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THE SEAS ARE CHANGING:
IT'S TIME TO USE OCEAN-BASED RENEWABLE
ENERGY, THE PUBLIC TRUST DOCTRINE, AND A
GREEN THUMB TO PROTECT SEAS FROM OUR
CHANGING CLIMATE

Jeffrey Thaler and Patrick Lyons***

“While no single step can reverse the effects of climate change, we have a moral obligation to future generations to leave them a planet that is not polluted and damaged.” - President Obama¹

“[R]enewable energy projects are, in many ways, infused with their own public trust values because of their promise to preserve land, water, and other public trust resources for future generations.” - Alexandra Klass²

I. INTRODUCTION

Climate change is having significant impacts on ocean and coastal ecosystems and wildlife, with rising seas inundating wetlands and coastal estuaries, warming waters altering marine species habitat and breeding behavior, and ocean acidification weakening corals, mollusks, and marine species, leaving them vulnerable to disease and predation.³ Though the threat of climate change has been acknowledged by President Obama⁴ and in federal statutory language,⁵ to date the U.S. government

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1. THE PRESIDENT'S CLIMATE ACTION PLAN, 4, June 2013, *available at* <http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf>.

2. Alexandra B. Klass, *Renewable Energy and the Public Trust Doctrine*, 45 U.C. DAVIS L. REV. 1021, 1073 (2011).

3. *See infra* notes 122-147.

4. THE PRESIDENT'S CLIMATE ACTION PLAN, *supra* note 1.

5. Coastal Zone Management Act, 16 U.S.C.A. §§ 1451-52 (2013).

has yet to provide a comprehensive plan to address the detrimental impacts of warming lands and seas. In response to governmental inaction, this Article seeks to demonstrate how the public trust doctrine (PTD) can play a role in protecting ocean and coastal resources from climate change. More specifically, this Article proposes that both federal and state PTDs can help protect traditional trust values⁶ of commerce, navigation and fishing—in addition to modern trust values of protecting tidal wetlands, estuaries, and wildlife—through establishing ocean-based renewable energy (ORE) as a public trust value. In addition to elevating ORE to equal footing with traditional trust values, this Article calls for placing a “green thumb” on the scales of balancing competing trust values to explicitly guide courts and agencies alike to operate under a rebuttable presumption favoring ORE over other PTD values because of its ability to help reduce carbon and other greenhouse gas (GHG) emissions as a means to mitigate climate change. As Bob Dylan wrote and sang fifty years ago, the times are changin' and waters are growing rapidly - today it is well past time to heed that warning and combat the rising levels of greenhouse gases, temperatures, seas, health care costs and storm damages by making maximum use of the clean, renewable energy available and waiting off our shores. Establishing a federal PTD and ORE values in all PTDs will enable governments to better fulfill their fiduciary obligations while empowering the doctrine to proactively protect trust resources - both traditional and modern - from the impacts of climate change.

Part II of this Article provides a brief overview of the history of the PTD in the United States, including its adoption from English common law and its evolution to its present status among the various states. Particularly, it explores the mutability of the PTD and its ability to evolve to meet the needs of society⁷ by incorporating a broad range of trust values to protect a variety of natural resources.⁸ The section concludes with an introduction to the current legal framework governing federal ocean resources and sets up the argument for recognizing a federal PTD.⁹ Part III focuses on climate change, how it is currently

6. Klass defines “public trust values” as encompassing “both traditional and modern activities and resources covered under the broadest interpretation of the common law public trust doctrine.” Klass, *supra* note 2, at 1024-25. These values include navigation, commerce, and fishing, as well as recreation, open space, wildlife, and wildlife habitat, and ecological protection. *Id.*

7. Charles F. Wilkinson, *The Headwaters of the Public Trust: Some Thoughts on the Source and Scope of the Traditional Doctrine*, 19 ENVTL. L. 425, 430-31 (1989).

8. See *infra* Part II.C.

9. See *infra* Parts II.D and V.C.

impacting the earth's ecosystems, and the potential detrimental effects to our planet if carbon emissions are left unabated. The section then turns its focus to how climate change is affecting public trust resources and highlights the degradation and alteration these resources have already experienced, calling on all levels of government to fulfill their fiduciary obligation to protect ocean and coastal resources from the impacts of climate change. Part IV discusses offshore wind, tidal and wave energy, and the variety of public trust-like language found throughout the federal legislation that has authority over the permitting and compliance of ORE projects. Part V brings PTD, climate change, and ORE together. It establishes the basis for a federal PTD and legitimizes its inception through common law, legislation, and executive order. The Article concludes by providing examples of how ORE can be incorporated into both federal and state PTDs, providing courts and governmental agencies with a doctrine that encourages and requires the utilization of ocean and coastal resources for harnessing clean, renewable energy in an effort to mitigate the impacts of climate change.

II. THE PUBLIC TRUST DOCTRINE IN THE UNITED STATES

A. The Public Trust Doctrine's Origins and Evolution in the United States

The U.S. PTD is premised on the notion that while the majority of resources are held in private ownership, some property, such as navigable and tidal waters and the lands beneath, is held in trust by the state for the benefit of the public.¹⁰ The origin of the U.S. PTD is generally attributed to England, where in the thirteenth century the Magna Carta and the writings of Bracton emerged, adopting the idea of *res communes*¹¹ from the Roman *Institutes of Justinian*,¹² declaring the

10. Alexandra B. Klass, *Modern Public Trust Principles: Recognizing Rights and Integrating Standards*, 82 NOTRE DAME L. REV. 699, 702 (2006).

11. See BRACTON ON THE LAWS AND CUSTOMS OF ENGLAND (George E. Woodbine & Samuel E. Thorne ed., Belknap Press 1968). In addition to the rivers and the sea shore, Romans also classified the sea itself, air, and wildlife as "res communes." See *Geer v. Connecticut*, 161 U.S. 519, 525 (1896) ("These things are those which the juris consults called 'res communes'. . . the air, the water which runs in the rivers, the sea, and its shores.") (citation omitted).

12. See CAESAR FLAVIUS JUSTINIAN, THE INSTITUTES OF JUSTINIAN (John B. Moyle trans., Project Gutenberg 2009) (circa 533 C.E.).

sea shores inalienable and “common to all.”¹³ The English concept of property distinguished between the *jus privatum* and the *jus publicum*, the former being land that the Crown could transfer to individuals in fee ownership, and the latter being held by the Crown in trust for the public,¹⁴ ensuring rights to the coast and portions of rivers affected by tidal ebb and flow.¹⁵

In reality, the precedential impact of English common law on the PTD has been questioned.¹⁶ Indeed, it has been suggested that navigable waters and submerged lands in England were in fact privately owned at the time of the American Revolution, and that the notion of publicly held submerged lands first appeared in U.S. common law in 1821 in the case of *Arnold v. Mundy*.¹⁷ Regardless of the actual precedential origins of the PTD, the importance of the idea of ensuring common access to navigable waters was pervasive in the United States at the time of its founding, as watercourse navigation was critical to early exploration of

13. BRACTON, *supra* note 11, at 39-40; *see also* Richard J. Lazarus, *Changing Conceptions of Property and Sovereignty in Natural Resources: Questioning the Public Trust Doctrine*, 71 IOWA L. REV. 631, 634 (1986).

14. Wilkinson, *supra* note 7, at 430-31.

15. Mary Turnipseed et al., *The Silver Anniversary of the United States' Exclusive Economic Zone: Twenty-Five Years of Ocean Use and Abuse, and the Possibility of a Blue Water Public Trust Doctrine*, 36 ECOLOGY L.Q. 1, 10-11 (2009) (citing LORD HALE, DE JURE MARIS, in STUART A. MOORE, HISTORY OF THE FORESHORE AND THE LAW RELATING THERETO, 384-406 (3d ed. 1888)).

16. Glenn J. MacGrady, *The Navigability Concept in the Civil and Common Law: Historical Development, Current Importance, and Some Doctrines that Don't Hold Water*, 3 FLA. ST. U. L. REV. 511, 514-15 (1975).

17. *Arnold v. Mundy*, 6 N.J.L. 1 (S. Ct. 1821) (the Supreme Court of Judicature of New Jersey held that navigable waters and the submerged lands beneath to be common to all citizens). MacGrady believes that this determination may have been a result of “misconceptions and oversimplifications of English common law that were imported into American law on the most tenuous of authority by creative nineteenth century American treatise writers and judges.” MacGrady, *supra* note 16, at 515. MacGrady also found the holding of *Arnold v. Mundy* was in large part relied upon by the United States Supreme Court in *Martin v. Waddell*, 41 U.S. 367, 410 (1842), where the Court expanded on *Arnold* by holding that after the original thirteen colonies gained independence from the English crown the newly formed states became sovereign and held title to submerged lands under navigable waters. *Id.* at 589-90. Furthermore, Joseph Sax, author of the modern U.S. PTD, observed that “neither Roman Law nor the English experience with lands underlying tidal waters is the place to search for the core of the trust idea.” Joseph L. Sax, *Liberating the Public Trust Doctrine from Its Historical Shackles*, 14 U.C. DAVIS L. REV. 185, 186 (1980-81).

the country and vital to commercial enterprise, human migration, and communication among the states.¹⁸

In 1892, the United States Supreme Court established for all states the duties and limitations of the PTD in the seminal case of *Illinois Central Railroad Company v. Illinois*.¹⁹ The Court found the Illinois state legislature's conveyance of over one-thousand acres of submerged lands in Chicago Harbor to the Illinois Central Railroad void under the PTD, holding that the lands under Lake Michigan were "held in trust for the people of the state that they may enjoy the navigation of the waters, carry on commerce over them, and have liberty of fishing therein, freed from the obstruction or interference of private parties."²⁰ The Court also held that "[t]he ownership of the navigable waters of the harbor, and of the lands under them, is a subject of public concern to the whole people of the state. The trust with which they are held, therefore, is governmental, and cannot be alienated."²¹ Thus, the PTD was established in the United States as a limit on the ability of a state to relinquish authority over the waters and submerged lands it held in trust, creating a fiduciary obligation to protect trust resources for both current and future generations of the public.

Concurrent with *Illinois Central*, the notion of sovereign trust obligations was being applied to state (not federal) public lands beyond those submerged beneath sea shores and rivers,²² with some states expanding the reach of the PTD to city streets and subsurface

18. Wilkinson, *supra* note 7, at 437-38. The need for oversight of waterways was a major catalyst for federal primacy under the commerce clause of the Constitution (U.S. CONST. art I, § 8, cl. 3), a fact elucidated in the landmark decision of *Gibbons v. Ogden*, 22 U.S. 1, 190 (1824), which found "[t]he power over commerce, including navigation, was one of the primary objects for which the people of America adopted their government." *Id.* at 190.

19. Ill. Cent. R.R. v. Illinois, 146 U.S. 387 (1892).

20. *Id.* at 452. The *Illinois Central* holding was consistent with the general sentiment of the U.S. courts of the nineteenth century of ensuring the rights to common use of state trust waters and lands to promote commerce, navigation and fishing. See *Shively v. Bowlby*, 152 U.S. 1, 57 (1894) (holding that submerged lands are of great value to the public for commerce, navigation and fishing and that the title is vested in the sovereign to benefit the people); *Pollard's Lessee v. Hagan*, 44 U.S. 212, 229 (1845) (establishing that newly formed states, just as the thirteen original states, hold sovereignty over their territory, including submerged lands (known as the "equal footing doctrine")).

