in 14 markets around the world."[39] Broken down,

> nearly 88% (12,631 [megwatts]) of all offshore wind installations were located in waters off the coast of ten European countries. The remaining 12% of the installed capacity is located largely in China, followed by Japan, South Korea and the United States.
>
> The UK [United Kingdom] is the world's largest offshore wind market and accounts for just under 36% of installed capacity, followed by Germany in the second spot with 29%. China passed Denmark in 2016 to achieve 3rd place in the global offshore rankings with 11%. Denmark now accounts for 8.8%, the Netherlands 7.8%, Belgium 5% and Sweden 1.4%. Other markets including Finland, Ireland, Spain, Japan, South Korea, the USA and Norway make the balance of the market.[40]

More and more countries are pursuing offshore wind,[41] and as of October 2017, at least 18 new wind farms were under construction, including seven in China and four each in

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[37] Leanna Garfield, "America's first offshore wind farm lauched with GE turbines twice as tall as the Statue of Liberty," *Business Insider*, http://www.businessinsider.com/ge-wind-farm-block-island-2017-5?IR=T (May 22, 2017).
[38] American Geosciences Institute, *What are the advantages and disadvantages of offshore wind farms?*, https://www.americangeosciences.org/critical-issues/faq/what-are-advantages-and-disadvantages-offshore-wind-farms (as viewed Nov. 5, 2017).
[39] Global Wind Energy Council, *Offshore wind power*, http://gwec.net/global-figures/global-offshore/ (as viewed Nov. 5, 2017).
[40] *Id*.
[41] *Id*.

the United Kingdom and Germany.[42] In addition, prices are dropping.[43] Indeed, in 2016 for the first time, in some locations offshore wind was cheaper than onshore wind.[44]

In terms of using ocean space, offshore wind farms can be enormous. When a blade on the largest of the turbines points straight up, an offshore wind turbine can stretch 640 feet into the air.[45] As of June 2017, "[t]he largest offshore wind farm on Earth is the UK's London Array, a massive site of 175 turbines in the outer Thames estuary."[46] This offshore wind farm occupies 100 square kilometers (38.61 square miles) and uses nearly 450 kilometers (almost 280 miles) of cable.[47]

The United States lags behind Europe and China in offshore wind production. The United States' first offshore wind farm, Deepwater Wind's Block Island Wind Farm, began commercial operations in December 2016.[48] The five-turbine installation located 30 miles off the coast of Rhode Island can produce up to 30 megawatts of electricity.[49] It began delivering electricity in May 2017 to the New England grid, allowing the diesel generators that had previously supplied Block Island's electricity to shut down.[50]

Nevertheless, as is true for the rest of the word, offshore wind farms are projected to become more common in the United States in future years. "The Department of Energy estimates that the land-based wind energy potential of the contiguous U.S. is approximately 10,500 GW [gigawatts], and our potential offshore wind energy capacity is over 4,150 GW. For comparison, in 2011 the nation's total net summer electricity

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[42] Statistica, *Number of offshore wind farm projects under construction as of October 2017, by country*, https://www.statista.com/statistics/264258/number-of-offshore-wind-farms-under-construction-by-country/ (as viewed Nov. 5, 2017).

[43] Global Wind Energy Council, *Offshore wind power*, http://gwec.net/global-figures/global-offshore/ (as viewed Nov. 5, 2017).

[44] *Id*. "In December 2016, the World Economic Forum reported that as the cost of producing wind turbines has fallen by more than 30% in the last three years, the cost of electricity from wind power has fallen to $50 per megawatt hour on average worldwide, without subsidies. That's half the cost of coal." Chris Baraniuk, "The massive farms harnassing an invisible force," *BBC*, http://www.bbc.com/future/story/20170606-the-largest-wind-farms-in-the-world-are-in-the-uk (6 June 2017).

[45] Chris Baraniuk, "The massive farms harnassing an invisible force," *BBC*, http://www.bbc.com/future/story/20170606-the-largest-wind-farms-in-the-world-are-in-the-uk (6 June 2017).

[46] *Id*.

[47] London Array, *The Project*, http://www.londonarray.com/the-project-3/ (as viewed Nov. 5, 2017).

[48] Deepwater Wind, *Block Island Wind Farm: America's First Offshore Wind Farm*, http://dwwind.com/project/block-island-wind-farm/ (as viewed Nov. 5, 2017).

[49] *Id*.

[50] Leanna Garfield, "America's first offshore wind farm lauched with GE turbines twice as tall as the Statue of Liberty," *Business Insider*, http://www.businessinsider.com/ge-wind-farm-block-island-2017-5?IR=T (May 22, 2017).

generating capacity from all sources was 1,051 gigawatts (GW)."[51] Federal leasing for offshore wind, discussed in more detail below, has been increasing along the Atlantic coast every year since 2013, with cumulative purchases as of December 2016 amounting to over 1.2 million acres.[52] In December 2016, the Department of the Interior leased 79,350 acres located 11.5 nautical miles off the coast of Jones Beach, New York for over $42 million for wind energy development,[53] while in March 2017, it leased another 122,405 acres located 24 nautical miles off the coast of Kitty Hawk, North Carolina, for over $9 million.[54] Thus, offshore wind development involves significant portions of the United States' offshore territory, and such leasing may soon expand to California,[55] Oregon,[56] and Hawai'i.[57]

Like other space-consuming activities in the ocean, offshore wind farms can lead to conflicts with other uses and values in the same ocean space. Identified potential conflicts include:

> remote sensing or communications infrastructure such as radar, electromagnetic fields (EMF), signals, and beacons; recreation areas and tourist zones; community health and well-being; port facilities and traffic; airport facilities and traffic; overland transportation arteries; ocean shipping routes; commercial fishing; competing industrial or other uses for water and the seabed, including mineral exploration; military use; cultural resources such as monuments and historic sites; visual resources; coastal infrastructure; ambient noise levels; terrestrial, coastal, and underwater flora and fauna; habitat areas including marine sanctuaries and critical habitat areas; air quality; water quality; meeting renewable energy goals; and protection of endangered species.[58]

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[51] Environmental Law Institute, *A Guide to State Management of Offshore Wind Energy in the Mid-Atlantic Region* 1 (April 2013), *available at* http://midatlanticocean.org/wp-content/uploads/2014/03/A-Guide-to-State-Management-of-Offshore-Wind-Energy-in-the-Mid-Atlantic-Region.pdf.

[52] U.S. Energy Information Administration, *Federal leasing for offshore wind grows as first U.S. offshore wind farm comes on line*, https://www.eia.gov/todayinenergy/detail.php?id=28992 (Dec. 2, 2016).

[53] U.S. Dept. of the Interior, *Press Release: Interior Department Auctions Over 79,000 Acres Offshore New York for Wind Energy Development*, https://www.doi.gov/pressreleases/interior-department-auctions-over-79000-acres-offshore-new-york-wind-energy (Dec. 16, 2016).

[54] U.S. Dept. of the Interior, *Press Release: Interior Department Auctions Over 122,000 Acres Offshore Kitty Hawk, North Carolina for Wind Energy Development*, https://www.doi.gov/pressreleases/interior-department-auctions-over-122000-acres-offshore-kitty-hawk-north-carolina-wind (March 16, 2017).

[55] Bureau of Ocean Energy Management, *California Activities*, https://www.boem.gov/California/ (as viewed Nov. 6, 2017).

[56] Bureau of Ocean Energy Management, *Oregon Activities*, https://www.boem.gov/Oregon/ (as viewed Nov. 6, 2017).

[57] Bureau of Ocean Energy Management, *Hawaii Activities*, https://www.boem.gov/Hawaii/ (as viewed Nov. 6, 2017).

[58] Environmental Law Institute, *supra* note 51, at 9.

While many of these conflicts "are likely to be minor or could be eliminated or reduced through careful decision-making,"[59] resolving them nevertheless increases the regulatory burden on offshore wind farms.

C. Marine Aquaculture

Globally, marine aquaculture—the controlled and generally confined raising of marine plants, shellfish, and fish, usually for food, in ocean waters—has been growing substantially.[60] This increase is generally attributed to three factors: the overall increase in human population and corresponding increase in demand for sources of protein; the plateauing of wild-caught marine fish and shellfish globally; and a desire to reduce the impacts from land-based agriculture, particularly meat production.[61] Indeed, NOAA considers the "stagnation" in wild-caught marine fisheries a particularly good reason for increasing marine aquaculture in the United States: "The United States is the leading global importer of fish and fishery products, with 91% of the seafood we eat (by value) originating abroad–half of which is from aquaculture. Driven by imports, the U.S. seafood trade deficit grew to over $14 billion in 2016."[62]

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[59] *Id*.

[60] "In contrast to world capture fisheries production, which has essentially stagnated since the mid-1980s, aquaculture has maintained an annual growth rate of 5.8 percent worldwide since 2005. In addition to fish production, aquaculture produces considerable quantities of aquatic plants. World aquaculture production of fish and plants combined reached 101.1 million tonnes in live weight in 2014, for an estimated total farmgate value of US$165.8 billion. In the United States sales of domestic marine aquaculture have grown on average 13 percent per year from 2007-2011 led by increases in oyster and salmon production. Global aquaculture production is dominated by Asia (89%), while China alone accounts for 62 percent." NOAA Fisheries, National Oceanic & Atmospheric Administration, *Aquaculture in the United States*, http://www.nmfs.noaa.gov/aquaculture/aquaculture_in_us.html (as viewed Nov. 1, 2017)

[61] Rebecca R. Gentry, Halley E. Froehlich, Dietmar Grimm, Peter Kareiva, Michael Parke, Michael Rust, Steven D. Gaines, & Benjamin S. Halpern, *Mapping the global potential for marine aquaculture*, 1 NATURE ECOLOGY & EVOLUTION 1317, 1317 (Sept. 2017). *See also* NOAA Fisheries, National Oceanic & Atmospheric Administration, *Aquaculture in the United States*, http://www.nmfs.noaa.gov/aquaculture/aquaculture_in_us.html (as viewed Nov. 1, 2017) ("While the worldwide amount of wild-caught seafood has stayed the same year to year, there is a dramatic increase in the amount raised through aquaculture."); 2004 USCOP FINAL REPORT, *supra* note 14, at 330 ("As traditional harvest fisheries have approached and exceeded sustainable levels, the farming of fish, shellfish, and aquatic plants in marine and fresh waters has become a burgeoning global industry.").

[62] NOAA Fisheries, National Oceanic & Atmospheric Administration, *Aquaculture in the United States*, http://www.nmfs.noaa.gov/aquaculture/aquaculture_in_us.html (as viewed Nov. 1, 2017). *See also* 2004 USCOP FINAL REPORT, *supra* note 14, at 330 ("There is great potential for marine aquaculture to become an even more important source of seafood for the U.S. market and a way to help reduce the nation's seafood trade deficit of $7 billion a year").

The number of marine species that can now be grown through aquaculture is impressive. "About 600 aquatic species are now raised in captivity, with different species being preferred for different regions."[63] In the United States, "marine aquaculture primarily produces oysters, clams, mussels, shrimp, and salmon as well as lesser amounts of cod, moi, yellowtail, barramundi, seabass, and seabream."[64] However, aquacultured marine species are quite diverse and include abalone,[65] Queen Conch,[66] giant clam,[67] and, fairly recently, Bluefin tuna,[68] arguably the world's most valuable and most endangered marine fish.

Much of the ocean is potentially available for aquaculture. Gentry et al. found in 2017 that over 11.4 million square kilometers of the ocean world-wide are at least potentially suitable for fish aquaculture, while over 1.5 million square kilometers could be used for shellfish aquaculture.[69] If all of this area were actually used, "approximately 15 billion tonnes of finfish could be grown every year—over 100 times the global seafood consumption."[70] Of course, as the authors correctly noted, much of this area would eventually be excluded for other reasons—to protect "environmentally sensitive or high biodiversity areas, such as coral reefs"; because of physical and economic conflicts with other uses, such as ports or coastal infrastructure, military needs, or energy production; or because of "social interactions with wild fisheries, jobs, prices, and cultural heritage . . . ."[71] Thus, the authors clearly recognized the issue of ocean space allocation as a real and a legitimate one, concluding that "[t]he actual zones suitable for aquaculture development will certainly be smaller than the identified areas," but that "the scale of potential space suggests high flexibility in siting farms according to more nuanced constraints."[72] Moreover, "[n]early every coastal country has high marine aquaculture

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[63] World Ocean Review, *Aquacuture—protein provider for the world*, http://worldoceanreview.com/en/wor-2/aquaculture/protein-provider-for-the-world/ (as viewed Nov. 5, 2017).

[64] NOAA Fisheries, National Oceanic & Atmospheric Administration, *What is aquaculture?*, http://www.nmfs.noaa.gov/aquaculture/what_is_aquaculture.html (as viewed Nov. 5, 2017).

[65] Dept. of Animal Science, University of California, Davis, *California Abalone Aquaculture* (June 1996), *available at* http://aqua.ucdavis.edu/DatabaseRoot/pdf/ASAQ-A10.PDF; Eyre Peninsula, *Abalone (aquaculture)*, http://seafoodfrontier.com.au/product/abalone-aquaculture/ (as viewed Nov. 5, 2017).

[66] Caicos Conch Farm, *the World's First and Only Commercial Conch Farm*, http://www.caicosconchfarm.net/why-farm-turks-caicos-conch-and-fish.html (as viewed Nov. 5, 2017).

[67] M. Mies, P. Dor, A. Z. Güth & P. Y. G. Sumida, *Production in Giant Clam Aquaculture: Trends and Challenges*, 25 REVIEWS IN FISHERIES SCIENCE & AQUACULTURE 286, 286-96 (2017).