21. Ill. Cent. R.R., 146 U.S. at 455.

22. See *American Emigrant Co. v. Cnty. of Wright*, 97 U.S. 339 (1877); see also John E. Montgomery, *The Public Trust Doctrine in Public Land Law: Its Application in the Judicial Review of Land Classification Decisions*, 8 WILLAMETTE L.J. 135, 146-47 (examining the feasibility of utilizing the PTD for federal courts' review of land classification decisions).

infrastructure such as subways and utilities.²³ This expanded judicial application of the PTD, both with submerged lands and otherwise, was used largely to support economic growth and expansion during the nineteenth century and the first half of the twentieth century.²⁴ As Richard J. Lazarus observed, “the traditional trust doctrine concept in the United States became as much a legal basis for economic expansion as for resource protection.”²⁵ Much as the U.S. PTD may have been founded on an innovative adaptation of English common law,²⁶ the expansion of the PTD to other public lands is an example of this same ability for the doctrine to evolve to meet the perceived needs of society, while still maintaining its fundamental purpose of ensuring common access to public waters and lands held in trust.²⁷ It is this mutability that enabled the PTD to further evolve as a key legal instrument in the promotion of the environmental protection movement of the latter half of the twentieth century,²⁸ and as we will argue, also allows for the PTD to be expanded to ORE in order for the federal government to uphold its sovereign trust responsibilities to protect the public trust values currently threatened in our increasingly climate changed world.²⁹

B. The Modern United States Public Trust Doctrine's Concepts

In his pioneering 1970 article, Professor Joseph Sax argued for the broad judicial adoption of the doctrine, with the aim of protecting the environment through preventing state actions that adversely affect public trust resources,³⁰ stating:

[I]t is clear the judicial techniques developed in public trust cases need not be limited either to these few conventional interests or to questions of disposition of public properties. Public trust problems are found whenever governmental regulation comes into question, and they occur in a wide range of situations in

23. Molly Selvin, *The Public Trust Doctrine in American Law and Economic Policy, 1789-1920*, 1980 WIS. L. REV. 1403, 1426-28 (1980).

24. *Id.* at 1438.

25. Lazarus, *supra* note 13, at 641.

26. See MacGrady, *supra* note 16, at 515; see also Joseph D. Kearny & Thomas W. Merrill, *The Origins of the American Public Trust Doctrine: What Really Happened in Illinois Central*, 71 U. CHI. L. REV. 799, 828 (2004).

27. See Wilkinson, *supra* note 7, at 468-70; see also Turnipseed et al., *supra* note 15, at 12.

28. Sax, *supra* note 17, at 556-57.

29. See *infra* Part III.

30. Sax, *supra* note 17, at 491; Klass, *supra* note 10, at 705-06.

which diffuse public interests need protection against tightly organized groups with clear and immediate goals. Thus, it seems that the delicate mixture of procedural and substantive protections which the courts have applied in conventional public trust case would be equally applicable and equally appropriate in controversies involving air pollution, the dissemination of pesticides, the location of rights of way for utilities, and strip mining or wetland filling on private lands in a state where governmental permits are required. Certainly the principle of the public trust is broader than its traditional application indicates.³¹

Sax believed the PTD had the “breadth and substantive content” to provide legal standing for citizens to address environmental problems through the courts.³² Following Sax’s article, a number of state courts heeded his argument and expanded the PTD to protect tideland, wetland, coastal ecosystems, and wildlife.³³

The broad scope of Sax’s interpretation of the PTD has not come without detractors,³⁴ such as Lazarus’ argument that the doctrine’s traditional,³⁵ utilitarian purpose limits its efficacy in supporting environmental protection law, while developments in environmental law since 1970 have also made Sax’s interpretation of the doctrine unnecessary.³⁶ Our Article does not attempt to contribute to this debate,

31. Sax, *supra* note 17, at 556-57.

32. *Id.* at 474.

33. *See infra* Part II.C.

34. *See* George P. Smith II & Michael Sweeney, *The Public Trust Doctrine and Natural Law: Emanations Within a Penumbra*, 33 B.C. ENVTL. AFF. L. REV. 307 (2006) (concluding the modern PTD should be “limited within the ancient values of principled economic reasoning” using natural law theory); Richard Delgado, *Our Better Natures: A Revisionist View of Joseph Sax’s Public Trust Theory of Environmental Protections, and Some Dark Thoughts on the Possibility of Law Reform*, 44 VAND. L. REV. 1209 (1991) (arguing Sax’s approach to the PTD forestalled advancement in natural resource and wilderness law).

35. Professors Ruhl and Salzman’s analysis of the PTD breaks down its traditional scope into several dimensions, including geographic (navigable waters and lands subject to the ebb and flow of the tide), trust uses (fishing, commerce, and navigation), and restrictions on alienation of public trust lands to private interests (how much land can be alienated). J.B. Ruhl & James Salzman, *Ecosystem Services and the Public Trust Doctrine: Working Change from Within*, 15 SOUTHEASTERN ENVTL. L.J. 223, 225 (2006).

36. Lazarus, *supra* note 13, at 701. *But see* Raphael D. Sagarin & Mary Turnipseed, *The Public Trust Doctrine: Where Ecology Meets Natural Resource Management*, 37 ANN. REV. ENVTL. RES. 473, 489 (2012) (arguing that Lazarus’ criticism of Sax’s vision of the PTD is “unnecessary” because it came during the height of environmental protection legislation, which has since “stalled and even reversed course through congressional weakening of environmental laws, unfavorable legal opinions, and lack of

for the incorporation of ORE values and uses into the PTD both supports the traditional, utilitarian use of public trust resources promoted by Lazarus while also supporting Sax's vision of employing the doctrine as a means of environmental protection.³⁷ Specifically, ORE is a means of commercially using public trust resources for the benefit of the public while also directly mitigating the detrimental impacts of climate change on public trust resources such as ocean and coastal ecosystems, fisheries, and wildlife.³⁸

Despite the criticisms of the PTD's efficacy and legitimacy, Sax's call for the judicial application of the doctrine to environmental protection and resource management currently entertains strong support in both a number of state courts³⁹ and throughout legal scholarship.⁴⁰ Moreover, recent scholarship has put forth strong arguments for expanding the PTD's scope at both the state⁴¹ and federal level,⁴² with specific arguments for its expansion to federal waters⁴³ and the incorporation of renewable energy into public trust values.⁴⁴ Thus, there is ample support for the expansion of a PTD infused with ORE values to both federal and state trust waters and lands, as ORE can act as both a means of environmental protection, by mitigating climate change, while also promoting the traditional public trust value of commerce by utilizing trust resources to generate renewable energy.

executive or congressional action on some of the most pressing environmental issues . . . [resulting in] statutory authority as it pertains to the environment . . . not [keeping] pace with the development[s] of environmental challenges that these laws sought to abate, let alone emerging challenges, such as climate change, ocean acidification, and overfishing.”)

37. See *infra* Part V.A.

38. See *infra* Part III.B.

39. See *infra* Part II.C.

40. A quick search of Westlaw revealed 51 federal and state cases citing Sax and the PTD (last searched Mar. 5, 2014); see also Michal C. Blumm & Lucas Ritchie, *Lucas's Unlikely Legacy: The Rise of Background Principles as Categorical Takings Defenses*, 29 HARV. ENVTL. L. REV. 321, 341-42 n.125 (2005) (finding by 1989 that Sax had been cited in thirty-three judicial opinions and an additional six more by 2005).

41. Klass, *supra* note 10.

42. Robin K. Craig, *Mobil Oil Exploration, Environmental Protection, and Contract Repudiation: It's Time to Recognize the Public Trust in the Outer Continental Shelf*, 30 ELR 11104 (2000).

43. See generally Turnipseed et al., *supra* note 15; see also Jack H. Archer & M. Casey Jarman, *Sovereign Rights and Responsibilities: Applying Public Trust Principles to the Management of EEZ Space and Resources*, 17 OCEAN & COASTAL MGMT. 253 (1992); see also Hope M. Babcock, *Grotius, Ocean Fish Ranching, and the Public Trust Doctrine: Ride 'Em Charlie Tuna*, 26 STAN. ENVTL. L.J. 3 (2007).

44. Klass, *supra* note 2.

*C. The Public Trust Doctrine and
Its Application to State Waters and Resources*

The United States Supreme Court's holding in *Illinois Central* established a fiduciary obligation for states to preserve trust resources for current and future generations, while setting a standard that grants states significant latitude in administering the trust so long as it is not "substantially impair[ed]."⁴⁵ Furthermore, in 1988, the Supreme Court held in *Phillips Petroleum Co. v. Mississippi*⁴⁶ that states have discretion in administering the trust, specifically in determining how broadly to define the geographic limits of what constitutes public trust lands.⁴⁷ This precedent establishes the PTD as a federal prohibition on any state action that attempts to wholly annul its trust responsibilities while still permitting states broad latitude in expanding the doctrine's reach beyond the federal minimum established in *Illinois Central*.⁴⁸

State public trust lands have traditionally been comprised of submerged lands under navigable and tidal waters.⁴⁹ In recent years—using the discretion afforded by *Illinois Central* and *Phillips Petroleum*—many coastal states have extended the PTD to the three nautical mile (nm) limit of their territorial waters.⁵⁰ The Submerged Lands Act (SLA) of 1953 granted title to near-shore lands to coastal states and defined navigable waters to include all waters three nautical miles from coastal states, except Texas and western Florida which extend nine nautical miles as a result of their Spanish law origins.⁵¹ As Professor Robin Kundis Craig notes, one of Congress's reasons for passing the SLA was "to further the Public Trust Doctrine by

45. Ill. Cent. R.R. v. Illinois, 146 U.S. 387, 452 (1892); see also Wilkinson, *supra* note 7, at 462.

46. 484 U.S. 469 (1988).

47. *Id.* at 475 (citing *Shively v. Bowlby*, 152 U.S. 1, 26 (1894)).

48. Klass, *supra* note 10, at 705 (citing Wilkinson, *supra* note 7, at 464); see also PPL Mont., LLC v. Montana, 132 S. Ct. 1215 (2012) ("[T]he contours of the public trust do not depend on the Constitution . . . the states retain residual power to determine the scope of the public trust . . .").

49. Turnipseed et al., *supra* note 15, at 20.

50. Craig, *supra* note 42, at 11117 (citing *Napeahi v. Wilson*, 987 F. Supp. 1288, 1291-92 (D. Hawaii 1996)) (holding the submerged lands of Hawaii's territorial waters are held in public trust); *Darden v. Pebble Beach Realty, Inc.*, 860 F. Supp. 1101, 1106 (E.D.N.C. 1993) (holding the public trust doctrine extends to the territorial waters off the coast of North Carolina); *Donnell v. United States*, 834 F. Supp. 19, 26 (D. Me. 1993) (holding the submerged lands off the coast of Maine are subject to the public trust).

51. 43 U.S.C. § 1301(b) (2006); Turnipseed, *supra* note 15, at 20 n.114.

decentralizing management of the coastal areas, thereby fostering management that is more adapted to the prevailing needs of the area.”⁵²

The discretion afforded by the Supreme Court to broaden the scope of the PTD has also allowed for several states to adopt other public trust resources and values into their doctrines. In 1971 the California Supreme Court was the first to incorporate the public trust values of ecological preservation into the PTD in *Marks v. Whitney*.⁵³ In justifying the use of the PTD to prohibit a private owner from filling and developing tidelands, the court stated:

[t]here is a growing public recognition that one of the most important uses of the tidelands—a use encompassed within the tidelands trust—is the preservation of those lands in their natural state, so that they may serve as ecological units for scientific study, as open space, and as environments which provide food and habitat for birds and marine life, and which favorably affect the scenery and climate of the areas.⁵⁴

Twelve years later, in the famous *Mono Lake* case, the California Supreme Court again invoked the public trust value of preservation to invalidate permits diverting water from Mono Lake to Los Angeles for domestic consumption.⁵⁵ The court defined the PTD as “an affirmation of the duty of the state to protect the people’s common heritage of streams, lakes, marshlands and tidelands”⁵⁶

The adoption of the public trust value of preservation for current and future generations is not unique to California, with similar holdings in such states as New York,⁵⁷ Washington,⁵⁸ and Hawaii.⁵⁹ Additionally,

52. Craig, *supra* note 42, at 11117 (quoting *Murphy v. Fla. Dep’t of Natural Resources*, 837 F. Supp. 1217, 1221 (S.D. Fla. 1993)).

53. 491 P.2d 374 (Cal. 1971).

54. *Id.* at 380.

55. *Nat’l Audubon Soc’y v. Super. Ct.*, 658 P.2d 709 (Cal. 1983).

56. *Id.* at 724.