[68] Dan Charles, "Farming The Bluefin Tuna, Tiger Of The Ocean, Is Not Without A Price," *NPR Morning Edition*, http://www.npr.org/sections/thesalt/2014/07/30/336339179/farming-the-bluefin-tuna-tiger-of-the-ocean-is-not-without-a-price (July 30, 2014); Nancy Bazilchuk & Anne Sliper Midling, "Putting Bluefin tuna back on the menu—by farming them," *Gemini*, https://geminiresearchnews.com/2017/01/putting-bluefin-tuna-back-menu-farming/ (Jan. 20, 2017).

[69] Gentry et al., *supra* note 33, at 1318.

[70] *Id*.

[71] *Id*. at 1319.

[72] *Id*.

potential and could meet its own domestic seafood demand, . . . typically using only a minute fraction of its of its ocean territory."[73] For example, using only one percent of the area available for low-density marine finfish aquaculture, the United States could increase its marine fish aquaculture production four- to eight-fold.[74]

Traditional coastal aquaculture can cause both spatial and ecological problems. For example, the rapid growth of marine aquaculture in the United States "has made it a significant contributor to marine habitat loss. Aquaculture facilities are placed directly in the ocean and coastal bays, allowing chemical and biological pollutants, including pesticides, antibiotics, uneaten fishfeed, fish feces, and the fish themselves to escape directly into the water—thereby significantly altering ecological interactions."[75] However, not all types of marine aquaculture create these problems. In the United States, for example, "The preponderance of marine aquaculture production–approximately two-thirds by value–consists of bivalve mollusks such as oysters, clams, and mussels."[76] While shellfish aquaculture can occupy considerable coastal space, in the form either of shellfish beds along the shoreline or shellfish rafts further out, it also can improve water quality, because the owners don't feed the shellfish and bivalves naturally filter water to obtain their food.[77]

Like offshore wind winds, marine aquaculture can occupy considerable space. Some of the newest net pens (such as for raising salmon), for example, encircle 91,000 cubic meters, well over 3 million cubic feet, of the water column and have a circumference of 240 meters (about 787 feet).[78]

When the U.S. Commission on Ocean Policy wrote its report in 2004, almost all marine aquaculture in the United States occurred close to shore.[79] Increasingly, however,

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[73] *Id*.
[74] *See id*. at 1321, fig. 4 (showing increases in finfish production possible).
[75] Erin R. Englebrecht, Comment, *Can Aquaculture Continue to Circumvent the Regulatory Net of the Magnuson-Stevens Fishery Conservation and Management Act?*, 51 EMORY L.J. 1187, 1188 (Summer 2002).
[76] NOAA Fisheries, National Oceanic & Atmospheric Administration, *Aquaculture in the United States*, http://www.nmfs.noaa.gov/aquaculture/aquaculture_in_us.html (as viewed Nov. 1, 2017). "Salmon and shrimp constitute most of the rest, but advances in technology and management techniques are increasing the availability of other species for the American public." *Id*.
[77] Connecticut Dept. of Agriculture, *Environmental Benefits of Shellfish Aquaculture*, http://www.ct.gov/doag/cwp/view.asp?a=1367&q=478090 (as viewed Nov. 5, 2017); Odd Lindahl, Rob Hart, Bodil Hernroth, Sven Kollberg, Lars-Ove Loo, Lars Olrog, Ann-Sofi Rehnstam-Holm, Jonny Svensson, Susanne Svensson & Ulf Syversen, *Improving Marine Water Quality by Mussel Farming: A Profitable Solution for Swedish Society*, 34 AMBIO 131, 133034 (March 2005).
[78] Huon Aquaculture, *Revolutionary New Net Pen Design*, https://www.huonaqua.com.au/about/farm/new-pens/ (as viewed Nov. 5, 2017).
[79] 2004 USCOP FINAL REPORT, supra note 14, at 331.

marine aquaculture is moving further out to sea, in part because of nearshore crowding.[80] "Open ocean aquaculture is broadly defined as the rearing of marine organisms in exposed areas beyond significant coastal influence."[81] As of 2010, only a few aquaculture research facilities had been sited in the United States' EEZ, and no commercial facilities had;[82] however, open ocean aquaculture facilities were in operation or under development in Australia, Chile, China, France, Ireland, Italy, Japan, Mexico, and Norway[83] and four commercial open ocean facilities were operating in state or territorial waters in the United States: Cates International's moi (Pacific threadfin) facility and Kona Blue Water Farms' kahala facility off Hawai'i; SnapperFarms' cobia facility off Puerto Rico; and A.E. Lang Fisheries' blue mussel facility off New Hampshire.[84]

Nevertheless, open ocean aquaculture in federal waters is likely to occur soon. In 2016, NOAA noted that while "[c]urrently, there are no commercial finfish or shellfish aquaculture operations in U.S. federal waters, . . . [t]hree shellfish operations received permits for shellfish aquaculture in federal waters off California and Massachusetts, but have not yet begun operations. In 2015, there were 18 permit holders for live rock aquaculture in federal waters off the coast of Florida."[85]

III. A BRIEF OVERVIEW OF OCEAN GOVERNANCE IN THE UNITED STATES, INCLUDING PERMITTING REGIMES FOR OFFSHORE WIND AND AQUACULTURE

A. Fragmentation of U.S. Ocean Jurisdiction Geographically and by Subject Matter

Unlike for terrestrial public lands, the United States' offshore territories are not subject to a multiple use mandate. Nevertheless, the fragmented structure of marine regulation creates a *de facto*, if somewhat chaotic, multiple use reality.

Current U.S. law arbitrarily fragments regulation of marine resources and uses both geographically and by subject matter. Part of this geographic fragmentation reflects international law: In addition to setting out the EEZ and continental shelf, UNCLOS III

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[80] *Id*. at 332.
[81] Harold H. Upton & Eugene F. Buck, Congressional Research Service, *Open Ocean Aquaculture* i (Aug. 9, 2010), *available at* http://nationalaglawcenter.org/wp-content/uploads/assets/crs/RL32694.pdf.
[82] *Id*.
[83] *Id*. at 2.
[84] *Id*.
[85] NOAA Fisheries, National Ocean & Atmospheric Administration, NOAA Fisheries' Final Rule to Implement the Fishery Management Plan for Aquaculture in Federal Waters of the Gulf of Mexico: Frequently Asked Questions 2 (Jan. 2016), *available at* http://sero.nmfs.noaa.gov/sustainable_fisheries/gulf_fisheries/aquaculture/documents/pdfs/aquaculture_gulf_fmp_faqs_jan2016.pdf.

establishes other important zones of national regulatory control over the sea. The twelve nautical miles of ocean closest to shore are a coastal nation's territorial sea, where the coastal nation exercises sovereign control over the waters, the airspace, the seabed, and the subsoil.[86] The next twelve nautical miles out are the contiguous zone, a zone of extended enforcement jurisdiction to aid nations in regulating activities in the territorial sea,[87] such as when fishing vessels violate the law within the territorial sea and then try to escape seaward.

Despite its lack of party status, the United States observes these zones, as well. In 1988, President Reagan proclaimed a 12-nautical-mile territorial sea for the United States.[88] President Clinton added a contiguous zone extending to 24 nautical miles in 1999.[89] As a result, the United States has more or less adopted the UNCLOS III scheme of geographic division in ocean regulation, and it regards the treaty's jurisdictional provisions as customary international law.

Jurisdictional fragmentation geographically multiplies under the Submerged Lands Act. Because the first three miles of coastal waters and submerged lands are primarily the states' to regulate, governmental authority fragments not just at the three-mile line between state waters and submerged lands and federal waters and the Outer Continental Shelf, but also repeatedly along the coasts, where state borders extend out to sea.

In addition, United States law ensures that multiple governments and agency bureaucracies, often with different and perhaps even competing regulatory priorities, will govern almost any marine space. Both national and state policies regarding ocean resources preserve various governments' and agencies' jurisdictional "turf" among a myriad of regulatory programs instead of regulating similar activities comprehensively under a single management regime.[90] For example, offshore oil and gas exploration and drilling routinely triggers oversight and review by a variety of state and federal agencies.

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[86] Convention on the Law of the Sea, Dec. 10, 1982, arts. 2.1, 2.2, 3, 1833 U.N.T.S. 397 (entered into force Nov. 16, 1994), *available at* http://www.un.org/Depts/los/convention_agreements/texts/unclos/UNCLOS.pdf.

[87] *Id*. art. 33.

[88] Territorial Sea of the United States of America, Proclamation No. 5,928, 54 Fed. Reg. 777 (Dec. 27, 1988).

[89] Contiguous Zone of the United States, Proclamation No, 7,219, 64 Fed. Reg. 48,701 (Aug. 2, 1999).

[90] According to the National Research Council, for example,

> [R]esponsibility for regulating activities in marine areas, extending from estuarine watersheds to deep ocean, is fragmented among a daunting number of local, state, federal, and international entities. This complexity in jurisdictional responsibility often places a major barrier to developing coordinated policies for managing ocean resources across political boundaries.

Id. at 3.

States have authority under the Submerged Lands Act to license the oil and gas extraction within three miles of shore. More than three miles out to sea, however, the intricate provisions of the federal Outer Continental Shelf Lands Act[91] apply, implemented since 2010 by the Bureau of Ocean Energy Management (BOEM).[92] If exploration or drilling in federal waters will affect the waters of the state's three-mile coastal zone and the state has complied with the federal Coastal Zone Management Act,[93] however, the state must agree that the exploration and drilling are consistent with its coastal zone management plan before such activities can proceed.[94] In either location, if offshore drilling requires platforms that might interfere with navigation, or if the exploration and drilling involves the discharge of dredged or fill material, the Army Corps of Engineers must determine whether to permit the activity pursuant to the federal Rivers and Harbors Act[95] and the Clean Water Act.[96] If the drilling facilities also discharge pollutants into the ocean, as through a sewage or wastewater discharge pipe, then the EPA (or a delegated state) will also have authority to regulate the project under the Clean Water Act.[97] Regulatory fragmentation regarding marine pollution is even more complex.[98]

As the above discussion suggests, current U.S. ocean law and policy fragment regulation of the marine environment by subject matter. More specifically, although ocean resources are directly interconnected and mutually influential, U.S. law regulates ocean resources on a resource-by-resource and often on a species-by-species basis rather than on a comprehensive ecosystem or regional basis. For example, United States law regulates each type of marine resource or use under a separate regulatory regime: the Outer Continental Shelf Lands Act[99] governs oil and gas exploration and development more than three miles out to sea; the Clean Water Act[100] and a plethora of other statutes[101] govern water quality; the Coastal Zone Management Act[102] encourages states to enact coastal zone management plans;[103] the Rivers and Harbors Act[104] preserves navigability;

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[91] 43 U.S.C. §§ 1331-1356 (2012).
[92] *See id*. §§ 1331(b), 1334 (giving authority to administer the OCSLA leasing program to the Secretary of the Interior); 30 C.F.R. § 250.101 (2017) (delegating the Secretary's OCSLA authority to the Minerals Management Service).
[93] 16 U.S.C. §§ 1451-1465 (2012).
[94] *See id*. § 1456(c)(3)(B).
[95] 33 U.S.C. § 403 (2012) (prohibiting construction of obstructions in navigable waters without a permit from the Army Corps of Engineers).
[96] *See* 33 U.S.C. § 1344(a), (d) (2012) (requiring permits from the Army Corps of Engineers for discharges of dredged or fill material into navigable waters).
[97] *Id*. §§ 1251(d), 1311(a), 1342(a), 1344(b).
[98] Craig, *Taking the Long View*, 29 ECOLOGY L.Q. at 663-65.
[99] 43 U.S.C. §§ 1331-1356 (2012).
[100] 33 U.S.C. §§ 1251-1387 (2012).
[101] Craig, *Taking the Long View*, 29 ECOLOGY L.Q. at 663-65.
[102] 16 U.S.C. §§ 1451-1465 (2012).
[103] *Id*. § 1455.
[104] 33 U.S.C. §§ 401-418 (2012).

the Magnuson-Stevens Fishery Conservation and Management Act[105] regulates fisheries; the Marine Mammal Protection Act[106] governs all marine mammals; and the Endangered Species Act[107] regulates endangered species, including marine endangered species.

Thus, in the United States, resource-by-resource regulation—not comprehensive regulation—is the general rule for marine resource use and the development of marine space. The fragmented approach to regulation has extended to both offshore wind and marine aquaculture, as the next two sections will address.

B. Regulating Offshore Wind in the United States

1. Regulation of Wind Farms in State Waters

Under the Submerged Lands Act, states would appear to be the primary regulators for offshore wind farms operating in state coastal waters. And, indeed, offshore wind farms in state waters must obtain a variety of state permits, licenses, and leases, which vary somewhat from state to state. Block Island Wind Farm, located in Rhode Island state waters, had to obtain Deepwater Wind Water Quality Certificates from the Rhode Island Department of Environmental Management (RIDEM) deeming it to be in compliance with state water quality regulations and the Clean Water Act;[108] a Freshwater Wetland permit for certain onshore construction activities from RIDEM;[109] and an assent from the Rhode Island Coastal Resources Management Council.[110]

Nevertheless, despite the fact that states control the first three miles of ocean waters and submerged lands, several federal agencies and federal statutes can affect the operations of offshore wind farms in state waters.[111] Only two federal agencies, however, directly authorize the building and operation of these facilities. First, under the Federal Power Act, the Federal Energy Regulatory Commission (FERC) is empowered to license most electricity-generating facilities in the navigable waters—specifically, to issue

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[105] 16 U.S.C. §§ 1801-1883 (2012).
[106] 16 U.S.C. §§ 1361-1421h (2012).
[107] 16 U.S.C. §§ 1531-1544 (2012).
[108] Deepwater Wind, *Press Release: Block Island Wind Farm Receives First Major Project Permits*, http://dwwind.com/press/block-island-wind-farm-receives-first-major-project-permits-2/ (May 8, 2014). These certificates implement Rhode Island's water quality certification authority under Section 401 of the Clean Water Act, 33 U.S.C. § 1341(a). *Id*.
[109] *Id*.
[110] *Id*. For a fairly comprehensive description of offshore wind development and state regulatory regimes for offshore wind in Maine, Massachusetts, Rhode Island, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Louisiana, and Texas, see Georgia Coastal Research Council, *A Survey of State Regulation of Offshore Wind Facilities* 13-38 (Feb. 2013), *available at* http://www.gcrc.uga.edu/FocusAreas/offshore_energy/StateRegulationSurvey.pdf.
[111] For a fairly complete list of these statutes, see Georgia Coastal Research Council, *supra* note 110, at 10-12 tbl. 3.

licenses "for the purpose of constructing, operating, and maintaining dams, water conduits, reservoirs, power houses, transmission lines, or other project works necessary or convenient for the development and improvement of navigation and for the development, transmission, and utilization of power across, along, from, or in any of the streams or other bodies of water over which Congress has jurisdiction under its authority to regulate commerce with foreign nations and among the several States . . . ."[112] While FERC generally exercises this authority in connection with hydropower dams, it would seem to apply equally easily to offshore wind farms. With respect to the Block Island Wind Farm, however, FERC licensed Deepwater Wind to market wholesale electricity[113] but did not license the facility itself; under a 2009 interagency agreement, FERC's authority over offshore energy projects is generally limited to hydrokinetic projects—those that use waves and ocean currents to generate electricity.[114]

Instead, the U.S. Army Corps of Engineers ("Army Corps") is the primary federal licensing authority for offshore wind farms in state waters, and Block Island Wind Farm received a combined Section 10/Section 404 permit from that agency,[115] which has jurisdiction under two statutes to regulate offshore wind farms in state waters. First, under the Rivers and Harbors Act of 1899,[116] Congress gave the Army Corps authority to permit many structures that can interfere with navigation, including dams and dikes in the navigable waters (Section 9)[117] and, more generally, any potential obstruction of the navigable waters, including "any wharf, pier, dolphin, boom, weir, breakwater, bulkhead, jetty, or other structures in any port, roadstead, haven, harbor, canal, navigable river, or other water of the United States, outside established harbor lines, or where no harbor lines have been established" (Section 10).[118] As a result, almost any structure built in the ocean, including both offshore wind turbines and marine aquaculture facilities, potentially needs a Section 10 permit under the Rivers and Harbors Act.

In addition, the process of constructing those structures in state waters almost always requires a Section 404 "dredge and fill" permit from the Army Corps pursuant to the federal Clean Water Act.[119] Under this provision, the Army Corps issues permits for "the discharge of dredged or fill material into the navigable waters at specified disposal

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[112] 16 U.S.C. § 797(e) (2012).
[113] Federal Energy Regulatory Commission, Order Granting Market-Based Rate Authorization and Request for Waivers, *Deepwater Wind Block Island, LLC*, Docket No. ER16-1804-000 (July 26, 2016).
[114] Bureau of Ocean Energy Management, *Partnering with Federal Energy Regulatory Commission*, https://www.boem.gov/Environmental-Stewardship/Environmental-Studies/Partnerships/Partner-FERC.aspx (as vied Nov 6, 2017).
[115] U.S. Army Corps of Engineers, Permit Number: NAE-2009-789 (Block Island Wind Farm project) 2 (Sept. 4, 2014), *available at* http://www.nae.usace.army.mil/Portals/74/docs/Topics/DeepwaterWind/BlockIslandPermit.pdf.
[116] 33 U.S.C. §§ 401-426p (2012).
[117] *Id*. § 401.
[118] *Id*. § 403.
[119] 33 U.S.C. § 1344 (2012).

sites;"[120] the Act would otherwise make such discharges illegal.[121] The Section 404 permit requirement, however, applies only in the "navigable waters," which the Clean Water Act defines to be "the waters of the United States, including the territorial seas."[122] The "territorial sea," in turn, is "the belt of the seas measured from the line of ordinary low water along that portion of the coast which is in direct contact with the open sea and the line marking the seaward limit of inland waters, and extending seaward a distance of three miles"[123]—in other words, the first three miles of ocean that the states control under the Submerged Lands Act.

The Army Corps permit provides one mechanism for centralizing the federal permit and approval requirements for offshore wind farms in state waters. Block Island's Army Corps permit, for example, not only combined the Section 10 and Section 404 permit requirements but also reinforced Rhode Island's water quality requirements,[124] ensured protection of Essential Fish Habitat[125] designated under the federal Magnuson-Stevens Fishery Conservation and Management Act,[126] protected birds and bats,[127] complied with historic and cultural heritage protection requirements,[128] satisfied the Federal Aviation Administration's air traffic concerns,[129] satisfied the Coast Guard's marine navigation concerns,[130] and complied with the Marine Mammal Protection Act and the Endangered Species Act.[131] Nevertheless, this list gives some sense of how much federal regulation in addition to state regulation applies to offshore wind farms in state waters.

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[120] *Id*. § 1344(a).
[121] *Id*. § 1311(a). Part III.C.1 discusses the Clean Water Act's overall regulatory program in more detail in connection with marine aquaculture.
[122] *Id*. § 1362(7).
[123] *Id*. § 1362(8).
[124] U.S. Army Corps of Engineers, Permit Number: NAE-2009-789 (Block Island Wind Farm project) 5 ¶1 (Sept. 4, 2014), *available at* http://www.nae.usace.army.mil/Portals/74/docs/Topics/DeepwaterWind/BlockIslandPermit.pdf.
[125] *Id*. at 6 ¶¶ 8-14.
[126] 16 U.S.C. §§ 1801(b)(7), 1853(a)(7), 1855(b) (2012). Under the Act, "essential fish habitat" is "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." *Id*. § 1802(10). *See also infra* Part III.C.2 (discussing the Magnuson-Stevens Act in more detail).
[127] U.S. Army Corps of Engineers, *supra* note 120, at 7 ¶¶15-17.
[128] *Id*. ¶18.
[129] *Id*. ¶19.
[130] *Id*. at 7-10, ¶¶20-25.
[131] *Id*, at 10-19, ¶¶26-45. The Marine Mammal Protection Act prohibits "take"—" to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal," 16 U.S.C. § 1362(13) (2012)—of all marine mammals, *id.* § 1372(a)(1), (2), which in Block Island's case included the highly endangered Northern right whale. The federal Endangered Species Act requires permitting federal agencies to consult with the U.S. Fish & Wildlife Service and the National Marine Fisheries Service, 16 U.S.C. § 1536(a)(2) (2012), and also prohibits private entities from "taking" listed species, *id*. § 1538(a), which in Block Island's case included not only the Northern right whale but also sturgeon and sea turtles.

2. Regulation of Wind Farms in Federal Waters

Until 2005, jurisdictions battles plagued offshore wind development in federal waters. As in state waters, both FERC and the Army Corps had legitimate jurisdictional claims to regulating offshore wind farms. Indeed, Cape Wind Associates, the owners of the ill-fated Cape Wind project off the coast of Massachusetts (the project has been suspended since July 2015), which sited in the small pocket of federal waters in Cape Cod, originally approached the Amy Corps in 2001 for a permit under the Rivers and Harbors Act.[132]

Nevertheless, in the federal waters over the Outer Continental Shelf, the U.S. Department of the Interior also has a claim to jurisdiction over offshore wind farms. Under the 1953 Outer Continental Shelf Lands Act (OCSLA),[133] the Secretary of the Interior has authority to lease the federal Outer Continental Shelf.[134] Until the BP *Deepwater Horizon* oil spill in the Gulf of Mexico in 2010, the Minerals Management Service administered OCSLA leasing; since 2011, the agency has been the Bureau of Ocean Management (BOEM).[135] BOEM's leasing authority most directly pertains to mineral extraction, such as oil and gas,[136] sulphur,[137] and "other minerals."[138] Nevertheless, the Department of the Interior argued that OCSLA jurisdiction extended to offshore wind.

Congress resolved this three-way battle over primary jurisdiction in the Energy Policy Act of 2005.[139] Section 388 of this law amended the OCSLA to give the Interior Department authority to lease the Outer Continental Shelf for wind facilities.[140] Specifically, this new authority provides that the Secretary of the Interior,

> in consultation with the Secretary of the Department in which the Coast Guard is operating and other relevant departments and agencies of the Federal Government, may grant a lease, easement, or right-of-way on the outer Continental Shelf for activities not otherwise authorized in this subchapter, the Deepwater Port Act of 1974 (33 U.S.C. 1501 et seq.), the

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[132] Bureau of Ocean Energy Management, *Cape Wind*, https://www.boem.gov/Renewable-Energy-Program/Studies/Cape-Wind.aspx (as viewed Nov. 6, 2017).
[133] 43 U.S.C. §§ 1331-1356b (2012).
[134] *Id*. § 1334(a).
[135] For the full history of the reorganization of the Minerals Management Service into first the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) and then into BOEM and the Bureau of Safety and Environmental Enforcement (BSEE), see Bureau of Ocean Energy Management, *Reorganization of the Former MMS*, https://www.boem.gov/Reorganization/ (as viewed Nov. 6, 2017).
[136] 43 U.S.C. § 1337(a) (2012).
[137] *Id*. § 1337(i), (j).
[138] *Id*. § 1337(k).
[139] Energy Policy Act of 2005, Pub. L. No. 109-58, 119 Stat. 594 (2005).
[140] *Id*. § 388(a) (adding 43 U.S.C. § 1337(p)).

> Ocean Thermal Energy Conversion Act of 1980 (42 U.S.C. 9101 et seq.), or other applicable law, if those activities—
>
> (A) support exploration, development, production, or storage of oil or natural gas, except that a lease, easement, or right-of-way shall not be granted in an area in which oil and gas preleasing, leasing, and related activities are prohibited by a moratorium;
>
> (B) support transportation of oil or natural gas, excluding shipping activities;
>
> (C) produce or support production, transportation, or transmission of energy from sources other than oil and gas; or
>
> (D) use, for energy-related purposes or for other authorized marine-related purposes, facilities currently or previously used for activities authorized under this subchapter, except that any oil and gas energy-related uses shall not be authorized in areas in which oil and gas preleasing, leasing, and related activities are prohibited by a moratorium.[141]

In 2009, the Minerals Management Service promulgated regulations for its new renewable energy program on the Outer Continental Shelf.[142] At the same time, the Service announced a Memorandum of Understanding (MOU) with FERC regarding regulatory jurisdiction over offshore hydrokinetic (wave and ocean current) energy projects. Under this MOU,

> (1) MMS [now BOEM] has exclusive jurisdiction with regard to the production, transportation, or transmission of energy from non-hydrokinetic alternative energy projects on the OCS, including renewable energy sources such as wind and solar; (2) MMS [now BOEM] has exclusive jurisdiction to issue leases, easements, and rights-of-way regarding OCS lands for hydrokinetic projects; and (3) the Commission has exclusive jurisdiction to issue licenses and exemptions for hydrokinetic projects located on the OCS.[143]

Under this MOU and the renewable energy program regulations, and in parallel with oil and gas development under OCSLA, "BOEM's renewable energy program occurs in four

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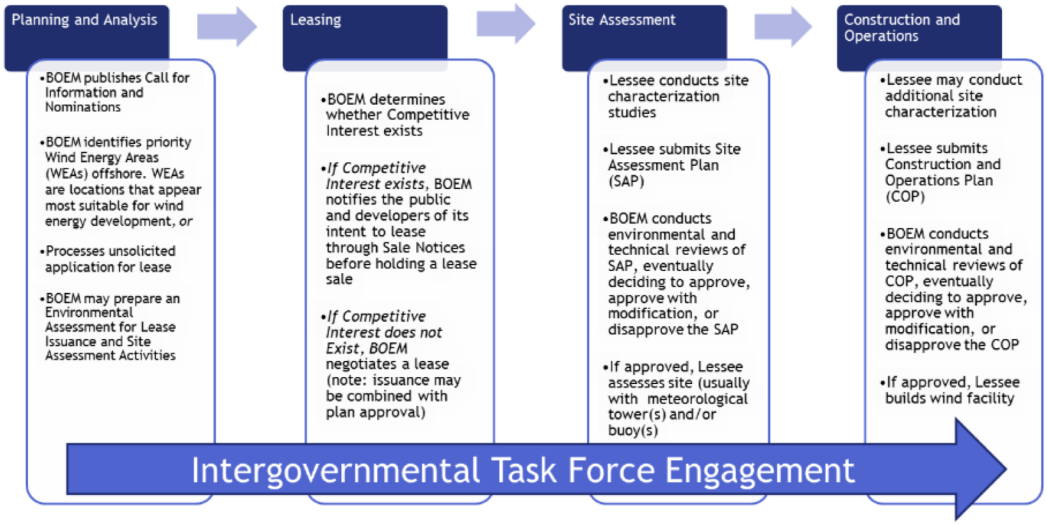
[141] 43 U.S.C. § 1337(p)(1) (2012).
[142] Minerals Management Service, U.S. Dept. of the Interior, Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf, 74 Fed. Reg. 19,638 (April 2009), *codified as* 30 C.F.R. §§ 285.100 to 285.1019.
[143] *Id*. at 19,639.

distinct phases: (1) planning and analysis, (2) lease issuance, (3) site assessment, and (4) construction and operations."[144]

Figure 2: BOEM's Regulatory Process for Offshore Wind
SOURCE: Bureau of Ocean Energy Management, https://www.boem.gov/Commercial-Leasing-Process-Fact-Sheet/



Despite the Energy Policy Act's and the MMS/FERC MOU's clarification of primary jurisdiction over offshore renewable energy facilities, the permitting and approval gauntlet for offshore wind projects in federal waters remains significant. For example, in addition to fulfilling the OCSLA leasing and approval processes, the Cape Wind project also required three Environmental Assessments, an Environmental Impact Statement (EIS), and a supplemental EIS under the National Environmental Policy Act (NEPA);[145] a conformity determination from the EPA under the Clean Air Act;[146] a Section 106 consultation with the Keeper of the National Register of Historic Places under the National Historic Preservation Act;[147] a Section 7 consultation with the U.S.