57. *W.J.F. Realty Corp. v. New York*, 672 N.Y.S.2d 1007, 1012 (App. Divs. 1998) (upholding environmental protection legislation restricting development of protected areas on Long Island on the premise that “the conservation of resources is intrinsically good and necessary for continuance of society In enacting environmental mandates (as in protecting the right of property), we are merely discharging our obligation under the societal contract between “[t]hose who are dead, those who are living and those who are yet to be born.”) (citation omitted).

58. *Citizens for Responsible Wildlife Mgmt. v. Washington*, 103 P.3d 203, 208 (Wash. Ct. App. 2004) (J. Quinn-Brintnall, concurring) (finding that though the issue did not violate the PTD’s obligation to preserve wildlife, the “sovereign authority to regulate natural resources is circumscribed by its duty to benefit future generations And

the PTD has been expanded by state courts to a variety of other public trust values. For example, in 2008 the California Court of Appeals in *Center for Biological Diversity, Inc. v. FPL Group, Inc.*⁶⁰ held that the public trust encompasses the protection and preservation of wildlife, which includes wild birds in addition to its application to fish and other traditional public trust values.⁶¹ Furthermore, as Klass has noted,

[i]n certain states, courts have expanded the doctrine from its historic domain of ensuring public access to navigable waters to protecting use, access to, and preservation of all waters usable for recreational purposes . . . dry sand beaches . . . parklands, wildlife and wildlife habitat connected to navigable waters, drinking water resources, and inland wetlands.⁶²

Building on the PTD's mutability and capacity to preserve ecosystems and wildlife habitat, Professors Ruhl and Salzman have called for state PTDs to adopt the values of ecosystem services⁶³ and

when the sovereign exercise this authority . . . the tenets of the public trust doctrine must be satisfied.”).

59. *Kelley v. 1250 Oceanside Partners*, 140 P.3d 985 (Haw. 2006) (finding under both common law and the state constitution the PTD imposes a duty to protect natural and water resources for present and future generations).

60. 83 Cal. Rptr. 2d 588 (Cal. Ct. App. 2008).

61. *Id.* at 595-96; Blumm and Paulsen found the *Center for Biological Diversity, Inc. v. FPL Group, Inc.* decision to be a milestone case, linking the doctrine of the sovereign ownership of wildlife with PTD and paving the way for other state courts to recognize that state ownership of wildlife is part of the PTD. Michael C. Blumm & Aurora Paulsen, *The Public Trust in Wildlife* (December 13, 2012), Lewis & Clark Law School Legal Studies Research Paper, available at <http://dx.doi.org/10.2139/ssrn.2189134>.

62. Klass, *supra* note 10, at 707-08 (citing several state cases); *Mont. Coal. for Stream Access v. Curran*, 682 P.2d 163, 171 (Mont. 1984) (holding the PTD protects access to all public recreational waters); *Matthews v. Bay Head Improvement Ass'n*, 471 A.2d 355, 365-66 (N.J. 1984) (expanding the PTD to ensure public access to dry sand beaches from high water mark to vegetation line for recreation); *Paepchke v. Pub. Bldg. Comm'n*, 263 N.E.2d. 11, 15 (Ill. 1970) (extending the public trust to parklands); *Pullen v. Ullmer*, 923 P.2d 54, 61 (Alaska 1996) (holding salmon fall under the purview of the PTD); *Mayor v. Passaic Valley Water Comm'n*, 539 A.2d 760, 765 (N.J. Super. Ct. Law Div. 1987) (holding the doctrine applies to drinking water); *Just v. Marinette Cnty.*, 201 N.W.2d 761, 769 (Wis. 1972) (holding wetlands are protected under the PTD).

63. Ecosystem services are economically valuable services, including “flood mitigation and groundwater recharge from wetlands, water filtration and sediment capture from forests, nutrient cycling, gas regulation, pollination, thermal regulation, carbon sequestration, etc.” Ruhl & Salzman, *supra* note 35, at 230-31.

natural capital⁶⁴ into the scope of the trust.⁶⁵ Specifically, they seek to change the “ecological scope” of the PTD to value the natural capital inherent in public trust resources that supplies economically valuable ecosystem services to the public.⁶⁶ This value of preserving ecosystems is both fundamental to numerous state PTDs and, as will be discussed, is critical to the doctrine’s ability to mitigate the impacts of climate change on trust resources.⁶⁷

In addition to the expansion of the PTD’s scope in state courts, many state constitutions and statutes have incorporated public trust language and principles as a means to bolster environmental protection and preserve natural resources.⁶⁸ Currently, the level of environmental rights provided under different state constitutions ranges from merely empowering legislatures to promulgate environmental legislation to codifying the PTD and granting citizens a right to a healthy environment,⁶⁹ with state court’s interpretations of this constitutional language largely dictating the efficacy of these provisions.⁷⁰ Moreover,

64. Ecosystem services flow from natural capital found in ecosystems, such as “forests, wetlands, coastal dunes, estuaries, and other ecologically defined units of study.” *Id.* at 231.

65. *Id.* at 232.

66. *Id.*

67. *See infra* Part III.B; Craig found that at least sixteen states have what she classifies as “nascent ecological public trust doctrines, representing an evolution of the American [PTD] far beyond its classic protection of public rights to navigate, fish in, and engage in commerce on navigable waters.” Robin K. Craig, *Adapting to Climate Change: The Potential Role of State Common Law Public Trust Doctrines*, 34 VT. L. REV. 781, 850 (2009).

68. Klass, *supra* note 10, at 714, 720-21.

69. *Id.* at 714; *see also* Robert J. Klee, *What’s Good for School Finance Should be Good for Environmental Justice: Addressing Disparate Environmental Impacts Using State Courts and Constitutions*, 30 COLUM. J. ENVTL. L. 135, 167-70 (2005) (forty-two state constitutions include language regarding environmental protection or natural resources, though only eight explicitly grant environmental rights); *see, e.g.*, ALASKA CONST. art. VIII, § 3 (“Wherever occurring in their natural state, fish, wildlife, and waters are reserved to the people for common use.”); PA. CONST. art. 1, § 27 (“The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and aesthetic values of the environment. Pennsylvania’s public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people.”).

70. Klass, *supra* note 10, at 716; *compare* *Cape-Francis Enters. v. Peed*, 29 P.3d 1011, 1017 (Mont. 2001) (finding that “[i]n light of [the] two provisions of Montana’s Constitution, it would be unlawful for . . . a private business entity, to drill a well on its property in the face of substantial evidence that doing so may cause significant degradation of uncontaminated aquifers and pose serious public health risks”), *with*

the PTD has also found its way into state statutory law. Starting in the 1970s and largely influenced by Sax, states began to pass “environmental rights” legislation, advancing to various degrees concepts such as creating a legal right to a healthy environment, providing citizens standing to protect the environment, and fostering the development of a common law of environmental quality.⁷¹ In addition to “environmental rights” statutes, other states have drafted environmental and natural resource legislation infused with public trust values.⁷² As with public trust constitutional provisions, the effectiveness of these statutes is in large part dependent upon the scope of the rights afforded under the legislation and judicial interpretation.⁷³ Klass found constitutional, statutory, and common law work best in concert to create a synergy, and, as will be discussed, could be used to position the PTD to have significant influence on state environmental protection efforts and to provide an effective tool to combat climate change’s negative impacts on

Borough of Moosic v. Pa. Pub. Util. Comm’n, 429 A.2d 1237, 1240 (Pa. Commw. Ct. 1981) (holding that despite § 27 of Pennsylvania’s Constitution, there is no need to consider factors outside existing statutes in the assessment of environmental harms). However, the Pennsylvania Supreme Court in a three-justice plurality recently recognized art. 1, § 27 of the state’s constitution to enforce a right to clean water and air, along with establishing a trustee relationship under which the state must manage resources for all people, including future generations. *See Robinson Twp. v. Pennsylvania*, 83 A.3d 901 (Pa. 2013). A Motion for Reargument or Reconsideration was denied, with one dissenting Justice, on February 21, 2014. http://scholar.google.com/scholar_case?case=1068716167567227972&hl=en&as_sdt=6&as_vis=1&oi=scholar.

71. Klass, *supra* note 10, at 720-21; *see also* Susan George et al., *The Public in Action: Using State Citizen Suit Statutes to Protect Biodiversity*, 6 U. BALT. J. ENVTL. L. 14 (1997) (fifteen states had environmental rights statutes as of the late 1990s); *see, e.g.*, MINN. STAT. §§ 116B.01-.13 (2013) (“The legislature finds and declares that each person is entitled by right to the protection, preservation, and enhancement of air, water, land, and other natural resources located within the state and that each person has the responsibility to contribute to the protection, preservation, and enhancement thereof. . . . Accordingly, it is in the public interest to provide an adequate civil remedy to protect air, water, land and other natural resources located within the state from pollution, impairment, or destruction.”).

72. *See, e.g.*, LA. REV. STAT. ANN. § 56:640.3(A) (2012) (“The legislature recognizes that under the public trust doctrine the marine fishery resources, among other natural resources, are managed by the state in trust for the benefit of all its citizens.”); 310 MASS. CODE REGS. 9.01(2)(a) (2013) (the Department of Environmental Protection has a statutory obligation and responsibility to the Commonwealth for the “effective stewardship of trust lands . . . in accordance with the public trust doctrine, as established by the common law and codified in the Colonial Ordinances of 1641-47 and subsequent statutes and case law of Massachusetts”).

73. Klass, *supra* note 10, at 727.

public trust resources by promoting ORE through traditional public trust values.⁷⁴

*D. The Public Trust Doctrine and
Its Application to Federal Waters and Resources*

In contrast to the relatively long-standing and well-established legal principles that the PTD is applicable to state waters and resources, there is no such foundation for the PTD's viability in the United States Constitution, federal statutes, or common law. As it stands today, U.S. coastal states have full ownership and sovereignty over their ocean waters and over submerged lands from their coastline to three or nine geographical miles out to sea,⁷⁵ subject only to the paramount rights of the federal government for purposes of "commerce, navigation, national defense, and international affairs."⁷⁶ In 1976, Congress passed the Fishery and Conservation Management Act (known as the "Magnuson-Stevens Act"), which codified the 1945 Truman Proclamation⁷⁷ by declaring all waters three to two hundred nautical miles off the coast of the United States and its territories to be fishery conservation zones administered under federal jurisdiction.⁷⁸ In response to the Act, coastal nations, through the United Nations Third Conference on the Law of the Sea (UNCLOS III), produced the treaty known as the United Nations Convention on the Law of the Sea,⁷⁹ which established greater authority for coastal nations over an expanded jurisdictional region, areas referred to as "Exclusive Economic Zones," or EEZs.⁸⁰ Specifically, ratifying coastal nations were granted "sovereign rights" in the EEZ for the purpose of, among others:

74. *See infra* Part V.

75. Submerged Lands Act of 1953, 43 U.S.C.A. § 1301(b) (2013).

76. *Id.* § 1314(a).

77. President Truman issued two proclamations. The first, Proclamation No. 2667, 10 Fed. Reg. 12,303 (Oct. 2, 1945), declared that "the Government of the United States regards the natural resources of the subsoil and sea bed of the continental shelf beneath the high seas but contiguous to the coasts of the United States as appertaining to the United States, subject to its jurisdiction and control." The second, Proclamation No. 2668, 10 Fed. Reg. 12,304 (Oct 2, 1945), established fishery conservation zones.