[144] Bureau of Ocean Energy Management, *Fact Sheet: Wind Energy Commercial Leasing Process* 1 (Dec. 19, 2011), *available at* https://www.boem.gov/Commercial-Leasing-Process-Fact-Sheet/.
[145] 42 U.S.C. § 4332(C) (requiring federal agencies to complete environmental impact analyses for "major Federal actions significantly affecting the quality of the human environment").
[146] *See* 42 U.S.C. § 7506(c)(1) (2012) ("No department, agency, or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license or permit, or approve, any activity which does not conform to" a State Implementation Plan).
[147] 54 U.S.C. § 306108 (2012) ("The head of any Federal agency having direct or indirect jurisdiction over a proposed Federal or federally assisted undertaking in any State and the head of any Federal department or independent agency having authority to license any undertaking, prior to the approval of the expenditure of any Federal funds on the undertaking or prior to the issuance of any license, shall take into account the

Fish & Wildlife Service under the federal Endangered Species Act;[148] a consultation with the Federal Aviation Administration; and a consultation with the U.S. Coast Guard.[149] In addition, completed offshore wind farms in federal waters still must transmit their electricity to shore—across state-owned submerged lands. As a result, they require permits or leases from the relevant states to transmit their electricity.

C. Regulating Marine Aquaculture in the United States

In 2004, the U.S. Commission on Ocean Policy critiqued the current state of marine aquaculture regulation in the United States, noting that:

> Aquaculture operations in offshore waters lack a clear regulatory regime, and questions about exclusive access have created an environment of uncertainty that is detrimental to investment in this industry. . . . A lead federal agency with an office dedicated to marine aquaculture is needed to address jurisdictional issues and to ensure the development of an economically and environmentally sound marine aquaculture industry.[150]

Unfortunately, nothing much has changed in the almost decade and a half since that report. Indeed, the deep uncertainty regarding how marine aquaculture facilities will be regulated is generally considered a hindrance to that industry's development.[151]

Congress has addressed marine aquaculture but has not yet produced a centralized regulatory regime for it. In 1980, for example, it enacted the National Aquaculture Act

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effect of the undertaking on any historic property. The head of the Federal agency shall afford the Council a reasonable opportunity to comment with regard to the undertaking.') Until December 2014, this provision was codified as 16 U.S.C. § 470f. Pub. L. No. 113-287, § 7, 128 Stat. 3272 (Dec. 19, 2014).

[148] 16 U.S.C. § 1536(a)(2) (2012) ("Each Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency (hereinafter in this section referred to as an "agency action") is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary, after consultation as appropriate with affected States, to be critical").

[149] Bureau of Ocean Energy Management, *Cape Wind*, https://www.boem.gov/Renewable-Energy-Program/Studies/Cape-Wind.aspx (as viewed Nov. 6, 2017).

[150] 2004 USCOP FINAL REPORT, *supra* note 14, at 330.

[151] Harold F. Upton & Eugene H. Buck, Congressional Research Service, *Open Ocean Aquaculture* 2 (Aug. 9, 2010), *available at* http://nationalaglawcenter.org/wp-content/uploads/assets/crs/RL32694.pdf; Madi Gamble, "Did You Know? All About Aquaculture: Current Status in New England," *TalkingFish.org*, https://www.talkingfish.org/2012/did-you-know/all-about-aquaculture-current-status-in-new-england (Oct. 23, 2012) (opining that "the lack of a simple, comprehensive regulatory structure for the [marine aquaculture] industry remains a major barrier to the growth of aquaculture operations in the United States.").

to encourage the development of aquaculture in the United States.[152] The Act addresses all aquaculture, marine and freshwater, and declares a national policy

> that aquaculture has the potential for reducing the United States trade deficit in fisheries products, for augmenting existing commercial and recreational fisheries and for producing other renewable resources, thereby assisting the United States in meeting its future food needs and contributing to the solution of world resource problems. It is, therefore, in the national interest, and it is the national policy, to encourage the development of aquaculture in the United States.[153]

The Act requires the Secretaries of Agriculture, Commerce, and the Interior to develop a National Aquaculture Development Plan,[154] which is designed to identify aquacultured species with commercial potential and to promote research into their production.[155] However, the Act creates no regulatory program for aquaculture; indeed, it required the Secretaries to produce a report on the regulatory constraints on aquaculture and to then act on that report's findings to reduce those constraints.[156]

Congress became interested in regulating marine—specifically, open ocean—aquaculture in 2007, when bills to enact the National Offshore Aquaculture Act were introduced into both houses at the request of the George W. Bush Administration.[157] However, neither bill was voted upon, let alone enacted.[158] As a result, marine aquaculture still lacks a centralized regulatory program.

In the absence of a specific statutory regime, several federal agencies can claim jurisdiction over marine aquaculture facilities, and, unlike for offshore wind, Congress has not resolved these jurisdictional battles. As a starting point, the U.S. Commission on Ocean Policy identified five federal agencies that marine aquaculture project owners need to consult or from which a permit is required "before an aquaculture facility can proceed": the U.S. Army Corps of Engineers, from which aquaculture facilities need a Section 10 permit pursuant to the Rivers and Harbors Act[159] and/or a Section 404 permit under the Clean Water Act[160]; the Coast Guard, which is responsible for safe

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[152] Pub. L. No. 96-362, 94 Stat. 1198 (Sept. 26, 1980), as amended by Pub. L. No. 99-198, Title XVII, 99 Stat. 1641 (Dec. 23, 1985), and codified as 16 U.S.C. §§ 2801-2810 (2012).
[153] 16 U.S.C. § 2801(c) (2012).
[154] *Id*. § 2803(a); "Secretaries" is defined in *id*. § 2802(7).
[155] *Id*. § 2803(b), (c).
[156] *Id*. § 2808.
[157] Upton & Buck, *supra* note 151, at 1.
[158] *Id*.
[159] 33 U.S.C. § 403 (2012).
[160] 33 U.S.C. § 1344(a) (2012). Shellfish aquaculture can generally make use of the Army Corps' Nationwide Permit 48 (NWP 48), which covers both the Section 10 and Section 404 permit requirements.

navigation[161]; the EPA pursuant to the Clean Water Act[162]; regional Fisheries Management Councils (FMCs) and NOAA, which claim jurisdiction to regulation marine aquaculture under the Magnuson-Stevens Fishery Conservation and Management Act[163]; and the U.S. Fish & Wildlife Service and NMFS/NOAA Fisheries, if species listed under the federal Endangered Species Act[164] are present in the area of the facility.[165] In addition, aquaculture facilities must generally lease the underlying continental shelf,[166] either from the relevant state or the federal government. Finally, "[t]he FDA [federal Food & Drug Administration] ensures that seafood from aquaculture operations is safe for human consumption. This includes making sure that feed and any drugs or chemicals used in the industry are FDA approved and properly administered. The USDA [U.S. Department of Agriculture] oversees issues related to disease and aquatic animal health in general."[167]

FDA and USDA regulation relevant to marine aquaculture is part of these agencies' normal regulatory functions pertaining to, respectively, animal drugs[168] and food supply regulation[169]; the agencies do not regulate whether or where marine aquaculture actually occurs. Similarly, Endangered Species Act consultation does not differ legally for aquaculture facilities than for any other projects that can trigger that requirement,[170] and Rivers and Harbors Act and Section 404 permitting are much the

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U.S. Amry Corps of Engineers, *Summary of the 2017 Nationwide Permits* 8 (Jan. 5, 2017), *available at* http://www.usace.army.mil/Portals/2/docs/civilworks/nwp/2017/nwp2017_sumtable_Jan2017.pdf?ver=2017-01-06-091151-173. *See also* National Oceanic & Atmospheric Administration, *State-by-State Shellfish Aquaculture Permitting Information* (Feb. 2016), *available at* http://www.nmfs.noaa.gov/aquaculture/shellfish_portal/state_permitting_shellfish_aq2016feb18.pdf.

[161] *E.g.*, U.S. Coast Guard, U.S. Dept. of Homeland Security, *USCG Navigation Rules and Regulations Handbook*, https://www.navcen.uscg.gov/?pageName=navRuleChanges (as viewed Nov. 5, 2017).

[162] 33 U.S.C. §§ 1251-1388 (2012).

[163] 16 U.S.C. §§ 1801-1884 (2012).

[164] 16 U.S.C. §§ 1531-1540 (2012).

[165] 2004 USCOP FINAL REPORT, *supra* note 14, at 100 Box 6.1.

[166] *See* discussion *infra* Part III.C.3.

[167] Madi Gamble, "Did You Know? All About Aquaculture: Current Status in New England," *TalkingFish.org*, https://www.talkingfish.org/2012/did-you-know/all-about-aquaculture-current-status-in-new-england (Oct. 23, 2012).

[168] Food, Drug, and Cosmetic Act, 21 U.S.C. §§ 301-399d (2012). New food safety amendments in 2007 also specifically addressed aquaculture. 21 U.S.C. § 2105 (2012).

[169] *See*, *e.g.*, Food Safety & Inspection Services, U.S. Dept. of Agriculture, *Food Defense and Emergency Response*, https://www.fsis.usda.gov/wps/portal/fsis/topics/inspection/siluriformes/!ut/p/a1/04_Sj9CPykssy0xPLMnMz0vMAfGjzOINAg3MDC2dDbz8LQ3dDDz9wgL9vZ2dDSwcTYAKIvEo8DMmUj8O4GhASL8XERYYFfk6-6brRxUklmToZual5etHFGfmlBZlpuUX5aYW64frR6GaYmAIhJ5-xsEmHl5-xgb-JugKsHgTogC3PwpyQyOqfNKCPdMVFQHyEAOV/?1dmy&urile=wcm%3apath%3a%2FFSIS-Content%2Finternet%2Fmain%2Ftopics%2Ffood-defense-and-emergency-response (as updated June 5, 2017, and viewed Nov. 5, 2017). In addition, the USDA is committed by statute to actively promoting aquaculture. 7 U.S.C. §§ 3321, 3322, & 3324 (2012).

[170] For overviews of Endangered Species Act consultations, see U.S. Fish & Wildlife Service, *Fact Sheet: Consultations with Federal Agencies* 1-2 (April 2011), *available at* https://www.fws.gov/endangered/esa-

same for aquaculture as for offshore wind.[171] As a result, this section will focus on Clean Water Act regulation of aquaculture, the emerging regulatory role of the Magnuson-Stevens Act in regulating aquaculture, and continental shelf leasing.

1. The Clean Water Act

U.S. regulation of marine aquaculture has historically focused much more on the environmental impacts of that industry than on its spatial demands.[172] The U.S. Commission neatly summarized the environmental concerns for nearshore aquaculture as including:

> the spread of disease among fish populations, genetic contamination and competition between farmed and native stocks, and effects from aquaculture operations on water quality, wetlands, and other natural habitats. Fish waste, dead fish, uneaten food, and antibiotics may contaminate the water around aquaculture facilities and harm surrounding ecosystems. Marine mammals, attracted by the food source, can become entangled in nets. There are also concerns about the increased demand for fishmeal used to feed farm-raised carnivorous fish. Obtaining fishmeal from traditional wild harvest practices may increase the pressure on fisheries that are already fully exploited. Extensive research is underway by the aquaculture community to determine how to decrease this demand.
>
> Another issue of increasing concern is the possible introduction of non-native species (intentionally or unintentionally) through marine aquaculture operations. In the United States, many cultured marine species are not native to the area where they are being farmed. In these cases, there is the possibility that foreign (or genetically-modified) animals or their reproductive offspring may escape and potentially compete or reproduce with wild populations, resulting in unpredictable changes to ecological, biological, and behavioral characteristics. Where non-native species come in contact with already depleted fish or shellfish stocks, recovery efforts may be hampered.[173]

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library/pdf/consultations.pdf; NOAA Fisheries, National Oceanic & Atmospheric Administration, *Consultation with Federal Agencies*, http://www.nmfs.noaa.gov/pr/consultation/ (as updated Sept. 24, 2014, and viewed Nov. 5, 2017). The consultation requirement comes from Section 7 of the ESA. 16 U.S.C. § 1536(a)(2) (2012).

[171] *See* discussion *supra* Part III.B; Upton & Buck, *supra* note 151, at 14.

[172] Robin Kundis Craig, *The Other Side of Sustainable Aquaculture: Mariculture and Nonpoint Source Pollution*, 9 WASH. U.J.L. & POL'Y 163, 164 (2002).

[173] 2004 USCOP FINAL REPORT, supra note 14, at 331. *See also* Craig, *Sustainable Aquaculture*, *supra* note 172, at 172-73 (listing similar environmental concerns).

Open ocean aquaculture simultaneously alleviates many environmental concerns and raises new regulatory and commercial issues. For example,

> Locating marine aquaculture activities farther offshore may reduce the visibility of these activities from land, be less intrusive to fisheries and recreational activities, and have fewer environmental impacts than activities located in nearshore areas. However, the logistics associated with operating offshore facilities are also more difficult, requiring long transit times for workers and supplies, and other technical complications. Offshore aquaculture structures must also be designed to withstand the effects of extreme winds, waves, and temperatures, and be positioned in a way that does not create a hazard to navigation.[174]

Nevertheless, the environmental impacts of open ocean aquaculture can still generate much concern.[175]

Given this concern with marine aquaculture's environmental, and particularly water quality, impacts, the most universal requirements for marine aquaculture come from the federal Clean Water Act.[176] In general, the Clean Water Act establishes a national goal "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."[177] The nation's waters, for regulatory purposes, explicitly include all parts of the ocean,[178] and Congress also explicitly included aquaculture within the ambit of activities that the Act regulates.[179]

The Clean Water Act's primary mechanism for achieving its water quality goals is a general prohibition of any "discharge of any pollutant" except in accordance with the Act's permit programs.[180] The most general of these permit programs is the Section 402 National Pollutant Discharge Elimination System (NPDES) permit program,[181] which gives the Administrator of the EPA initial authority to issue permits "for the discharge of

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[174] *Id*. *See also* Upton & Buck, *supra* note 151, at 10 ("Proponents of open ocean aquaculture suggest that open ocean finfish aquaculture systems may produce fewer and less severe environmental impacts than those caused by nearshore aquaculture systems. This may be in part because dissolved and particulate waste products and excess feed may be assimilated and recycled more efficiently in the open ocean environment. However, the scope of any effects may vary greatly, depending on the culture technique, location, size/scale, and species raised.").
[175] *Id*. at 10-13.
[176] 33 U.S.C. §§ 1251-1388 (2012).
[177] *Id*. § 1251(a).
[178] *Id*. § 1362(7)-(10) (defining, respectively, "navigable waters," "territorial sea," "contiguous zone," and "ocean"). The Act's prohibition on "discharges of pollutants" applies to all of these waters. *Id*. § 1362(12).
[179] *See id*. § 1328 (specifically discussing aquaculture projects).
[180] *Id*. § 1311(a).
[181] *Id*. s 1342.

any pollutant, or combination of pollutants," notwithstanding the general prohibition.[182] States can acquire permit program authority from the EPA,[183] and most coastal states have in fact done so.[184] The Act's more limited permit program, the Section 404 permit program, applies to discharges of dredged or fill material (in other words, construction activities), including along the coast, and is administered in almost all states by the U.S. Army Corps of Engineers.[185] Both permit programs are relevant to marine aquaculture—Section 404 with respect to facility construction, and Section 402 for facility operations. As noted, Section 404 permitting for marine aquaculture is very similar to Section 404 permitting for wind turbines, so this discussion will concentrate on Section 402 NPDES permit requirements.

The discharge limitations in most NPDES permits are based on water quality standards and effluent limitations. Effluent limitations are technology-based, numeric or narrative "restriction[s] . . . on quantities, rates, and concentrations of chemical, physical, biological, and other constituents which are discharged from point sources into navigable waters, the waters of the contiguous zone, or the ocean, including schedules of compliance."[186] Water quality standards, in turn, describe the overall goal of water quality for a given body of water.[187] In particular, water quality standards "consist of the designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses."[188] Designated uses delineate what the state wants the water body to be used for. Such uses include "public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial, and other purposes . . . ."[189] Water quality criteria create standards for water quality that will allow the water body to achieve the designated uses.[190]

Discharges into the ocean are subject to another set of limitations as well. Under Section 403 of the Clean Water Act, no NPDES permit "for a discharge into the territorial sea, the waters of the contiguous zone, or the oceans shall be issued, . . . except in compliance with . . . guidelines" that the EPA establishes pursuant to that section.[191] These guidelines, known as "ocean discharge criteria," are for "determining the degradation of the waters of the territorial seas, the contiguous zone, and the oceans."[192]

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[182] *Id*. § 1342(a)(1).
[183] *Id*. § 1342(b).
[184] U.S. Environmental Protection Agency, *NPDES State Program Information: State Program Authority*, https://www.epa.gov/npdes/npdes-state-program-information (as updated Sept. 27, 2017, and viwed Nov. 5, 2017).
[185] 33 U.S.C. § 1344(a), (b) (2012).
[186] 33 U.S.C. § 1362(11) (2012).
[187] *Id*. § 1313.
[188] *Id*. § 1313(c)(2)(A).
[189] *Id*.
[190] 40 C.F.R. §122.44(d)(1)(vi)(A) (2017).
[191] 33 U.S.C. § 1343(a) (2012).
[192] *Id*. §1343(c). These guidelines are based on:

The EPA promulgated ocean discharge criteria in 1980 that have remained in place ever since.[193]

Congress explicitly address aquaculture in the Clean Water Act. Indeed, to encourage aquaculture projects, Congress included a special section in the Act, Section 318,[194] and made the general NPDES permit program subject to its provisions when aquaculture projects are involved.[195] Under Section 318, "[t]he Administrator is authorized . . . to permit the discharge of a specific pollutant or pollutants under controlled conditions associated with an approved aquaculture project under Federal or State supervision pursuant to" the NPDES permit program.[196] States may acquire aquaculture permitting authority,[197] but "[t]he Administrator shall by regulation establish any procedures and guidelines which the Administrator deems necessary to carry out" aquaculture permitting.[198]

The EPA's regulations define an "aquaculture project" as "a defined managed water area which uses discharges of pollutants into that designated area for the maintenance or production of harvestable freshwater, estuarine, or marine plants or

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> (A) the effect of disposal of pollutants on human health or welfare, including but not limited to plankton, fish, shellfish, wildlife, shorelines, and beaches;
>
> (B) the effect of disposal of pollutants on marine life including the transfer, concentration, and dispersal of pollutants or their byproducts through biological, physical, and chemical processes; changes in marine ecosystem diversity, productivity, and stability; and species and community population changes;
>
> (C) the effect of disposal, of pollutants on esthetic, recreation, and economic values;
>
> (D) the persistence and permanence of the effects of disposal of pollutants;
>
> (E) the effect of the disposal at varying rates, of particular volumes and concentrations of pollutants;
>
> (F) other possible locations and methods of disposal or recycling of pollutants including land-based alternatives; and
>
> (G) the effect on alternate uses of the oceans, such as mineral exploitation and scientific study.

Id.

[193] 45 Fed. Reg. 65,942, 65,953 (Oct. 3, 1980), codified at 40 C.F.R. §§125.120 to 125.124 (2017).

[194] 33 U.S.C. § 1328 (2012).

[195] *See id*. §1342(a)(1) (noting that the Administrator of the EPA may issue NPDES permits "[e]xcept as provided in section[] 1328").

[196] *Id*. § 1328(a).

[197] *Id*. § 1328(c).

[198] *Id*. § 1328(b).

animals."[199] Section 318 and the EPA's regulations promote allowing the discharges that make such projects possible—for example, additions of food, antibiotics, and pesticides. For example, permitting agencies need not subject aquaculture projects to the technology-based effluent limitations that apply most NPDES permits, "except with respect to toxic pollutants."[200]

Nevertheless, even aquaculture projects could involve the unintended pollution of downstream waters by aquaculture wastes and by-products. To deal with this unintended pollution, the EPA has set standards for approving aquaculture projects.[201] Aquaculture projects must comply with the Section 403 ocean discharge criteria and state plans for controlling water pollution;[202] in addition, "[n]o NPDES permit shall be issued to an aquaculture project unless:"

> (1) The Director determines that the aquaculture project:
>
> > (i) Is intended by the project operator to produce a crop which has significant direct or indirect commercial value (or is intended to be operated for research into possible production of such a crop); and
> >
> > (ii) Does not occupy a designated project area which is larger than can be economically operated for the crop under cultivation or than is necessary for research purposes.
>
> (2) The applicant has demonstrated, to the satisfaction of the Director, that the use of the pollutant to be discharged to the aquaculture project will result in an increased harvest of organisms under culture over what would naturally occur in the area;
>
> (3) The applicant has demonstrated, to the satisfaction of the Director, that if the species to be cultivated in the aquaculture project is not indigenous to the immediate geographical area, there will be minimal adverse effects on the flora and fauna indigenous to the area, and the total commercial value of the introduced species is at least equal to that of the displaced or affected indigenous flora and fauna;
>
> (4) The Director determines that the crop will not have a significant potential for human health hazards resulting from its consumption;

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[199] 40 C.F.R. § 122.25(b)(1) (2017).
[200] *Id*. § 122.10(c).
[201] *Id.* § 125.11.
[202] *Id*. § 125.11(b), (c).

> (5) The Director determines that migration of pollutants from the designated project area to water outside of the aquaculture project will not cause or contribute to a violation of water quality standards or a violation of the applicable standards and limitations applicable to the supplier of the pollutant that would govern if the aquaculture project were itself a point source. The approval of an aquaculture project shall not result in the enlargement of a pre-existing mixing zone area beyond what had been designated by the State for the original discharge.[203]

Finally, "[d]esignated project areas shall not include a portion of a body of water large enough to expose a substantial portion of the indigenous biota to the conditions within the designated project area,"[204] and "[a]ny modifications caused by the construction or creation of a reef, barrier or containment structure"—which might themselves require an additional permit under Section 404 of the Act[205]—"shall not unduly alter the tidal regimen of an estuary or interfere with migrations of unconfined aquatic species."[206]

Thus, although the EPA's regulations focus primarily on discharges into the aquaculture project, they also forbid aquaculture projects from interfering the general ecology of the surrounding waters, either structurally, through the introduction of foreign species or new disease, or through pollution of the waters. In addition, these regulations also seek to ensure that the aquaculture project uses the minimum space required and is more productive than the natural environment.

While the regulations for aquaculture projects focus on the siting and inputs to an aquaculture facility, the regulations for an aquatic animal production facility (AAPF) focus on the accumulation pollution that such facilities can cause.[207] AAPFs are the aquatic equivalent of terrestrial animal feeding operations, or AFOs. As is true for their terrestrial counterparts (concentrated animal feeding operations (CAFOs), or animal feedlots), AAPFs become water quality problems when the facility collects many animals into relatively small confined spaces, creating concentrated AAPFs, or CAAPFs. While CAAPFs are generally land-based aquaculture facilities, the EPA's effluent limitations for CAAPFs also apply to net pen aquaculture located within ocean waters.[208] As the EPA notes, "Net pen systems typically are located along a shore or pier or may be

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[203] *Id*. § 125.11(a).
[204] *Id*. § 125.11(d).
[205] 33 U.S.C. § 1344(a) (2012).
[206] 40 C.F.R. § 125.11(e) (2017).
[207] Revisions to the Water Quality Planning and Management Regulation and Revisions to the National Pollutant Discharge Elimination System Program in Support of Revisions to the Water Quality Planning and Management Regulation, 65 Fed. Reg. 43,586, 43,649 (July 13, 2000).
[208] U.S. Environmental Protection Agency, *Concentrated Aquatic Animal Protection Effluent Guidelines*, https://www.epa.gov/eg/concentrated-aquatic-animal-production-effluent-guidelines (as viewed Nov. 3, 2017).

anchored and floating offshore. The most significant net pen operations are salmon net pens located in the northeastern and northwestern coastal areas of the United States. Other species, such as steelhead trout, cobia and redfish, also can be cultured in net pen operations."[209] However, to qualify as CAAPFs, net pen aquaculture must "[d]irectly discharge wastewater" and "[p]roduce at least 100,000 pounds of fish, molluscs or crustaceans a year."[210]

CAAPFs must get NPDES permits.[211] The EPA promulgated the current effluent limitations for CAAPFs in 2004.[212] Under these regulations, all net pen CAAPFs must: manage feeding to minimize waste; collect and dispose of waste; minimize discharges in the transportation and harvest of the animals; promptly remove the carcasses of dead animals; store drugs, pesticides, and feeds so as to minimize spills; maintain the net pen; keep records about feeding, animal production, and net pen maintenance; and properly train staff.[213] In addition, these facilities must notify the relevant permitting authority: "of the use . . . of any investigational new animal drug (INAD) or any extralabel drug use where such a use may lead to a discharge of the drug to waters of the U.S."; of any "[f]ailure in, or damage to, the structure of an aquatic animal containment system resulting in an unanticipated material discharge of pollutants to waters of the U.S.;" and of the facility's "Best management practices (BMP) plan."[214]

2. The Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act[215] is the federal statute that regulates commercial and recreational fishing in federal waters (and,

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[209] *Id*. Under the regulations, "net pen system" "means a stationary, suspended or floating system of nets, screens, or cages in open waters of the United States. Net pen systems typically are located along a shore or pier or may be anchored and floating offshore. Net pens and submerged cages rely on tides and currents to provide a continual supply of high-quality water to the animals in production." 40 C.F.R. § 451.2(j) (2017).

[210] U.S. Environmental Protection Agency, *Concentrated Aquatic Animal Protection Effluent Guidelines*, https://www.epa.gov/eg/concentrated-aquatic-animal-production-effluent-guidelines (as viewed Nov. 3, 2017). *See also* 40 C.F.R. Pt. 122, appendix C (2017) (providing the more technical requirements for a facility to qualify as a CAAPF).

[211] 40 C.F.R. § 122.24(a) (2017).

[212] U.S. Environmental Protection Agency, Effluent Limitations Guidelines and New Source Performance Standards for the Concentrated Aquatic Animal Production Point Source Category, 69 Fed. Reg. 51,927 (Aug. 23, 2004).