78. Fishery Conservation and Management Act of 1976, 16 U.S.C.A §§ 1801-1884 (2013).

79. United Nations Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 3.

80. Turnipseed et al., *supra* note 15, at 29.

exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the seabed and of the seabed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds.⁸¹

Through proclamation, but without ratification of the Law of the Sea Treaty,⁸² President Reagan, in 1983, created the United States EEZ.⁸³

Subsequent presidential proclamations extended the United States territorial sea from three to twelve nautical miles (claiming full sovereignty over the territorial sea)⁸⁴ and established the contiguous zone, which extends twelve to twenty-four nautical miles from the coastline of the United States and its territories.⁸⁵ Currently, coastal nations “have full sovereignty over their internal waters and territorial seas (zero to twelve nautical miles seaward); sovereign rights and jurisdiction over the waters, seabed, and resources of their EEZs (twelve to two-hundred nautical miles); and increased jurisdiction to regulate activities within their contiguous zones (twelve to twenty-four nautical miles).”⁸⁶ In total, the United States EEZ covers 4.4 million square miles, an expanse larger than the combined area of all fifty states.⁸⁷ These concepts of sovereignty and sovereign rights thus have significant implications for the efficacy and implementation of the PTD in federal waters.⁸⁸

81. UNCLOS III, art. 56 (1)(a), Dec. 10, 1982, 1833 U.N.T.S. 3.

82. Though the United States was a key player in UNCLOS III, the United States has never ratified the treaty, and despite support from President Obama, the military, and business interests, Congress seems no closer to ratification, due in large part to objections from Senate Republicans concerned over national sovereignty. Patrick Goodenough, *New Senate Unlikely to Favor Law of the Sea Treaty*, CNS, Nov. 8, 2012, <http://cnsnews.com/news/article/new-senate-unlikely-favor-law-sea-treaty> (last visited March 2, 2014).

83. Proclamation No. 5030, 48 Fed. Reg. 10605 (1983) (though the United States never ratified the Law of the Sea Treaty, it acts in accordance with the rules of the treaty).

84. Proclamation No. 5928, 54 Fed. Reg. 777 (Jan. 9, 1989).

85. Proclamation No. 7219, 64 Fed. Reg. 48,701 (Aug 2, 1999).

86. Turnipseed et al., *supra* note 15, at 31 (citing United Nations Convention on the Law of the Sea, *supra* note 79, at arts. 3, 57, and Proclamation No. 7219, *supra* note 85).

87. Turnipseed et al., *supra* note 15, at 3.

88. See *infra* Part V.C.

As ORE projects have been permitted⁸⁹ and installed⁹⁰ in recent years, legal scholarship has turned to the investigation of the PTD's influence on both state and federal submerged lands and waters.⁹¹ However, though public trust language is found in federal resource management statutes⁹² and commentators have made strong arguments for a federal PTD based in the United States Constitution, federal statutes and the common law,⁹³ many have concluded that no federal public trust doctrine presently exists.⁹⁴ Despite this, strong arguments have been made for the need of the PTD to be established in outer continental shelf,⁹⁵ with other commentators providing a "roadmap" for how a federal PTD could be established.⁹⁶ However, none of these arguments have emphasized the need to implement a federal PTD that incorporates

89. See CAPE WIND LEASE, BUREAU OF OCEAN ENERGY MANAGEMENT, <http://www.boem.gov/Renewable-Energy-Program/Studies/Cape-Wind.aspx> (last visited Aug. 5, 2013).

90. See OCEAN RENEWABLE POWER COMPANY (ORPC), <http://www.orpc.co/default.aspx> (last visited Jul. 31, 2013) (a tidal energy project located in the Bay of Fundy off the Maine coast); see also Mario Moretto, *UMaine's Floating Prototype becomes First Offshore Wind Turbine to Provide Power to US*, BANGOR DAILY NEWS, Jun. 13, 2013, available at <http://bangordailynews.com/2013/06/13/news/hancock/umaines-floating-prototype-becomes-first-offshore-wind-turbine-to-provide-power-to-us/?ref=relatedSidebar> (in June of 2013 the VoltturnUS offshore wind turbine prototype deployed off the coast of Maine became the first offshore wind turbine in the U.S. to provide electricity to the power grid).

91. See, e.g., Klass, *supra* note 2; Turnipseed et al., *supra* note 15; Elizabeth A. Ransom, Note, *Wind Power Development on the United States Outer Continental Shelf: Balancing Efficient Development and Environmental Risk in the Shadow of the OCSLA*, 31 B.C. ENVTL. AFF. L. REV. 465 (2004); Rachel E. Salcedo, *Law Applicable on the Outer Continental Shelf and in the Exclusive Economic Zone*, 58 AM. J. COMP. L. 407 (2010).

92. See *infra* notes 160-195.

93. See *infra* Part V.C.

94. See Wilkinson, *supra* note 7, at 288-89 (concluding that though numerous federal courts had used public trust language regarding public lands in their opinions the aggregate did not amount to a federal common law public trust obligation); Eric Pearson, *The Public Trust Doctrine in Federal Law*, 24 J. LAND RESOURCES & ENVTL. L. 173, 174-75 (2004) ("The public trust doctrine . . . exists only nominally in federal law . . . Much of the soaring pro-federal public trust doctrine rhetoric, therefore, would seem to be empty, or near-empty, talk."); Karl S. Coplan, *Public Trust Limits on Greenhouse Gas Trading Schemes: A Sustainable Middle Ground?*, 35 COLUM. J. ENVTL. L. 287, 312 (2010) ("Whether the public trust doctrine applies to federal legislative action remains an open question.").

95. See Craig, *supra* note 42, at 11120.

96. See Klass, *supra* note 2, at 1067-70; Turnipseed et. al., *supra* note 15, at 40-50.

ORE values as a means of combating climate change.⁹⁷ As illustrated in the preceding sections, climate change threatens to irrevocably harm trust lands and resources. Both the federal government and individual states can better protect these resources from the detrimental impacts of climate change by elevating ORE to equal status with other traditional public trust values and establishing a “green thumb” rebuttable presumption in favor of ORE. This would better ensure that judicial and legislative action is taken so that ocean waters and submerged lands are used as a means to reduce carbon emissions and slow the steady march of rising waters and warming seas.

III. CLIMATE CHANGE AND ITS THREAT TO PUBLIC TRUST RESOURCES

A. A Carbon Stressed World: Current and Future Impacts of Climate Change

In the 2012 article, *Fiddling as the World Floods and Burns: How Climate Change Urgently Requires a Paradigm Shift in the Permitting of Renewable Energy Projects*,⁹⁸ Professor Jeffrey Thaler provides a comprehensive overview of the United States’ energy use and resulting impacts of climate change.⁹⁹ Rather than repeat that analysis for this Article, we give a general overview of U.S. energy consumption, its impacts upon climate change, and how climate change adversely affects public trust resources.

Since 1750 and the start of the Industrial Revolution, atmospheric concentrations of GHGs have significantly increased due to human consumption of fossil fuels, warming the planet and changing our climate.¹⁰⁰ The combustion of fossil fuels to generate electricity

97. See Jeffrey Thaler, *In the Public Trust: Climate Changed Sea Levels and Ocean Wind Power*, 31 DELAWARE LAWYER 20 (No. 4 Winter 2014).

98. Jeffrey Thaler, *Fiddling as the World Floods and Burns: How Climate Change Urgently Requires a Paradigm Shift in the Permitting of Renewable Energy Projects*, 42 ENVTL. L. 1101 (2012).

99. *Id.* at Section II.

100. Thaler, *supra* note 97, at 1107-08. In 2007, the Intergovernmental Panel on Climate Change (IPCC) reported that it was ninety percent certain that humans were responsible for the majority of the “unequivocal” increase in average global temperatures over the past fifty years. RICHARD B. ALLEY ET AL., INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, SUMMARY FOR POLICYMAKERS: A REPORT OF WORKING GROUP I OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 2-5, 10-12 (2007), available at <http://www/ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf>. In 2013 the IPCC increased its certainty to ninety-five percent certainty that humans were the principle cause of climate change. See Justin Gillis, *Climate Panel Cites Near Certainty on Warming*, N.Y.

accounts for the largest source of carbon dioxide (CO₂) emissions (a GHG) in the United States.¹⁰¹ In fact, on May 9, 2013 the Mauna Loa Observatory in Hawaii measured atmospheric CO₂ concentrations to have passed four-hundred parts per million, the highest concentrations in more than three million years.¹⁰² Despite the United States signing and the ratification of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, acknowledging the need to stabilize GHG emissions to avoid the dangerous impacts of climate change,¹⁰³ both fossil fuel consumption and atmospheric GHG emissions continue to grow in the United States, perpetuating “an urgent and potentially irreversible threat to human societies and the planet.”¹⁰⁴

TIMES, Aug. 19, 2013, available at http://www.nytimes.com/2013/08/20/science/earth/extremely-likely-that-human-activity-is-driving-climate-change-panel-finds.html?adxn1=1&src=me&adxn1x=1377029122-oLLP3nIPAdkPrb/xm7M2Q&_r=2& (the report finds that if carbon emissions continue unabated a five-degree-Fahrenheit increase in global temperature is likely, which would lead to “widespread melting of land ice, extreme heat waves, difficulty growing food and massive changes in plant and animal life, probably including a wave of extinctions.”).

101. EPA 430-R-12-001, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990-2011, at ES-11 (2012), <http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html> (last visited Aug. 14, 2013); see also *Causes of Climate Change*, EPA, <http://www.epa.gov/climatechange/science/causes.html> (last visited Aug. 14, 2013) (CO₂ is the primary GHG emitted by humans, and “[t]he current CO₂ level is higher than it has been in at least 800,000 years Methane is more abundant in Earth’s atmosphere now than at any time in at least the past 650,000 years.”).

102. Robert Kunzig, *Climate Milestone: Earth’s CO₂ Level Passes 400 ppm*, NAT’L GEOGRAPHIC DAILY NEWS, May 9, 2013, available at <http://news.nationalgeographic.com/news/energy/2013/05/130510-earth-co2-milestone-400-ppm/> (“The last time the concentration of Earth’s main greenhouse gas reached this mark, horses and camels lived in the high Arctic. Seas were at least 30 feet higher—at a level that today would inundate major cities around the world. The planet was about two to three degrees Celsius (3.6 to 5.4 degrees Fahrenheit) warmer. But the Earth then was in the final stage of a prolonged greenhouse epoch, and CO₂ concentrations were on their way down. This time, four-hundred ppm is a milepost on a far more rapid uphill climb toward an uncertain climate future.”).

103. United Nations Framework Convention on Climate Change, art. 2, May 9, 1992, 1771 U.N.T.S. 107 (the objective of UNFCCC was “[to achieve] stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.”).

104. Thaler, *supra* note 97, at 1109 n.31 (quoting *United Nations Framework Convention on Climate Change, Conference of the Parties*, Durban, S. Afr., Nov. 28-Dec. 11, 2011, *Report of the Conference of the Parties on Its Seventeenth Session, Addendum, Part Two: Action Taken by the Conference of the Parties at Its Seventeenth Session*, 2,

In 2012 the planet witnessed average global land and sea surface temperatures that ranked among the ten warmest years on record, with the heat content in the upper seven-hundred meters of the ocean at record highs and sea levels reaching record levels as well.¹⁰⁵ These increased global temperatures have continued, with the National Oceanic and Atmospheric Administration (NOAA) reporting that 2013 tied for the fourth-warmest year ever recorded, continuing the trend of thirty-seven consecutive years of higher than average global temperatures.¹⁰⁶ In the months preceding June 2013, the Northern Hemisphere saw “one of the most rapid shifts in near opposite extremes on record, if not the largest from April to May,” with a snow cover in April that ranked the ninth highest on record followed by a hurried melt that left May with the third lowest snow cover ever recorded.¹⁰⁷ In the western United States, heat waves and drought conditions in July 2013 led to persistent wildfires and degraded rangelands.¹⁰⁸ Climate change may have already permanently

U.N. Doc. FCCC/CP/2011/9/Add.1 (Mar. 15, 2012), available at <http://unfccc.int/resource/docs/2011/cop17/enf/09a01.pdf>.

105. *State of the Climate in 2012*, 94(8), *BULL. AM. METEOROLOGICAL SOC'Y. (SPECIAL SUPPLEMENT)*, (J. Blunden & D.S. Arndt eds.) (Aug. 2013), at xiv (additionally, “[m]inimum Arctic sea ice extent in September and Northern Hemisphere snow cover extent in June both reached new record lows Permafrost temperatures reached record high values in northernmost Alaska. A new melt extent record occurred on 11-12 July on the Greenland ice sheet . . .”); see also *Unprecedented Climate Extremes Mark Decade 2001-2010*, ENVTL NEWS SERVICE, July 17, 2013, available at <http://ens-newswire.com/2013/07/17/unprecedented-climate-extremes-mark-decade-2001-2010/>.