[213] 40 C.F.R. §§ 451.21 (2017) (effluent limitations for existing net pen CAAPFs based on Best Practicable Technology (BPT), 451.24 (imposing identical new source performance standards (NSPS) on new net pen CAAPFs). The effluent limitations for existing net pen CAAPFs based on Best Available Technology Economically Achievable (BAT) and Best Conventional Technology (BCT) are also identical to the BPT limitations. *Id*. §§ 451.22, 451.23.

[214] *Id*. § 451.3. To fulfill the BMP plan requirements, the facility must "[d]evelop and maintain a plan on site describing how the permittee will achieve the" effluent limitation requirements. *Id*. § 451.3(d).

[215] 16 U.S.C. §§ 1801-1884 (2012).

to a more limited extent, in state waters[216]). It created eight regional Fishery Management Councils (FMCs)[217] overseen by the Secretary of Commerce, who has delegated much of his/her authority to NOAA Fisheries (also known as the National Marine Fisheries Service or NMFS).[218] One of the primary functions of each regional FMC is to "prepare and submit to the Secretary a fishery management plan [FMP] with respect to each fishery within its geographical area of authority and, from time to time, such amendments to each such plan as are necessary . . . ."[219] NOAA Fisheries and the regional FMCs currently "track[] 473 fish stocks managed by 46 fishery management plans."[220]

For any species managed under the act, the management goal is "optimum yield."[221] To achieve this goal, FMPs must meet 10 national standards[222] and contain 15 mandatory requirements.[223] FMPs can also contain a plethora of other provisions at the FMC's discretion, including permit requirements, fishing zones, catch limitations, and gear limitations.[224]

Because the Magnuson-Stevens Act focuses on wild populations of fish, aquaculture is a poor fit for its regulatory mechanisms. Nevertheless, as the U.S. Commission on Ocean Policy observed in 2004,

> Although the Magnuson–Stevens Fishery Conservation and Management Act may not have been intended as a mechanism for managing marine aquaculture, the National Oceanic and Atmospheric Administration asserts that the harvest of aquaculture species falls under the Act. Therefore, the Regional Fishery Management Councils (RFMCs) may develop management measures for aquaculture in offshore waters and the National Marine Fisheries Service (NMFS) may regulate aquaculture harvest based on RFMC recommendations.[225]

To date, although "several regional fishery management councils have exercised regulatory oversight over open ocean aquaculture," the New England Fishery

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[216] *Id*. § 1856(b).
[217] The eight regions are New England, the Mid-Atlantic, the South Atlantic, the Caribbean, the Gulf of Mexico, the Pacific, the North Pacific, and the Western Pacific *Id*. § 1852(a).
[218] NOAA Fisheries, NOAA, *About Us*, http://www.nmfs.noaa.gov/aboutus/aboutus.html (as viewed Dec. 24, 2016).
[219] 16 U.S.C. § 1852(h)(1) (2012).
[220] NOAA Fisheries, *Our Work: Fisheries*, http://www.noaa.gov/fisheries (as viewed Dec. 26, 2016).
[221] 16 U.S.C. § 1851(a)(1) (2012).
[222] *Id*. § 1851(a).
[223] *Id*. § 1853(a).
[224] *Id*. s 1853(b).
[225] 2004 USCOP FINAL REPORT, *supra* note 14, at 101 Box 6.1.

Management Council (NEFMC) and the Gulf of Mexico Fishery Management Council (GOMFMC) "have been particularly active in this respect."[226]

Marine aquaculture is a substantial industry in New England, dominated by Atlantic salmon.[227] However, several other fish, shellfish, and seaweed species are aquacultured commercially and experimentally, including American oyster, Atlantic cod, Atlantic sea scallop, barramundi, bay scallops, blue mussel, European oyster, green sea urchin, quahog, seaweed, soft-shelled clams, steelhead trout, summer flounder, sea bass, and sea bream.[228] The NEFMC "has established evaluation criteria for open ocean aquaculture proposals that encourage the use of best management practices aimed at reducing environmental and fishery impacts."[229] As early as 1996, moreover, it began amending FMPs to allow for aquaculture research projects.[230] In 1999, it began proposing management measures for aquacultured Atlantic salmon in order to promote the rehabilitation of overfished wild salmon stocks.[231] Under the 1999 regulations still in force, "[t]he New England Fishery Management Council (NEFMC) may, at any time, initiate action to implement, add to or adjust Atlantic salmon management measures to allow for Atlantic salmon aquaculture projects in the EEZ, provided such an action is consistent with the goals and objectives of the Atlantic Salmon FMP."[232]

The GOMFMC began its program for regulating aquaculture in federal waters in January 2009, when it voted to approve a permitting regime.[233] This vote touched off a jurisdictional battle within Congress regarding the whole issue of open ocean

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[226] Upton & Buck, *supra* note 151, at 14-15.

[227] Madi Gamble, "Did You Know? All About Aquaculture: Current Status in New England," *TalkingFish.org*, https://www.talkingfish.org/2012/did-you-know/all-about-aquaculture-current-status-in-new-england (Oct. 23, 2012).

[228] *Id*.; George LaPointe, *Overview of the Aquaculture Sector in New England* 3-6 (Jan. 2013), *available at* http://georgelapointeconsulting.com/uploads/3/4/3/4/34346476/aquaculture_review_paper.pdf.

[229] Upton & Buck, *supra* note 151, at 15.

[230] U.S. Dept. of Commerce, Fisheries of the United States; Amendment 5 to the Atlantic Sea Scallop Fishery Management Plan, 61 Fed. Reg. 45,305, 45,395 (Aug. 29, 1996) ("NMFS announces that the New England Fishery Management Council (Council) has submitted Amendment 5 to the Fishery Management Plan for the Atlantic Sea Scallop Fishery (FMP) for Secretarial review and is requesting comments from the public. Amendment 5 would temporarily close a 9 mi^2 (23.31 km^2) site to support a scallop aquaculture research project. The intended effect of the closure would be to prevent conflicts between fishing gear and project equipment for the limited duration of the research project."). NMFS approved the project in a final rule issued in January 1997. U.S. Dept. of Commerce, Fisheries of the United States; Atlantic Sea Scallop Fishery; Amendment 5, 62 Fed. Reg. 1829, 1829 (Jan. 14, 1997).

[231] National Oceanic & Atmospheric Administration, U.S. Dept. of Commerce, Fisheries of the Northeastern United States; Amendment 1 to the Atlantic Salmon Fishery Management Plan, 64 Fed. Reg. 5754, 5754 (Feb. 9, 1999).

[232] National Oceanic & Atmospheric Administration, U.S. Dept. of Commerce, Fisheries of the Northeastern United States; Amendment 1 to the Atlantic Salmon Fishery Management Plan, 64 Fed. Reg. 40,519, 40,520 (July 27, 1999) (codified as 50 C.F.R. § 648.41(a)).

[233] Upton & Buck, *supra* note 151, at ii, 1-2.

aquaculture, including over whether it should be allowed;[234] however, as noted, Congress has not superseded FMC aquaculture regulation.

In January 2016, the GOMFMC promulgated a revised and more comprehensive regime to regulate aquaculture in federal waters of the Gulf of Mexico.[235] The regulation makes offshore aquaculture its own FMP,[236] and it "requires persons who want to conduct select aquaculture activities in the Gulf exclusive economic zone (EEZ) to apply for and obtain a Gulf aquaculture permit. This permit authorizes the operation of an offshore aquaculture facility in the Gulf EEZ and allows the sale of allowable aquaculture species cultured at an offshore aquaculture facility in the Gulf EEZ."[237] However, the aquaculture regime created is limited in several ways: only citizens and permanent resident aliens can obtain permits;[238] the permits initially last only 10 years, with five-year renewal terms;[239] the aquacultured organisms must be native to the Gulf of Mexico[240] and not genetically engineered;[241] only 20 permits total are allowed; and the FMP imposes total harvest limits on the industry:

> The FMP establishes an annual catch limit (ACL) for offshore aquaculture in the Gulf EEZ of 64 million lb (29 million kg), round weight . . . . This maximum level of harvest represents the average landings of all marine species in the Gulf, except menhaden and shrimp, between 2000–2006. Also, the FMP limits a person, corporation, or other entity from producing, annually, more than 20 percent of the total annual ACL (12.8 million lb (5.8 million kg), round weight) for offshore aquaculture in the Gulf EEZ, to ensure entities do not obtain an excessive share of the ACL.[242]

Permits cost $10,000 initially, with a $1000 fee each year; renewal applications cost $5000.[243]

The aquaculture FMP also imposes extensive siting and technology requirements on aquaculture facilities intended primarily to protect the marine environment but also spread out the facilities themselves. For example, "[a]quaculture facilities are prohibited

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[234] *Id*.
[235] National Oceanic & Atmospheric Administration, Dept. of Commerce, Fisheries of the Caribbean, Gulf, and South Atlantic; Aquaculture, 81 Fed. Reg. 1762 (Jan. 13, 2016), *codified* at 50 C.F.R. §§ 622.100-622.109 (2017).
[236] 81 Fed. Reg. at 1762.
[237] *Id*.
[238] *Id*.
[239] *Id*.
[240] *Id*. at 1765.
[241] *Id*. at 1763.
[242] *Id*. at 1764.
[243] *Id*. at 1762.

in Gulf EEZ marine protected areas, marine reserves, habitat areas of particular concern (HAPCs), Special Management Zones, permitted artificial reef areas, and coral areas," and all facilities must be built to withstand hurricanes.[244] In addition, "[n]o aquaculture facility may be sited within 1.6 [nautical miles] (3 km) of another aquaculture facility," and "[p]ermit sites must be twice as large as the combined area encompassed by the approved aquaculture systems to allow for best management practices such as the rotation of systems for fallowing."[245] "Siting criteria include but are not limited to the following: Results of the baseline environmental survey; site depth; frequency of harmful algal blooms or hypoxia; and location of the site relative to marine mammal migratory pathways, important natural habitats, and fishing grounds," and use of a proposed site can be denied if the aquaculture operation would interfere with Essential Fish Habitat, endangered or threatened species, or other commercial and recreational users in the area, if the site would expose the aquacultured animals to low dissolved oxygen or harmful algal blooms, or if the geography of the site would interfere with waste dispersal.[246]

The Gulf of Mexico Aquaculture FMP adds to the regulatory bureaucracy for marine aquaculture without simplifying any of it. Because neither the GOMFMC nor NOAA can overrule other agencies' jurisdiction, the new aquaculture regime just adds one more permit requirement to an already complicated regulatory regime: Army Corps and EPA NPDES permits are still required,[247] although "NOAA Fisheries is working with these agencies to set up a coordinated permitting process for the Gulf"[248]; "[t]he use of biologics, pesticides, and drugs must comply with all applicable United States Department of Agriculture (USDA), EPA, and FDA requirements";[249] "[u]se of aquaculture feeds must be conducted in compliance with EPA feed monitoring and management guidelines";[250] "NMFS requires permittees to inspect aquaculture systems for entanglements or interactions with marine mammals, protected species, and migratory birds";[251] "NMFS, in cooperation with the USDA's Animal and Plant Health Inspection Service (APHIS), may order movement restrictions and/or removal of all cultured animals upon confirmation by the APHIS reference laboratory that the cultured animals test positive for a reportable or emerging pathogen and pose a threat to the health of wild or cultured animals";[252] and NMFS may test for genetically engineered organisms

[244] *Id*. at 1765.
[245] *Id*.
[246] *Id*. at 1765-66.
[247] *Id*. at 1763, 1764.
[248] National Oceanic & Atmospheric Administration, *NOAA expands opportunities for U.S. aquaculture*, http://www.noaanews.noaa.gov/stories2016/011116-noaa-expands-opportunities-for-us-aquaculture.html (Jan. 11, 2016).
[249] 81 Fed Reg. at 1764.
[250] *Id*.
[251] *Id*.
[252] *Id*.

and order their removal.[253] Thus, while GOMFMC's permit requirement ensures oversight of open ocean aquaculture in federal waters and helps to manage competing uses of the Gulf of Mexico, it does little to ease the regulatory burden on this new field of aquaculture.[254]

3. Submerged Lands and Continental Shelf Leasing

Most marine aquaculture facilities require structures that are attached to or resting upon the seafloor, or continental shelf. These submerged lands are almost always owned by a government; under the Submerged Lands Act, as discussed, coastal states own and regulate the first three miles of seabed (Florida and Texas each own out to three marine leagues, about nine nautical miles or 10.2 miles, in the Gulf of Mexico[255]), and the federal government owns the Outer Continental Shelf extending from three to 200 miles from shore. As a result, marine aquaculture generally requires some sort of lease from the relevant government.

Most coastal states have leasing programs in place for marine aquaculture in state waters.[256] As one example,

> The State of Maine has an active aquaculture leasing and monitoring system that been in place since the mid-1970's. The leasing process is managed by the Department of Marine Resources with environmental monitoring and compliance of finfish leases conducted by the Department of Environmental Protection for leases that require discharge permits under the Clean Water Act. There are 191 aquaculture leases in Maine waters; 28 finfish leases, 65 standard shellfish leases, 15 experimental shellfish/seaweed leases, and 90+ limited purpose aquaculture (LPA) permits. In total, aquaculture leases in

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[253] *Id*.

[254] Indeed, the multi-agency guide to permitting for these facilities underscores just how daunting the regulatory process is, identifying three permit requirements, three additional potentially required authorizations, and eight potentially necessary environmental consultations. National Oceanic & Atmospheric Administration, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish & Wildlife Service, Bureau of Ocean Energy Management, U.S. Coast Guard, & Bureau of Safety and Environmental Enforcement, *A Guide to the Application Process for Offshore Aquaculture in U.S. Federal Waters of the Gulf of Mexico* 4 tbl. 1, 5 tbl. 2, 6-7 tbl. 3 (June 2016), *available at* http://sero.nmfs.noaa.gov/sustainable_fisheries/gulf_fisheries/aquaculture/documents/pdfs/permit_applicant_guide_06032016.pdf.

[255] National Oceanic & Atmospheric Administration, *NOAA expands opportunities for U.S. aquaculture*, http://www.noaanews.noaa.gov/stories2016/011116-noaa-expands-opportunities-for-us-aquaculture.html (Jan. 11, 2016).

[256] For an overview of state leasing laws as pertain to shellfish aquaculture, see National Oceanic & Atmospheric Administration, *State-by-State Shellfish Aquaculture Permitting Information* (Feb. 2016), *available at* http://www.nmfs.noaa.gov/aquaculture/shellfish_portal/state_permitting_shellfish_aq2016feb18.pdf.

> Maine cover 1,333 acres, divided almost equally between finfish and shellfish/kelp/urchin leases.[257]

On the other side of the country, in the State of Washington, "[f]or more than a hundred years, the state Department of Natural Resources (DNR) and its predecessor has offered leases to support aquaculture operations that grow oysters, clams, and mussels using a variety of growing methods, including: bottom, bag, intertidal long lines, and floating shellfish rafts."[258] The states has leased about 2100 acres of its submerged for aquaculture, 80% of which is used for oysters.[259] Hawai'i, in contrast, enacted the Hawaii Ocean and Submerged Lands Leasing Act only in 1986.[260] However, it is the leading state in permitting deep water open ocean aquaculture; in 2010, "[t]he Board of Land and Natural Resources of the State of Hawaii, in a unanimous vote . . . granted an application from Hawaii Oceanic Technology, Inc. for a 35 year lease on the company's 247 acre (one square kilometer) deep open ocean aquaculture site . . . ."[261] The company "had planned to place 12 'Oceanspheres' on a 247-acre site in the deep waters 2.6 miles off the Kohala Coast on the Big Island," raising 6000 tons of bigeye and yellowfin tuna per year, but the company went out of business in January 2017, cancelling its lease with the state.[262] However, Keahole Point Fish and Kampachi Farms, both successors to the successful Kona Blue company, are working with the same kind of open ocean "fish ball" technology to grow kampachi (a relative of yellowtail) in Hawaiian waters.[263]

The federal statute that generally applies to leasing of projects on the Outer Continental Shelf is the Outer Continental Shelf Lands Act (OCSLA),[264] implemented by the Bureau of Ocean Energy Management (BOEM)[265] and the Bureau of Safety and Environmental Enforcement (BSEE). The OCSLA most prominently regulates offshore

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[257] George LaPointe, *Overview of the Aquaculture Sector in New England* 3 (Jan. 2013), *available at* http://georgelapointeconsulting.com/uploads/3/4/3/4/34346476/aquaculture_review_paper.pdf.

[258] Washington Department of Natural Resources, *Aquaculture*, https://www.dnr.wa.gov/programs-and-services/aquatics/shellfish/aquaculture (as viewed Nov. 4, 2017). The Department has assembled the various statutory sections of the Revised Code of Washington that govern aquaculture leasing at https://www.dnr.wa.gov/publications/aqr_aqua_rcw_wacs.pdf.

[259] *Id*.

[260] Hawaii Laws 1986, ch. 91, § 1, *as revised by* Hawaii Laws 1999, ch. 176, §§ 2, 11; Hawaii Laws 2002, ch. 203, § 1, and *codified as* HAW. REV. STAT. §§ 190D-1 to 190D-36 (2016).

[261] Fish Site Editor, "Lease Granted for First Deep Ocean Site," *The Fish Site*, https://thefishsite.com/articles/lease-granted-for-first-deep-ocean-site (4 Nov. 2010).

[262] Duane Shimogowa, "Hawaii fish farming company shuts down after 10 years in business," *Pacific Business News*, https://www.bizjournals.com/pacific/news/2017/01/24/hawaii-fish-farming-company-shuts-down-after-10.html (Jan. 25, 2017).

[263] James Wright, "Kona Blue dissolved, Kampachi Farms launched," *SeafoodSource*, https://www.seafoodsource.com/news/aquaculture/kona-blue-dissolved-kampachi-farms-launched (Sept. 19, 2011); Kampachi Farms LLC, *Ocean's Finest Fish*, http://www.kampachifarm.com/ (as viewed Nov. 4, 2017);

[264] 43 U.S.C. §§ 1331-1356b (2012).

[265] Bureau of Ocean Energy Management, *Home Page*, https://www.boem.gov/ (as viewed Nov. 4, 2017).

oil and gas leasing,[266] but it also applies to offshore renewable energy, including offshore wind farms, ocean wave energy facilities, and ocean current energy facilities.[267]

However, "BOEM is not seeking the authority over activities such as aquaculture . . . ."[268] Moreover, BOEM and BSEE play only very limited roles in the new open ocean aquaculture permitting regime for the Gulf of Mexico: "The Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE) must review and provide certain approvals for the activities permitted by NOAA, EPA, and [the Army Corps]. These approvals will be incorporated into the federal permitting processes, i.e., no separate authorizations will be issued."[269] In addition, BOEM's participation is necessary only if Gulf open ocean aquaculture facilities tether to existing oil and gas rigs, while BSEE performs a consulting role.[270] Thus, for now, the federal government has chosen not to actively lease the Outer Continental Shelf for aquaculture.

IV. NEW APPROACHES TO RATIONALIZING MULTIPLE USES OF THE OUTER CONTINENTAL SHELF

As Parts II and III made clear, both offshore wind farms and marine aquaculture are likely to become more common in the United States' ocean waters, and both types of facilities can require considerable space, creating potential and actual conflicts with a variety of other human activities and marine ecosystem needs. Given that, in general, offshore wind and the more environmentally benign forms of marine aquaculture provide benefits (clean energy and food security, respectively) worth encouraging, law should consider how best to reconcile these developments with each other and with other marine activities. To date, marine spatial planning has provided the preferred course, and so this Part's discussion starts there.

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[266] Bureau of Ocean Energy Management, *Oil & Gas Energy Program*, https://www.boem.gov/Oil-and-Gas-Energy-Program/ (as viewed Nov. 4, 2017).

[267] Bureau of Ocean Energy Management, *Renewable Energy*, https://www.boem.gov/Renewable-Energy/ (as viewed Nov. 4, 2017).

[268] Bureau of Ocean Energy Management, *Alternative Uses of Existing Oil and Gas Platforms*, https://www.boem.gov/Renewable-Energy-Program/Renewable-Energy-Guide/Alternate-Uses-of-Existing-Oil-and-Gas-Platforms.aspx (as viewed Nov. 5, 2017).

[269] National Oceanic & Atmospheric Administration, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish & Wildlife Service, Bureau of Ocean Energy Management, U.S. Coast Guard, & Bureau of Safety and Environmental Enforcement, *A Guide to the Application Process for Offshore Aquaculture in U.S. Federal Waters of the Gulf of Mexico* 5 (June 2016), *available at* http://sero.nmfs.noaa.gov/sustainable_fisheries/gulf_fisheries/aquaculture/documents/pdfs/permit_applicant_guide_06032016.pdf.

[270] *Id*. at 5 tbl. 2.

A. Marine Spatial Planning

The concept of marine spatial planning derives from a terrestrial counterpart: land use planning and municipal zoning. The marine concepts are similar, as Tundi Agardy has explained:

> Zoning is a set of regulatory measures used to implement marine spatial plans—akin to land use plans—the specify allowable uses in all areas of the target ecosystem(s). Different zones accommodate different uses, or different levels of use. As in municipal zoning, regulations address prohibitions or permitted uses, or both. All zoning plans are portrayed on maps, since the regulations are always area-based.[271]

Nevertheless, unlike most land use planning, marine spatial planning seeks from the beginning to account for the health of the relevant marine ecosystems and to achieve ecosystem-based management in the oceans, balancing biodiversity protection with human use.[272]

Marine spatial planning at the national level in the United States derives from the U.S. Commission on Ocean Policy's 2004 report, which endorsed the increased use of marine protected areas (MPAs), marine reserves, and marine spatial planning in the United States. For example, it recommended that fisheries managers increase the use of "essential fish habitat" designations on an ecosystem basis[273] and that the federal government "develop national goals and guidelines leading to a uniform process for the effective design, implementation, and evaluation of marine protected areas."[274]

This report languished during the George W. Bush Administration, but in June 2009, a few months after coming into office, President Barack Obama created the Interagency Ocean Policy Task Force.[275] His memorandum concluded that "the United States needs to act within a unifying framework under a clear national policy" in order to protect its marine and Great Lakes resources, "including a comprehensive, ecosystem-based framework for the longterm conservation and use of our resources."[276]

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[271] TUNDI AGARDY, OCEAN ZONING: MAKING MARINE MANAGEMENT MORE EFFECTIVE 6 (2010).
[272] INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION & MAN AND THE BIOSPHERE PROGRAMME, UNESCO, MARINE SPATIAL PLANNING: A STEP-BY-STEP APPROACH TOWARD ECOSYSTEM-BASED MANAGEMENT 10 (2009).
[273] 2004 USCOP FINAL REPORT, *supra* note 14, at 295-98 (2004),
[274] *Id*. at 105.
[275] President Barack Obama, Memorandum for the Heads of Executive Departments and Agencies, *National Policy for the Oceans, Our Coasts, and the Great Lakes* (June 12, 2009), *available at* http://www.whitehouse.gov/sites/default/files/page/files/2009ocean_mem_rel.pdf.
[276] *Id*.

The Task Force released its final recommendations on July 19, 2010.[277] It identified nine priority objectives for the United States in implementing its recommended National Ocean Policy.[278] Most relevant here, the first two of these priority objectives were to "[a]dopt ecosystem-based management as a foundational principle for the comprehensive management of the ocean, our coasts, and the Great Lakes" and to "[i]mplement comprehensive, integrated, ecosystem-based coastal and marine spatial planning and management in the United States."[279]

The Task Force defined coastal and marine spatial planning ("CMSP") to be "a comprehensive, adaptive, integrated, ecosystem-based, and transparent spatial planning process, based on sound science, for analyzing current and anticipated uses of ocean, coastal, and Great Lakes areas."[280] The immediate goals for CMSP are to reduce conflicts between uses and better protect the environment by considering the environment's needs as well as humans'.[281] In addition, CMSP would also incorporate a precautionary approach[282] and "would be adaptive and flexible to accommodate changing environmental conditions and impacts . . . ."[283] "Without such an improved approach," the Task Force concluded, "we risk an increase in user conflicts, continued planning and regulatory inefficiencies with their associated costs and delays, and the potential loss of critical economic, ecosystem, social, and cultural services for present and future generations."[284]

The Task Force envisioned a regional approach to CMSP based primarily on scientific distinctions among large marine ecosystems ("LMEs").[285] Applied to the United States, this approach resulted in nine regional planning units: Northeast, Mid-Atlantic, South Atlantic, Gulf Coast, West Coast, Great Lakes, Alaska, the Pacific

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[277] WHITE HOUSE COUNCIL ON ENVIRONMENTAL QUALITY, FINAL RECOMMENDATIONS OF THE INTERAGENCY OCEAN POLICY TASK FORCE (July 19, 2010), *available at* http://www.whitehouse.gov/files/documents/OPTF_FinalRecs.pdf.
[278] *Id*. at 6.
[279] *Id*.; *see also id.* at 28 (repeating the list).
[280] *Id*. at 41.
[281] *Id*. More specifically, the Task Force detailed that:

> Multiple existing uses (e.g. commercial fishing, recreational fishing and boating, subsistence uses, marine transportation, sand and gravel mining, and oil and gas operations) and emerging uses (e.g., off-shore renewable energy and aquaculture) would be managed in a manner that reduces conflict, enhances compatibility among uses and with sustain ecosystem functions and services, provides for public access, and increases certainty and predictability for economic investments.

Id. at 48.
[282] *Id*. at 49. "Application of a precautionary approach . . . is consistent with and essential for improved stewardship." *Id*. at C-III.
[283] *Id*.
[284] *Id*. at 42.
[285] *Id*. at 51.

Islands, and the Caribbean.[286] Within each region, CMSP would apply from the shore throughout the United States' 200-mile-wide exclusive economic zone ("EEZ"), but generally *not* to private property, including privately owned submerged lands.[287]

On the same day that the Task Force released its report, President Obama issued his Ocean Stewardship Executive Order, announcing a National Ocean Policy.[288] The order recognizes the pervasive importance of the oceans, ranging from basics such as jobs, food, and energy to transportation and national security.[289] It then sets out ten goals for protecting the United States' ocean ecosystems, including to: "protect, maintain, and restore the health and biological diversity of ocean, coastal, and Great Lakes ecosystems and resources;" "improve the resiliency of ocean, coastal, and Great Lakes ecosystems, communities, and economies;" and "improve our understanding and awareness of changing environmental conditions, trends, and their causes, and of human activities taking place in ocean, coastal, and Great Lakes waters[.]"[290]

To implement the new National Ocean Policy, the Order creates the National Ocean Council, made up of representatives from a wide variety of federal agencies and departments.[291] Most relevant for this Article, the National Ocean Council was charged with approving and implementing marine spatial planning in U.S. waters, and its plans are binding on all federal agencies to the extent allowed by current statutes.[292] The Order defines "coastal and marine spatial planning" very similarly to the Task Force's definition, to mean:

> a comprehensive, adaptive, integrated, ecosystem-based, and transparent spatial planning process, based on sound science, for analyzing current and anticipated uses of ocean, coastal, and Great Lakes areas. Coastal and marine spatial planning identifies areas most suitable for various types or classes of activities in order to reduce conflicts among uses, reduce environmental impacts, facilitate compatible uses, and preserve critical ecosystem services to meet economic, environmental, security, and social objectives.[293]

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[286] *Id*.
[287] *Id*. at 49-50.
[288] Executive Order No. 13,547, Stewardship of the Ocean, Our Coasts, and the Great Lakes, 75 Fed. Reg. 43,023 (July 19, 2010), *available at* http://www.whitehouse.gov/files/documents/2010stewardship-eo.pdf.
[289] *Id*. § 1.
[290] *Id*. § 2.
[291] *Id*. § 4(a).
[292] *Id*. § 6(a)(ii).
[293] *Id*. § 3(b).