106. Ryan Koronowski, *NOAA: 2013 was Tied for the Fourth-Hottest Year on Record*, CLIMATE PROGRESS, Jan. 21, 2014, <http://thinkprogress.org/climate/2014/01/21/3187581/noaa-nasa-2013-temperature/> (also citing a National Aeronautics and Space Administration (NASA) report that found 2013 to be the seventh-warmest on record, which used the same data as NOAA but analyzed it using a slightly different process).

107. Jason Samenow, *Snow and Arctic Sea Ice Plummet Suddenly as Globe Bakes*, WASH. POST, July 18, 2013, available at <http://www.washingtonpost.com/blogs/capital-weather-gang/wp/2013/07/18/snow-and-arctic-ice-extent-plummet-suddenly-as-globe-bakes/>. (“The snow extent shrunk from 12.4 million square miles to 6.2 million square miles in a month’s time. By June, just 2.3 million square miles of snow remained in the Northern Hemisphere (a decline of 63 percent from May) . . . [the] Northern Hemisphere spring snow cover is in the midst of long-term free fall, similar to its relative, summer Arctic sea ice extent.”).

108. *U.S. Endures Heat Waves, Extended Drought*, ENVTL. NEWS SERV., Jul. 16, 2013, available at <http://ens-newswire.com/2013/07/16/u-s-endures-heat-waves-extended-drought/> (“In New Mexico, 93 percent of rangeland and pastures are rated poor or very poor. The figure is 59 percent in Colorado; 35 percent in Wyoming; and 17 percent in Utah. Similar conditions exist in Nevada, where more than 60 percent of the state has been in severe or extreme drought conditions since the beginning of 2013.”). For current

transformed the western U.S. forests, as the increasing frequency of “mega-fires” has left vast swaths of land sterilized and almost impossible for forests to regenerate.¹⁰⁹

Global CO₂ emissions from fossil fuel combustion and cement production achieved record levels of 9.5 +/- 0.5 Pg C¹¹⁰ in 2011, and broke that record in 2012 with 9.7 +/- Pg C in 2012.¹¹¹ With CO₂ emissions continuing to increase more rapidly, the international goal of limiting the warming of the planet to 2.0 degrees Celsius (°C) is quickly becoming unattainable.¹¹² To have even a fifty-fifty chance to keep average global temperature below 2.0°C of the planet’s temperature as it was in 1750, emissions must not exceed one trillion tons.¹¹³ Nonetheless, by October 2013 humans had already emitted over 573.5 billion tons of CO₂, and at current rates the trillionth ton will be emitted in December 2040.¹¹⁴

Predictions have been made that with each degree Celsius increase in temperature, the climate will respond by doubling to quadrupling the area burned by wildfires in the western United States, decreasing crop yields by five to fifteen percent, increasing the destructive force of

drought conditions, precipitation analysis, crop conditions, stream flow, soil moisture, fire danger and snowpack information in the U.S., see DROUGHT MONITOR: CURRENT CONDITIONS, NAT’L DROUGHT MITIGATION CTR., <http://droughtmonitor.unl.edu/current.html> (last visited Sep. 10, 2013).

109. Richard Schiffman, *The Southwest’s Forests May Never Recover from Megafires*, THE ATLANTIC, Jul. 5, 2013, available at <http://www.theatlantic.com/technology/archive/2013/07/the-southwests-forests-may-never-recover-from-megafires/277545/> (“The last 10 years have seen more than 60 mega-fires over 100,000 acres in size in the West. When they get that big, firefighters often let them burn themselves out, over a period of weeks, or even months. These fires typically leave a scorched earth behind that researchers are beginning to fear may never come back as forest again.”).

110. 1 Pg C = 1 billion tons of carbon = 3.7 billion tons of CO₂.

111. GLOBAL CARBON BUDGET, GLOBAL CARBON PROJECT, <http://www.globalcarbonproject.org/carbonbudget/13/hl-full.htm> (last visited Mar. 5, 2014).

112. Justin Gillis & John M. Broder, *With Carbon Dioxide Emissions at Record High, Worries on How to Slow Warming*, N.Y. TIMES, Dec. 2, 2012, available at http://www.nytimes.com/2012/12/03/world/emissions-of-carbon-dioxide-hit-record-in-2011-researchers-say.html?_r=0 (referencing the Global Carbon Project). The 2°C threshold is the target often cited to avoid severe global consequences from climate change. See, e.g., Richard H. Moss et al., *The Next Generation of Scenarios for Climate Change Research and Assessment*, 463 NATURE 747, 750 (2010) (discussing the need to develop climate change scenarios with a 2.0°C “maximum”).

113. Thaler, *supra* note 97, at 1109.

114. TRILLIONTHONNE.ORG, EXPLAINING THE NEED TO LIMIT CUMULATIVE EMISSIONS OF CARBON DIOXIDE, <http://trillionthtonne.org/> (last visited Oct. 1, 2013) (calculating that for a three-in-four chance of remaining below a 2°C rise emissions must stop at 750 billion tons, a level that at current rates will be reached in early 2028).

hurricanes, causing more very hot summers, and creating greater variability in precipitation frequency and amount.¹¹⁵ A summary of studies found that a 1.0°C increase in average global temperatures would reduce annual September Arctic sea ice by fifteen to twenty-five percent; a 2.0°C increase would cause greater heat waves in Europe, result in significant melting of the Greenland Ice Sheet, and lead to the extinction of numerous terrestrial and marine species; 3.0°C would result in severe drought and firestorms in the Amazon, emitting large quantities of carbon into the atmosphere; at 4.0°C hundreds of billions of tons of carbon in permafrost melt, releasing egregious amounts of methane and the Arctic Ocean icecap disappears; a 5.0°C increase has not been seen on earth for fifty-five million years, a time when the Canadian high Arctic was home to crocodiles and rainforests; and 6.0°C was last seen 251 million years ago in the Permian period, when up to ninety-five percent of species abruptly became extinct.¹¹⁶

To monetize the effects of climate change, the National Research Council (NRC) analyzed the “hidden” costs of fossil fuel consumption not accounted for in the price of oil, coal, and other carbon-based energy sources.¹¹⁷ The NRC estimated that in 2005 fossil fuel energy production in the United States caused \$120 billion in damage, primarily through damages to human health from air pollution.¹¹⁸ The NRC also suggested that damages from climate change, such as harm to ecosystems and infrastructure, insurance costs, negative effects of air pollutants, and

115. See Thaler, *supra* note 97, at 1113 (citing NAT'L RESEARCH COUNCIL, CLIMATE STABILIZATION TARGETS: EMISSIONS, CONCENTRATIONS, AND IMPACTS OVER DECADES TO MILLENNIA, 6-8, 23, 119-20 (2011)).

116. Thaler, *supra* note 97, at 1113-14 (citing MARK LYNAS, SIX DEGREES: OUR FUTURE ON A HOTTER PLANET 358 (2008)); see also NEW NASA VISUALIZATIONS SHOW TWO FUTURES OF CLIMATE CHANGE, U.S. GLOBAL CHANGE RESEARCH PROGRAM, <http://www.globalchange.gov/whats-new/agency-news/942-new-nasa-visualizations-show-two-futures-of-climate-change> (last visited Mar. 2, 2014) (visually depicting two different CO₂ emission scenarios (550 ppm and exceeding 800 ppm) and their resulting impacts on temperature and precipitation on the U.S. by 2100).

117. See generally NAT'L RESEARCH COUNCIL, HIDDEN COSTS OF ENERGY: UNPRICED CONSEQUENCES OF ENERGY PRODUCTION AND USE (2010) [hereinafter NRC HIDDEN COSTS OF ENERGY].

118. *Id.* at 21; see also Katie Valentine, *Cutting Carbon Emissions Could Save 3 Million Lives Per Year by 2100, Study Finds*, CLIMATE PROGRESS, Sept. 23, 2013, available at <http://thinkprogress.org/climate/2013/09/23/2662871/cutting-carbon-saves-lives/> (finding that three million premature deaths a year could be avoided globally by 2100 if aggressive emission cuts are made, with the U.S. already experiencing 200,000 premature deaths a year from exposure to air pollution).

national security risks,¹¹⁹ could amount to an additional \$120 billion.¹²⁰ Exemplifying the costs of climate change, in 2012 the world's two most costly natural disasters were both in the United States, with Hurricane Sandy costing \$65 billion and the year-long Midwest/Plains drought totaling \$35 billion.¹²¹ On a related note, a United Nations draft report recently found that if the world's governments continue to not seriously address carbon emissions, within fifteen years, it will be virtually impossible to solve the economic disruptions caused by climate change.¹²²

119. NRC HIDDEN COSTS OF ENERGY, *supra* note 116, at 46, 53, 66-67; *see also* Thaler, *supra* note 97, at 1112.

120. NRC report author Thomas McKone stated that “damages from GHGs appear to be on the same order of magnitude as those for human health.” Allan Chen, *The Hidden Costs of Energy Production—\$120 Billion in 2005*, BERKELEY LAB NEWS CTR., Oct. 21, 2009, available at <http://newscenter.lbl.gov/feature-stories/2009/10/21/hidden-costs-of-energy>; *see also* Thaler, *supra* note 97, at 1112 n.48.

121. Doyle Rice, *Hurricane Sandy, Drought Cost U.S. \$100 billion*, U.S.A. TODAY, Jan. 24, 2013, available at <http://www.usatoday.com/story/weather/2013/01/24/global-disaster-report-sandy-drought/1862201/> (referencing the insurance firm Aon Benfield's *Annual Global Climate and Catastrophe Report*) (“Sandy and the drought accounted for nearly half of the world's economic losses but, owing to higher levels of insurance coverage in the U.S., 67% of insured losses globally, the report states. Total economic losses include the entire cost of an event, while insured losses are the amount of economic losses that are covered by insurance.”); *see also* H.R. REP. NO. 111-137, at 317 (2009) [hereinafter ACESA REPORT], available at <http://www.gpo.gov/fdsys/pkg/CRPT-111hrpt137/pdf/CRPT-111hrpt137.pdf> (House of Representatives committee report finding that “[t]here was broad scientific consensus that the United States is vulnerable to weather hazards that will be exacerbated by climate change” and that the “cost of damages from weather disasters has increased markedly from the 1980s, rising to more than 100 billion dollars in 2007. In addition to a rise in total cost, the frequency of weather disasters costing more than one billion dollars has increased.”); *see also* Tim Folger, *Rising Seas*, NAT. GEO., Sept. 2013, available at <http://ngm.nationalgeographic.com/2013/09/rising-seas/folger-text> (“By the end of the century a hundred-year storm surge like Sandy's might occur every decade or less. Using a conservative prediction of a half meter (20 inches) of sea-level rise, the Organization for Economic Co-operation and Development estimates that by 2070, 150 million people in the world's large port cities will be at risk from coastal flooding, along with \$35 trillion worth of property—an amount that will equal nine percent of the global GDP.”).

122. Justin Gillis, *U.N. Says Lag in Confronting Climate Woes Will be Costly*, N.Y. TIMES, Jan. 16, 2014, available at http://www.nytimes.com/2014/01/17/science/earth/un-says-lag-in-confronting-climate-woes-will-be-costly.html?ref=justingillis&_r=0 (without serious emission reductions, future generations will have to develop the technology to suck carbon and other GHGs out of the atmosphere and store them underground, but it is unclear if these technologies will ever exist and even if they did, they would be exorbitantly expensive as compared to taking steps now to slow emissions).

B. Climate Change and its Impacts on Public Trust Resources

Climate change is already having a significant impact upon public trust resources, threatening the traditional public trust values of navigation, commerce, and fishing in and on navigable and tidal waters and the lands beneath, in addition to causing negative impacts upon numerous trust values recognized by various state courts and legislatures in the United States. One major threat to these public trust values is sea level rise, which globally has already increased by eight inches since the late 1800s.¹²³ The September 27, 2013 IPCC Assessment Report found that the Greenland and Antarctic ice sheets have been losing mass, glaciers have continued to shrink almost worldwide, and both Arctic sea ice and Northern Hemisphere spring snow cover have continued to decrease in extent—and all these changes will continue through this century.¹²⁴ Under all scenarios, the rate of sea level rise will very likely exceed that observed during 1971–2010 due to increased ocean warming and increased loss of mass from glaciers and ice sheets.¹²⁵

The new report also projects that global mean sea level rise for 2081–2100 will likely be in the range of 10.2 to 32 inches, depending on greenhouse gas emission rates; the scenario of a no-slowdown of fossil fuel emissions shows a mean sea level rise range between 21 and 38.2 inches, which would be devastating—with substantial damages in the hundreds of billions of dollars—for numerous highly populated coastal cities at or near current sea levels, from New York to Hong Kong.¹²⁶

123. OUR CHANGING CLIMATE, 2013 FEDERAL ADVISORY COMMITTEE DRAFT CLIMATE ASSESSMENT, 63, available at <http://ncadac.globalchange.gov/download/NCAJan11-2013-publicreviewdraft-chap2-climate.pdf> (oceans are absorbing over ninety percent of increased atmospheric heat resulting for GHG emissions, expanding the ocean as it warms and increasing sea levels. This rising is compounded by melting glaciers and ice sheets.).

124. IPCC HEADLINE STATEMENTS FROM THE SUMMARY FOR POLICYMAKERS, available at http://www.climatechange2013.org/images/uploads/WG1AR5_Headlines.pdf; see also Joe Romm, *Arctic Autumns on Track to Warm a Staggering 23°F, NOAA Warns*, CLIMATE PROGRESS, Feb. 13, 2014, <http://thinkprogress.org/climate/2014/02/13/3280421/arctic-autumn-staggering-warming/> (citing a recent NOAA study, which projects that by the end of the century the Arctic will warm by 23.0°F in late fall and 9.0°F in late spring under emission projections without a mitigation scenario).

125. *Id.*

126. Andrew Freedman, *Zeroing In on IPCC's Sea Level Rise & Warming 'Hiatus'*, CLIMATE CENT., Sept. 27, 2013, available at <http://www.climatecentral.org/news/zeroing-in-on-ipccs-sea-level-rise-warming-hiatus-16532>. A study released in July 2013 found global sea levels likely will rise about 2.4 meters (7.5 feet) for every 1.0°C global average temperature increase. *Each Degree of Warming Will Raise Sea Levels 7.5 Feet*, ENVTL. NEWS SERV., July 15, 2013, available at <http://ens-newswire.com/2013/07/15/each->

At present, rising oceans are significantly impacting public trust resources, as the 2009 ACESA Report found that “[sea level rise is] already causing inundation of low-lying lands, corrosion of wetlands and beaches, exacerbation of storm surges and flooding, and increases in the salinity of coastal estuaries and aquifers.”¹²⁷ Wetlands and coastal estuaries (tidelands), beaches, and the wildlife dependent on this habitat are considered public trust resources by numerous U.S. states,¹²⁸ and damage to these resources harms fishing and commerce.¹²⁹ These trust resources are especially threatened in the North Atlantic coast “hot spot” running from Cape Hatteras, North Carolina to Boston, Massachusetts, where sea levels have been rising three to four times faster than the global average since 1980.¹³⁰

Evidence shows that climate change is occurring at a pace “orders of magnitude more rapid” than at any other time in the last sixty-five

degree-of-warming-will-raise-sea-levels-7-5-feet (“Scientists say the four major contributors to sea-level rise on a global scale are: melting of glaciers, melting of the Greenland ice sheet, melting of the Antarctic ice sheet, and expansion of the ocean itself as it warms.”).

127. Thaler, *supra* note 97, at 1118 (quoting ACESA REPORT, *supra* note 121, at 305); see also P. ROBINSON, A.K. LEIGHT, D.D. TRUEBLOOD, & B. WOOD, CLIMATE SENSITIVITY OF THE NAT’L ESTUARINE RESEARCH RESERVE SYSTEM, REPORT TO NOAA’S CLIMATE PROGRAM OFFICE 79 (2013) (finding climate change to be one of the key stressors to U.S. estuary resilience, as well as temperature change and sea level rise to pose risks to estuary biophysical sensitivity).

128. See generally *supra* Part II.C; see also *Avenal v. State*, 886 So. 2d 1085, 1101-02 (La. 2004) (using the public trust doctrine to uphold a river diversion project that adversely impacted private oyster beds, in order to address coastal erosion, which threatened land, jobs, and commerce).

129. *Global Warming Impacts on Estuaries and Coastal Wetlands*, NAT’L WILDLIFE FED’N, <https://www.nwf.org/Wildlife/Threats-to-Wildlife/Global-Warming/Effects-on-Wildlife-and-Habitat/Estuaries-and-Coastal-Wetlands.aspx> (last visited Feb. 2, 2014). (“Fishing, tourism and recreational boating associated with estuaries supports more than 28 million jobs in the U.S. In 2006, an estimated \$491 million in fish and wildlife was extracted from Louisiana, with much of that dependent upon or from coastal wetlands. Chesapeake Bay waters alone produce some 500 million pounds of seafood for human consumption each year. Some 75 percent of commercial fisheries rely upon estuaries and coastal wetlands for habitat.”); see also Stephane Hallegatte et al., *Future Flood Losses in Major Coastal Cities*, 3 NATURE CLIMATE CHANGE 802, 802 (2013) (for the world’s 136 largest coastal cities, average flood losses were estimated to be approximately \$6 billion per year in 2005 and are predicted to increase to \$52 billion by 2050).

130. Asbury H. Sallenger, Jr. et al., *Hotspot of Accelerated Sea-Level Rise on the Atlantic Coast of North America*, 2 NATURE CLIMATE CHANGE 884, 884 (2012) (this “hotspot” is due to a variety of factors, such as ocean circulation patterns, the earth’s shape and rotation, and water temperature and salinity variations).

million years, potentially outpacing many species' ability to adapt.¹³¹ The National Wildlife Federation (NWF) considers climate change "the biggest threat wildlife will face this century," citing dangers such as shifts in the location of species and habitats, changes in seasonal timing, changes to winter temperature and precipitation, and more severe droughts and heavy rainfall events.¹³² These impacts are already threatening sea birds off the Atlantic coast, such as the iconic Atlantic puffin and razorbill, which are experiencing starvation and unusual migration behaviors linked to warming ocean temperatures and severe weather events.¹³³ Moreover, climate change has the potential to significantly alter entire ecosystems, leading to mass die-offs¹³⁴ or exodus of wildlife species considered endemic to a region.¹³⁵

131. Rebecca J. Rosen, *The Climate Is Set to Change 'Orders of Magnitude' Faster Than at Any Other Time in the Past 65 Million Years*, THE ATLANTIC, Aug. 2, 2013, available at <http://www.theatlantic.com/technology/archive/2013/08/the-climate-is-set-to-change-orders-of-magnitude-faster-than-at-any-other-time-in-the-past-65-million-years/278290/> (citing Noah S. Diffenbaugh & Christopher B. Field, *Changes in Ecologically Critical Terrestrial Climate Conditions*, 341 SCIENCE 486 (2013)). ("[T]he Paleocene-Eocene Thermal Maximum, thought one of the more rapid climatic shifts, was 100-fold slower than the most dramatic 21st century scenarios, and 10-fold slower than the best-case ones. . . . The specifics of how this 'unprecedented rate of global warming' will affect terrestrial species are uncertain, and will likely vary region to region, habitat to habitat. For some species, hospitable environments may emerge just kilometers away. For others, the authors put it in words that conceal the turmoil, 'the constraint may be no-analog climates.' Meaning, simply, that they'll have nowhere to go.")

132. WILDLIFE IN A WARMING WORLD, NAT'L WILDLIFE FED'N, 4-8 (2013), available at https://www.nwf.org/pdf/Reports/NWF_Wildlife-Warming-World_Report_web.pdf [hereinafter NWF WILDLIFE REPORT]; see also SHIFTING SKIES: MIGRATORY BIRDS IN A WARMING WORLD, NAT'L WILDLIFE FED'N, 22-28 (2013), <https://www.nwf.org/News-and-Magazines/Media-Center/Reports/Archive/2013/06-18-13-Migratory-Birds-in-a-Warming-World.aspx> (last visited Feb. 2, 2014) [hereinafter NWF BIRDS REPORT].

133. Abigail Curtis, *Starving Puffins Indicate Trouble at Sea*, BANGOR DAILY NEWS, June 5, 2013, available at <http://bangordailynews.com/2013/06/05/news/midcoast/starving-puffins-indicate-trouble-at-sea/> (razorbills have been migrating to Florida instead of the Gulf of Maine in the winter, puffin chicks are starving because their parents are struggling to find herring, and puffins have been suffering significant die-offs related to a series of severe storms).

134. John Holyoke, *Report: Climate Change a Threat to Freshwater Fishing*, BANGOR DAILY NEWS, Sept. 5, 2013, available at <https://bangordailynews.com/2013/09/05/outdoors/report-climate-change-a-threat-to-freshwater-fishing/> (severe weather events caused by climate change could exacerbate pollution runoff into freshwater ecosystems and further degrade aquatic habitat, threatening species such as Maine's iconic brook trout).

135. See, e.g., Aislinn Samacki, *Experts Identify Maine Wildlife, Plants Vulnerable to Climate Change*, BANGOR DAILY NEWS, Mar. 12, 2014, available at <http://bangordailynews.com/2014/03/12/outdoors/experts-identify-maine-wildlife-plants-vulnerable-to-climate-change/?ref=regionstate> (a Manomet Center for Conservation Science study finds

Over the past century, global sea-surface temperatures have increased approximately 1.3° Fahrenheit, with the heat penetrating almost two miles into the ocean.¹³⁶ Ocean warming is having a significant impact on marine species, causing them to change breeding times and shift their habitats toward the poles at a rate much faster than terrestrial species.¹³⁷ For example, phytoplankton (a basic food for all marine species), zooplankton, and bony fish are moving towards the poles at an average of seventy-two kilometers (forty-five miles) every decade, greatly outpacing the terrestrial species average of six kilometers (four miles).¹³⁸ Changes as large as these generally lead to “migration, adaptation or extinction,” with the potential to drastically affect fishing and marine tourism industries.¹³⁹

iconic Maine species such as moose, loons, and salmon are vulnerable to population decline caused by climate change); see also Mario Moretto, *Climate Experts: Warming in Maine Leading to Declining Moose, Lobster Populations*, BANGOR DAILY NEWS, Oct. 17, 2013, available at <http://bangordailynews.com/2013/10/17/politics/climate-experts-discuss-effects-of-warming-in-maine-including-declining-moose-lobster-populations/> (reporting on the presentation of renowned climatologist Michael Mann, which in part discussed the current impacts of climate change on the iconic Maine species of moose and lobster); see also Jim Robbins, *Moose Die-Off Alarms Scientists*, N.Y. TIMES, Oct. 14, 2013, available at http://www.nytimes.com/2013/10/15/science/earth/something-is-killing-off-the-moose.html?emc=eta1&_r=1& (discussing the link between climate change and the steep moose population declines being experienced across North America).

136. Thaler, *supra* note 97, at 1123 (citing S. Levitus et al., *Warming of the World Ocean, 1955-2003*, 32 GEOPHYSICAL RES. LETTERS 1 (2005)); see also Joe Romm, *Faux Pause: Ocean Warming, Sea Level Rise and Polar Ice Melt Speed Up, Surface Warming to Follow*, CLIMATE PROGRESS, Sept. 25, 2013, available at <http://thinkprogress.org/climate/2013/09/25/2562441/faux-pause-ocean-warming-speed-up/> (“global warming has accelerated, with more overall global warming in the past 15 years than the prior 15 years. This is because about 90% of overall global warming goes into heating the oceans, and the oceans have been warming dramatically.”).

137. *Global Scientists Shocked by True Scale of Ocean Warming*, ENV’T NEWS SERVICE, Aug. 5, 2013, available at <http://ens-newswire.com/2013/08/05/global-scientists-shocked-by-true-scale-of-ocean-warming/>.