The National Ocean Council is also incorporating the Task Force's final recommendations, which were referenced in the Executive Order.[294]

As the Task Force recommended, moreover, the National Ocean Council is pursuing marine spatial planning for the United States through a regional approach.[295] The eight regions have made greater and lesser progress toward their plans, but only the Alaska region has opted not to act at all.[296]

Marine spatial planning offers one process both for making space for offshore wind farms and marine aquaculture and for ensuring that these newer uses do not interfere with existing ocean activities or marine ecosystems. For example, marine spatial planning is also occurring in the United States at the state level, and the State of Washington has just completed its draft marine spatial planning mapping efforts for its state coastal waters. The map layers reveal that while, in Washington, offshore wind potential and marine shellfish aquaculture generally occur in different areas of the coast, the best areas for offshore wind farms are also heavily used commercial fishing grounds.[297] Indeed, Washington found that its Pacific coast "is highly used by at least 1 to 3 existing ocean uses or resources"—indeed, most of the area "is highly used by at least 4 and up to 14 existing uses or resources. In particular, the most heavily used areas include the continental shelf break, the Juan de Fuca Canyon in the north, and much of the southern area from the nearshore to about 15-20 miles offshore, especially near the entrances to Grays Harbor and the Columbia River."[298] The resulting plan designates "Important, Sensitive and Unique Areas (ISUs) in state waters that have high conservation value, high historic value, or key infrastructure. The ISUs include standards to maintain the high values of these areas and to protect the ISUs from adverse effects of offshore development, while allowing existing compatible uses such as fishing."[299] In addition, the plan seeks to protect existing marine aquaculture facilities (mostly shellfish) from new development.[300] With respect to offshore renewable energy in state waters, however, Washington concluded that:

> Analyses produced for the MSP illustrate the large footprint required for projects designed to produce wind energy at a scale matching potential

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[294] *See id*. § 1 (adopting the Task Force's recommendations "except as otherwise provided").
[295] *Id*. § 8.
[296] Coastal and Marine Spatial Planning, National Oceanic & Atmospheric Administration, *Regional Activities*, https://cmsp.noaa.gov/activities/index.html (as viewed Nov. 6, 2017).
[297] State of Washington, *Washington Marine Spatial Planning*, http://mapview.msp.wa.gov/default.aspx (as viewed Nov. 6, 2017).
[298] Washington Department of Ecology, Washington Department of Fish & Wildlife, & Washington Department of Natural Resources, Draft Marine Spatial Plan for Washington's Pacific Coast xv (Oct. 2017), *available at* http://www.msp.wa.gov/wp-content/uploads/2017/draft_MSP_and_appendices.pdf.
[299] *Id*. at 4-22.
[300] *Id*. at 4-38.

> needs for renewable energy in the regional power grid in the next 10-15 years . . . . In state waters on Washington's Pacific coast, these analyses indicate that projects of this scale require large footprints that occupy a large proportion of the total area of state waters and intersect with many existing ocean uses and resources. Therefore, in state waters, industrial-scale renewable energy projects will likely have a very difficult time demonstrating that they can avoid significant adverse impacts to existing uses and resources. Community-scale renewable energy facilities proposed for state waters may find it easier to demonstrate consistency with state policies, plans, and authorities through existing permitting processes.[301]

Thus, Washington considers its state waters already too crowded to allow big offshore wind farms.

As the Washington example demonstrates, marine spatial planning can allow governments to: (1) identify ocean areas of use, including the kinds of uses made, the number of uses made, and the intensity of those uses; (2) exclude certain uses from certain places (such as development in Washington's ISUs; and (3) identify mutually compatible uses. However, marine spatial planning also generally *reflects* existing regulation rather than amending or rationalizing jurisdictional fragmentation. As such, it is not always the best tool for dealing with emerging technological developments regarding multiple use of the ocean.

B. Multiple Use Marine Structures

Marine aquaculture is an inherently technologically flexible industry. As the U.S. Commission on Ocean Policy observed, aquacultured marine "organisms can be raised in everything from nearly natural environments to enclosed structures, such as ponds, cages, and tanks . . . ."[302] As such, it is both possible and increasingly likely that marine aquaculture will occur on structures built for other purposes, such as offshore energy development. Multiple-use designs for offshore windfarms have surfaced in the United

[301] *Id*. at 4-25.
[302] 2004 USCOP FINAL REPORT, *supra* note 14, at 330.

Kingdom,[303] Greece,[304] South Korea,[305] and the United States,[306] among others. In its most extreme form, often known as "seasteading," multiple-use offshore structures could become home to entire communities.[307]

In the near term, however, the more limited goal of combining offshore wind and marine aquaculture is a hot legal, policy, and technological topic; "consideration of multiple uses of offshore renewable energy systems in the design phase so that the economic benefits from a unit area of sea can be maximized in a sustainable way has been a central research topic since the year 2000."[308] Experiments with including aquaculture on offshore oil rigs began in Turkey in 1987,[309] and wind turbines began to be combined with aquaculture in China in the 1990s.[310] In Germany, "[d]ue to the fact that offshore wind farms provide an appropriately sized area free of commercial shipping traffic (as most offshore wind farms are designed as restricted-access areas due to hazard mitigation concerns), projects on open ocean aquaculture have been carried out since 2000 in the German Bight . . . ."[311]

Germany invested in offshore wind first and has only recently become interested in marine aquaculture, but "the main barrier for open ocean aquaculture development in many instances is . . . the limited availability of suitable space."[312] As a result, the offshore wind farms are the structures that could make marine aquaculture commercially viable in Germany:

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[303] "UK: Tender opens for grid connection to nine offshore wind farms," *Energy-Pedia News*, https://www.energy-pedia.com/news/united-kingdom/tender-opens-for-grid-connection-to-nine-offshore-wind-farms (29 July 2009).

[304] Phoebe Koundouri, "Research on Innovative Multi-Purpose Offshore Platforms in Greece," *Energy and Sustainability Club*, http://www.imbaenergyclub.gr/2012/12/06/research-on-innovative-multi-purpose-offshore-platforms-in-greece/ (Dec. 6, 2012).

[305] Bela H. Buck, Nancy Nevejan, Mathieu Wille, Michael Chambers, & Thierry Chopin, *Offshore and Multi-Use Aquaculture with Extractive Species: Seaweeds and Bivalves*, *in* BELA H. BUCK & RICHARD LANGAN, EDS., AQUACULTURE PERSPECTIVE OF MULTI-USE SITES IN THE OPEN OCEAN: THE UNTAPPED POTENTIAL FOR MARINE RESOURCES IN THE ANTHROPOCENE 23, 52 fig. 2-13 (SpringerOpen 2017).

[306] Sara Skelton, *Energy and the Environment—A Coastal Perspective: Habitat Enhancement and Loss*, http://coastalenergyandenvironment.web.unc.edu/environmental-stressors/physical-dynamic-presence/habitat-enhancement-and-loss/ (May 26, 2011).

[307] The Seasteading Institute, *The Oceans Are the Next Frontier*, https://www.seasteading.org/ (as viewed Nov. 6, 2017); Emma Morris, "Bluetopia," 550 NATURE 22 (5 Oct. 2017)

[308] Poul Holm, Bela H. Buck, & Richard Langan, *Introduction: New Approaches to Sustainable Offshore Food Production and the Development of Offshore Platforms*, *in* BELA H. BUCK & RICHARD LANGAN, EDS., AQUACULTURE PERSPECTIVE OF MULTI-USE SITES IN THE OPEN OCEAN: THE UNTAPPED POTENTIAL FOR MARINE RESOURCES IN THE ANTHROPOCENE 1, 7 (SpringerOpen 2017).

[309] *Id*. at 8.

[310] *Id*. at 11.

[311] *Id.* at 11.

[312] Bela Hieronymus Buck, Gesche Krause, & Harald Rosenthal, *Extensive open ocean aquaculture development within wind farms in Germany: the prospect of offshore co-management and legal constraints*, 47 COASTAL & OCEAN MANAGEMENT 95, 99-101 (2004).

> One of the main reasons for this linkage of open ocean aquaculture to wind farms results from the fact that aquaculture alone would not be able to afford expensive infrastructure facilities. While offshore wind farm structures do not depend on aquaculture per se, it is essential to open ocean aquaculture to rely on infrastructures provided by others in order to become commercially viable. As the areas of wind farms could be partly banned for other uses (especially fishing) for security reasons, the support of open ocean aquaculture installations creates a positive spin-off effect in providing alternative livelihood for the concerned fishermen communities, who would lose the access to their traditional fishing grounds.[313]

In contrast, in the United States, aquaculture could increase the productivity and financial well-being of new off shore wind farms as they are installed.[314] In all countries, however, "the success of such a synergy depends on the installation of an effective regulatory framework . . . ."[315]

To some extent, U.S. law already recognizes that energy and aquaculture facilities can be combined. In addition to giving the U.S. Department of the Interior jurisdiction over offshore wind, Section 388 of the Energy Policy Act of 2005 also gave the Department "jurisdiction over projects that make alternate use of existing oil and natural gas platforms in Federal waters," including aquaculture.[316] According to BOEM, "Section 388 clarifies the Secretary of the Interior's authority to allow an offshore oil and gas structure, previously permitted under the OCS Lands Act, to remain in place after oil and gas activities have ceased so that the structure can be used for other energy and marine-related activities. This authority provides opportunities to extend the life of facilities for non-oil and gas purposes, such as research, renewable energy production, and aquaculture, before being removed."[317]

However, "BOEM is not seeking the authority over activities such as aquaculture, but only the decision to allow platforms to be converted to such uses, if the appropriate agency approves the underlying activity."[318] Nor does Section 388 expressly apply to

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[313] *Id*. at 103.
[314] Hauke L. Kite-Powell, *Economics of Multi-use and Co-location*, *in* BUCK & LANGAN, *supra* note 302, at 233-34.
[315] Busk, Krause, & Rosenthal, *supra* note 306, at 103.
[316] Bureau of Ocean Energy Management, *Alternate Uses of Existing Oil and Gas Platforms*, https://www.boem.gov/Renewable-Energy-Program/Renewable-Energy-Guide/Alternate-Uses-of-Existing-Oil-and-Gas-Platforms.aspx (as viewed Nov. 4, 2017).
[317] Bureau of Ocean Energy Management, *Alternate Uses of Existing Oil and Gas Platforms*, https://www.boem.gov/Renewable-Energy-Program/Renewable-Energy-Guide/Alternate-Uses-of-Existing-Oil-and-Gas-Platforms.aspx (as viewed Nov. 4, 2017).
[318] *Id*.

dual-use aquaculture and wind towers. As a result, under current law such dual-use facilities will be subject to *both* of the multiple permitting regimes that apply to offshore wind farms and marine aquaculture—not exactly a legal encouragement to any company willing to experiment.

V. CONCLUSION

There are good economic, security, and environmental reasons to encourage (carefully!) both increased offshore wind production and increased marine aquaculture in the United States, including reducing greenhouse gas emissions, increasing energy independence, reducing seafood imports and fishing pressures on wild stocks, and increasing the variety of healthy, locally-produced foods available to U.S. consumers. As the United States' ocean space becomes more crowded, however, finding space for these geographically significant activities requires careful planning and avoidance of conflicts, both among the various ocean uses and between human uses and marine ecosystem needs. Marine spatial planning provides an excellent process for assessing current and future uses and needs, for ensuring that marine ecosystems are protected, and for separating absolutely conflicting uses into separate zones. However, it cannot perform the multijurisdictional regulatory streamlining and rationalization necessary to fully encourage offshore, particularly open ocean, wind farms and aquaculture.

The existing regulatory regimes for both offshore wind farms and marine aquaculture are complicated, reflecting the pervasive regulatory fragmentation that characterizes ocean and coastal law in the United States. Neither regime, however, contemplates the potential economic and spatial advantages of pursuing aquaculture production at offshore wind farms, although the technology for doing so is evolving rapidly.

While wholesale reform of federal ocean law is unlikely, creating a legal link between the ongoing marine spatial planning in both state and federal waters and permitting simplification for desirable facilities would close the regulatory loop with far less legal reform required. For example, data collected during a marine spatial planning process could form the basis for delineating pre-approved zones for combined wind-and-aquaculture facilities, perhaps with fast-track or preferred leasing of the continental shelf for combined projects subject to some standard limitations like those that the GOMFMC included in its permitting regime for marine aquaculture (for example, native species only) and other refinements (for example, pre-approval only for seaweeds, mollusks, and fish species that do not require feeding). Such a legal connection might not only encourage more efficient use of the United States' ocean territory for 21st-century but also inspire the regional bodies to complete marine spatial planning efforts for federal ocean waters, providing us all with a more comprehensive picture of how our ocean supports us.