138. *Id.* (“Phytoplankton – which provide the basic food for all life in the seas – are now blooming an average of six days earlier in the season, compared with land plants. Baby fish appear to be hatching around 11 days earlier in the season”).

139. *Id.*; see also Clarke Canfield, *New England Sees Rise in Warm-Water Ocean Species*, PORTLAND PRESS HERALD, Sept. 26, 2013, available at <http://www.pressherald.com/news/New-England-sees-rise-in-warm-water-ocean-species-.html?pagenum=1> (reporting that in the Gulf of Maine, sightings of warmer water species such as Longfin squid, ocean sunfish, sea horses, triggerfish, and filefish are being reported in greater frequency, while Atlantic cod and other commercially valuable fish to New England are shifting northeast due to warming waters).

Warming ocean waters also have facilitated the outbreak of pathogens in the eastern oyster and microbial diseases in reef-building corals,¹⁴⁰ while ocean warming and ocean acidification¹⁴¹ are believed to have led to declines in clam populations off the Maine coast, with warming waters harboring the invasive European green crab that prey on clam populations already threatened by the effects of ocean acidification.¹⁴² Moreover, there is great concern along the North Atlantic coast regarding lobster and the impacts of ocean warming, with fears that populations in the Gulf of Maine could soon experience a collapse similar to that of southern New England's lobster fishery.¹⁴³

140. NWF WILDLIFE REPORT, *supra* note 130, at 5 (citing S.E. Ford & R. Smolowitz, *Infection Dynamics of an Oyster Parasite in Its Newly Expanded Range*, 151 MARINE BIOLOGY 119 (2007); John F. Bruno et al., *Thermal Stress and Coral Cover as Drivers of Coral Disease Outbreaks*, 5 PLOS ONE BIOLOGY 1220 (2007)).

141. Ocean acidification is the reduction of the pH caused primarily by the uptake of CO₂ from the atmosphere. CO₂ is an acid gas, in that as it dissolves in water it becomes carbonic acid (H₂CO₃) and alters the ocean's chemistry. Ocean pH has declined globally by about 0.1 units, making carbonate ions less abundant, which are a crucial component of the calcium carbonate (CaCO₃) needed for the formation of sea shells and coral skeletons. This results in greater difficulty for and stresses on the species that depend on calcium carbonate for building and maintaining shells and other structures, such as coral, plankton, and shellfish. Roughly a third of all CO₂ related to human activity has been absorbed by oceans, and were it not for the ocean, atmospheric levels of CO₂ would be increasing at a greater rate than they are presently. See *What is Ocean Acidification?*, NOAA OCEAN ACIDIFICATION PROGRAM, available at <http://www.oceanacidification.noaa.gov/Home/WhatisOceanAcidification.aspx>; see also Astrid C. Wittman & Hans-O. Pörtner, *Sensitivities of Extant Animal Taxa to Ocean Acidification*, 3 NATURE CLIMATE CHANGE 995 (2013) (analyzing five specific categories of ocean life (corals, echinoderms, mollusks, crustaceans, and fishes) and projecting all categories to respond poorly to acidification, with corals, echinoderms, and mollusks being the most vulnerable); see also OCEAN ACIDIFICATION, SUMMARY FOR POLICYMAKERS, <http://www.igbp.net/news/news/news/oceanacidificationsummaryforpolicymakersreleased.5.30566fc6142425d6c911265.html> (the ocean is acidifying at a "rate of change [that] may be faster than at any time in the last 300 million years").

142. Bill Trotter, *Scientists Zero in on 'Exploding' Green Crab Population in Maine*, BANGOR DAILY NEWS, Nov. 18, 2013, available at <http://bangordailynews.com/2013/11/18/news/hancock/scientists-zero-in-on-exploding-green-crab-population-in-maine/>; see also Katie Valentine, *Climate Change Devastating Ocean Fisherman: 'Sometimes We'll Catch 5,000 Pounds of Jellyfish'*, CLIMATE PROGRESS, Sept. 24, 2013, available at <http://thinkprogress.org/climate/2013/09/24/2665951/climate-change-fishermen-oceans/> ("Rising temperature and ocean acidification are causing jellyfish populations to increase . . . disrupting the ocean ecosystem and clogging fishermen's nets.").

143. Whit Richardson, *Portland Symposium Addresses Climate Change's Effects on Lobster Fishery*, BANGOR DAILY NEWS, Nov. 30, 2012, available at <http://bangordailynews.com/2012/11/29/business/climate-changes-effects-on-lobster-fishery-among-topics-addressed-in-portland->

Additionally, the commercially important species of cod, haddock, winter flounder, and yellowtail flounder found off the New England coast are extra sensitive to ocean warming, as they are at the southern end of their range.¹⁴⁴ Ocean warming and acidification thus have already had significant impacts on the trust waters, ecosystems, and species protected under the PTD, as well as on the public trust values of fishing and commerce, and continues to threaten the livelihoods of fishermen, the U.S. economy, and national food supply.¹⁴⁵

Sea level rise, ocean warming, ocean acidification, and acute damage from severe weather events as a result of climate change increasingly have the potential to drastically alter the ecosystems of wetlands, estuaries, and near shore and deep sea fisheries to the point that will make any form of the PTD obsolete. As Professor Ralph W. Johnson has stated, “the right of fishery . . . is meaningless unless fish are there to be caught. . . . Thus the right of fishery necessarily includes an implied right to water quality sufficient to support the fishery.”¹⁴⁶ Similarly, Professor Sax understood the PTD to bestow the trustee with an obligation to support the public’s “expectations that support social,

symposium/?ref=search (“In western Long Island Sound, lobster landings have decreased 99 percent since 1998”); see also Christopher Cousins, *King’s Climate Change Speech in Congress Ponders Disaster for Maine Lobster Industry*, BANGOR DAILY NEWS, Sept. 18, 2013, available at <http://bangordailynews.com/2013/09/18/outdoors/kings-climate-change-speech-in-congress-ponders-disaster-for-maine-lobster-industry/> (speaking before Congress, Senator King of Maine expressed his fears of climate change’s impacts on the lobster industry, citing the collapse in Southern New England, stating that “lobster makes up about 70 percent to 80 percent of our fisheries’ value, and what’s happening in Maine is that as the water gets warmer, the lobsters go north.”).

144. NWF WILDLIFE REPORT, *supra* note 130, at 34; see also Seth Koenig, *Maine Experts: Gulf of Maine has become Cod-forsaken Place, Endangering All Fisheries*, BANGOR DAILY NEWS, July 31, 2013, available at <http://bangordailynews.com/2013/07/31/business/marine-experts-gulf-of-maine-has-become-a-cod-forsaken-place-endangering-all-fisheries/?ref=inline> (ocean warming has pushed cod and other fish species north, severely impacting the fishing industry, reducing the number of species they can harvest and leaving lobsters with fewer predators, causing their population to boom in recent years, which has led to record catches in Maine and Canada, but has also suppressed prices).

145. In 2010, U.S. commercial fishermen landed 8.2 billion pounds of seafood worth \$4.5 billion. Additionally, “[c]ommercial and recreational fishing are integral to the nation’s social and economic fabric. NOAA reported commercial and recreational fisheries generated \$166 billion in sales impacts, contributed \$72 billion to the Gross National Product and supported 1.4 million jobs in the fishing sector and across the broader economy.” U.S. DOMESTIC SEAFOOD LANDS AND VALUES INCREASE IN 2010, NOAA (Sept. 7, 2011), available at http://www.noaanews.noaa.gov/stories2011/20110907_usfisheriesreport.html.

146. Ralph W. Johnson, *Oil and the Public Trust Doctrine in Washington*, 14 U. PUGET SOUND L. REV. 671, 698 (1991).

economic and ecological systems from avoidable destabilization and disruption,¹⁴⁷ or as Wilkinson paraphrased Sax, the public expects “most of its rivers will remain rivers, its lakes lakes, and its bays bays.”¹⁴⁸ Turnipseed et al. expanded on this conclusion, finding “[i]t is equally fair to conclude that the public also expects that its rivers will continue to *function* as rivers, its lakes as lakes, its bays as bays, as well as its oceans as oceans.”¹⁴⁹ Following this argument, it is reasonable to conclude that the public also expects wildlife to remain and function as wildlife.

In conclusion, climate change is currently degrading the traditional public trust values of fishing, commerce, and navigation protected under *Illinois Central*, as well as numerous other public trust values—such as wildlife—protected under other state doctrines. This is in addition to the negative impacts climate change has on trust resources found beyond state waters, which are administered under the sovereignty and sovereign rights of the United States federal government. This evidence and trend, together with the catastrophic impacts climate change will have on these resources if insufficient action is taken, triggers the fiduciary responsibility under the PTD for all levels of government to take steps to mitigate the impacts of climate change on trust resources. As the next section will discuss, Ocean-based renewable energy (ORE) can significantly aid both states and the federal government in living up to their trust obligations, with its great potential to utilize public trust resources to generate clean energy and slow the pace of climate change to help ensure rivers will continue to function as rivers, lakes as lakes, bays as bays, oceans as oceans, and wildlife as wildlife.

IV. OCEAN-BASED RENEWABLE ENERGY TECHNOLOGY AND THE PUBLIC TRUST DOCTRINE

Ocean-based renewable energy has the ability to act as a significant source of electricity for the United States, providing a means to reduce U.S. dependence on fossil fuels while mitigating the effects of climate change. The following section will outline the benefits of offshore wind and marine hydrokinetic energy, both in general and to public trust resources, while illustrating how a great deal of the legislation and

147. Joseph L. Sax, *Liberating the Public Trust Doctrine from Its Historical Shackles*, 14 U.C. DAVIS L. REV. 185, 193 (1980).

148. Turnipseed et al., *supra* note 15, at 61 (quoting Wilkinson, *supra* note 7, at 426).

149. *Id.*

regulations governing ORE is already infused with public trust-like language and values.

A. Offshore Wind Energy and the Public Trust Doctrine

The United States Department of Energy (DOE) projects that wind power can realistically supply 20% of the country's electricity by 2030, an increase of 293 GW (gigawatts), with more than 50 GW supplied by offshore wind.¹⁵⁰ Offshore wind energy generation offers significant advantages over land-based wind energy generation,¹⁵¹ such as stronger and more consistent wind speeds leading to higher net capacity factors¹⁵² and higher power densities.¹⁵³ Offshore wind turbine substructures are categorized by the depth of water in which they are deployed: shallow (thirty meters or less), transitional (thirty to sixty meters), and deep water (greater than sixty meters).¹⁵⁴ The U.S. offshore wind projects of Cape Wind in Massachusetts and Block Island in Rhode Island will be shallow water installations embedded in the seabed,¹⁵⁵ with the former in federal waters¹⁵⁶ and the latter within Rhode Island's three nautical mile

150. U.S. DEP'T OF ENERGY, 20% WIND ENERGY BY 2030: INCREASING WIND ENERGY'S CONTRIBUTION TO U.S. ELECTRICITY SUPPLY, 9-10 (July 2008).

151. Thaler, *supra* note 97, at 1128-30.

152. *Id.* at 1129 n.120 (citing *Capacity Factors at Danish Offshore Wind Farms*, ENERGY NUMBERS, <http://energynumbers.info/capacity-factors-at-danish-offshore-wind-farms> (last visited July 29, 2013) (a power plant's net capacity factor is a ratio of "actual power output over a period of time divided by its potential output if it had operated at full nameplate capacity the entire time").

153. NATIONAL RENEWABLE ENERGY LAB., RENEWABLE ELECTRIC FUTURES STUDY, 9-2 [hereinafter NREL FUTURES], available at http://www.nrel.gov/analysis/re_futures/ ("The kinetic energy and the kinetic power density are quantities that provide an estimate of the amount of energy that is present in the natural environment, and are sometimes referred to as theoretical potential, gross potential, or potential resources.").

154. WALTER MUSIAL & BONNIE RAM, NATIONAL RENEWABLE ENERGY LABORATORY, LARGE-SCALE WIND POWER IN THE UNITED STATES 6 (2010).

155. Thaler, *supra* note 97, at 1129; see also U.S. DEP'T OF THE INTERIOR, CAPE WIND ENERGY PROJECT FINAL ENVIRONMENTAL IMPACT STATEMENT 4-20 (2009), available at www.boem.gov/Renewable-Energy-Program/Studies/Cape-Wind-Energy-Project-FEIS-pdf.aspx; DEEP WATER WIND, BLOCK ISLAND WIND FARM ENVIRONMENTAL REPORT/CONSTRUCTION AND OPERATIONS PLAN 1-2 fig. 1.1-1 (2012), available at <http://dwwind.com/docs/Environmental%20Report.pdf>.

156. On October 6, 2010 Cape Wind was issued the first U.S. commercial lease to construct and operate an offshore wind energy facility. *Cape Wind: Project History and Overview*, BUREAU OCEAN ENERGY MGMT., <http://www.boem.gov/Renewable-Energy-Program/Studies/Cape-Wind.aspx> (last visited Mar. 2, 2014).

territorial waters.¹⁵⁷ Deep water installations utilize floating platforms tethered by anchors or moorings instead of embedding monopole foundations.¹⁵⁸ This nascent floating platform turbine technology is in the early stages of development, with pilot projects in Norway (Statoil's Hywind project in 2009), Portugal (Principle Power's Wind Float turbine in 2012), Japan (Kabashima Island Spar turbine in 2012), and the Gulf of Maine (University of Maine's small-scale turbine launched in 2013).¹⁵⁹ This technology seeks to capitalize on the greater wind speeds and greater energy potential found in the deep waters further from shore, which can provide energy to consumers in major coastal cities proximate to deep water wind resources.¹⁶⁰

There are numerous federal and state laws and regulations that have jurisdiction over offshore wind projects, and a number of those laws contain language referencing public trust values or federal trust obligations.¹⁶¹ The Outer Continental Shelf Lands Act (OCSLA),¹⁶² enacted by Congress in 1953, is a declaration of U.S. authority over "the subsoil and sea bed of the outer Continental Shelf,"¹⁶³ which includes "all submerged lands lying seaward and outside of the area of lands beneath navigable waters" subject to U.S. jurisdiction and control.¹⁶⁴ In 1978, the OCSLA was amended by Congress, proclaiming "the outer Continental Shelf is a vital national resource reserve held by the Federal

157. BLOCK ISLAND, *supra* note 153, at 1-2.

158. NREL FUTURES, *supra* note 151, at 11-24.

159. MAIN(E) INT'L CONSULTING LLC, FLOATING OFFSHORE WIND FOUNDATIONS: INDUSTRY CONSORTIA AND PROJECTS IN THE UNITED STATES, EUROPE AND JAPAN, 11, 21, 22, 42 (2013); *see also* Moretto, *supra* note 90.

160. Thaler, *supra* note 97, at 1129 (citations omitted).

161. For an overview of the laws and regulations influencing offshore wind energy *see* Thaler, *supra* note 97, at 1130-41 (making sense of the federal and state permits and regulations that impact offshore wind permitting); JEFF THALER, PERMITTING AND LEASING FOR MAINE OFFSHORE WIND ENERGY PROJECTS (2013), *available at* http://www.e2tech.org/Resources/Documents/MOWII_Offshore_Wind_Roadmap_JAN2013.pdf [hereinafter THALER, PERMITTING]; Rita Heimes, *Ocean Management & Planning in the United States: From Competition to Cooperation*, 29 ANNUAIRE DE DROIT MARITIME ET OCEANIQUE, 97 (2011) (giving an in depth analysis of the U.S. federal laws affecting offshore energy development); *see also* Turnipseed et al., *supra* note 15, at 4 nn. 6-7 (according to the United States Commission on Ocean Policy, there are at least 140 federal laws influencing coastal and ocean policy and over twenty federal agencies and departments overseeing ocean and coastal activities) (citing U.S. COMM'N ON OCEAN POL'Y, AN OCEAN BLUEPRINT FOR THE 21ST CENTURY: FINAL REPORT (2004), *available at* www.scribd.com/doc/40270021/Ocean-Blueprint-for-21st-Century-1)).

162. 43 U.S.C.A. §§ 1331-56 (2013).

163. *Id.* § 1332(1).

164. *Id.* § 1331(a).

Government for the public.”¹⁶⁵ As Craig points out, though Congress did not use the term “trust” in the OCSLA amendment,¹⁶⁶ the Conference Report regarding the amendment sought to emphasize that the Outer Continental Shelf (OCS) is “held for all the people”¹⁶⁷ and “[i]n spirit if not in name, therefore, Congress created a public trust in the outer continental shelf lands.”¹⁶⁸

The Energy Policy Act of 2005 (EP Act)¹⁶⁹ amended the OCSLA to give legal authority to review and approve offshore energy projects to the Secretary of the Interior.¹⁷⁰ This authority is carried out by the Bureau of Ocean Energy Management (BOEM), which regulates access rights and the licensing of test sites to develop new energy technologies for offshore wind projects on the OCS by granting competitive or non-competitive leases.¹⁷¹ In 2010 the Department of the Interior (DOI) implemented the “Smart from the Start” initiative in order to expedite the permitting process for offshore development through the designation of Wind Energy Areas (WEA) off the Atlantic Coast.¹⁷² BOEM’s efforts to

165. *Id.* § 1332(3).

166. Craig, *supra* note 42, at 11116 n.202. “The House amendment contains a finding that OCS lands and resources are public property held in trust. The Senate bill contains no such provisions. The House receded to the Senate and the Conference Report contains no such provision.” H.R. REP. NO. 95-1474, at 75 (1978) (Conf. Rep.).

167. H.R. REP. NO. 95-1474, at 80 (1978) (Conf. Rep.).

168. Craig, *supra* note 42, at 11116.

169. Energy Policy Act of 2005, Pub. L. 109-058, 119 Stat. 604 (2005) (codified as amended in scattered sections of 16 U.S.C. and 42 U.S.C.).

170. A role previously held by the U.S. Army Corps of Engineers (Corps), though the Corps still retains jurisdiction under section 10 of the Rivers and Harbors Act (Rivers and Harbors Appropriation Act of 1899). 33 U.S.C.A. § 403 (2012).

171. Thaler, *supra* note 97, at 1132 (citing Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf (codified 30 C.F.R. §§ 250, 285, 290) (2011)). BOEM interprets its authority to include “exclusive jurisdiction with regard to the production, transportation, or transmission of energy from nonhydrokinetic alternative energy projects on the OCS, including renewable energy sources such as wind and solar.” 30 C.F.R. §§ 250, 285, 290 (2011).

172. Press Release, U.S. Dep’t of the Interior, Salazar Launches ‘Smart from the Start’ Initiative to Speed Offshore Wind Energy Development off the Atlantic Coast (Nov. 23, 2010), available at <http://www.doi.gov/news/pressreleases/Salazar-Launches-Smart-from-the-Start-Initiative-to-Speed-Offshore-Wind-Energy-Development-off-the-Atlantic-Coast.cfm>; see also Salazar, *Chu Announce Major Offshore Wind Initiatives*, U.S. DEP’T OF ENERGY (Feb. 7, 2011), available at http://www.apps.a.eere.energy.gov/news/progress_alerts.cfm/news_id=20137 (WEAs aim to “coordinate[] environmental studies . . . and expedite[] approval processes to speed offshore wind energy development”). On July 31, 2013, BOEM held its first-ever offshore wind lease sale, leasing 164,750 acres located 9.2 nm off the coast of Rhode Island, a development area capable of generating enough energy to power more than one million homes. See Press Release, U.S. Dep’t of the Interior,

encourage offshore wind energy development are presently, in large part, spurred by President Obama's comprehensive Climate Action Plan and its call for the DOI to double renewable energy permitting efforts to add an additional ten thousand megawatts of renewable energy production on public waters and lands by 2020.¹⁷³ President Obama's plan uses express public trust language, stating:

While no single step can reverse the effects of climate change, we have a moral obligation to future generations to leave them a planet that is not polluted and damaged. Through steady, responsible action to cut carbon pollution, we can protect our children's health and begin to slow the effects of climate change so that we leave behind a cleaner, more stable environment.¹⁷⁴

While BOEM holds primary jurisdiction over leasing and licensing offshore wind projects on the OCS, the EP Act did not supplant the authority of other federal laws and agencies that have concomitant regulatory authority over energy projects in federal waters.¹⁷⁵ One of these laws is the National Environmental Protection Act (NEPA), which requires comprehensive environmental review for all "major [f]ederal actions significantly affecting the quality of the human environment."¹⁷⁶ NEPA contains explicit public trust language, as the statute directs all federal agencies involved with federal projects to improve the federal plans in order to "create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans,"¹⁷⁷ as well as declaring it the obligation of the federal government to "fulfill the responsibilities of each generation as trustee of the environment for succeeding generations."¹⁷⁸

Interior Holds First-Ever Competitive Lease Sale for Renewable Energy in Federal Waters (July 31, 2013), *available at* <http://www.doi.gov/news/pressreleases/interior-holds-first-ever-competitive-lease-sale-for-renewable-energy-in-federal-waters.cfm>.

173. *See* THE PRESIDENT'S CLIMATE ACTION PLAN, *supra* note 1, at 7.

174. *Id.* at 4.

175. 43 U.S.C. § 1337(p)(9) (2006) ("Nothing in this subsection displaces, supersedes, limits, or modifies the jurisdiction, responsibility, or authority of any Federal or State agency under any other Federal law.")

176. National Environmental Policy Act of 1969, 42 U.S.C. § 4332(C) (2006). The Council on Environmental Quality (CEQ) defines "major federal action" to include all federal licensing and permitting processes, thus encompassing the majority of all offshore wind projects. *See* 40 C.F.R. § 1508.18 (1978), WL 40 CFR s 1508.18.

177. 42 U.S.C. § 4331(a) (2006).

178. *Id.* § 4331(b)(1); *see also* Susan D. Baer, *The Public Trust Doctrine - A Tool to Make Federal Administrative Agencies Increase Protection of Public Land and its*

Additionally, most offshore wind projects will likely fall under the purview of federal laws aimed at protecting terrestrial, avian, and marine wildlife species. One such law is the Endangered Species Act (ESA),¹⁷⁹ which prohibits the “take”¹⁸⁰ of any listed species.¹⁸¹ The ESA also contains public trust-like language, declaring endangered species to be “of esthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people,”¹⁸² and pledging the United States, as a sovereign state, to “conserve to the extent practicable the various species of fish or wildlife and plants facing extinction.”¹⁸³ Similarly, the Marine Mammal Protection Act (MMPA)¹⁸⁴ will apply to most offshore wind developments and prohibits the taking of any marine mammal within U.S. waters.¹⁸⁵ It too contains trust-like language, declaring that

marine mammals have proven themselves to be resources of great international significance, esthetic and recreational as well as economic . . . and that the primary objective of their management should be to maintain the health and stability of the marine ecosystem . . . [and thus] it should be the goal to obtain an optimum sustainable population keeping in mind the carrying capacity of the habitat.¹⁸⁶

Additionally, in *American Pelagic Fishing Co. v. United States*,¹⁸⁷ the Federal Circuit Court of Appeals interpreted the scope of the

Resources, 15 B.C. ENVTL. AFF. L. REV. 385, 399 (1988) (“In imposing a duty to preserve the ‘environment’ for future generations, NEPA is a direct and complete codification of the public trust doctrine.”); Sagarin & Turnipseed, *supra* note 37, at 485 (making similar observations regarding NEPA’s public trust language).

179. 16 U.S.C. §§ 1531-44 (2012).

180. *Id.* § 1532(19) (defining “take” as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct”).

181. *Id.* § 1538(a)(1)(B). Species listed under the ESA fall under one of two categories, based on their risk of extinction: (1) “endangered” or (2) “threatened.” Endangered encompasses “any species which is in danger of extinction throughout all or a significant portion of its range.” *Id.* §1532(6). Threatened includes “any species which is likely to become an endangered within the foreseeable future throughout all or a significant portion of its range.” *Id.* § 1532(20).

182. *Id.* § 1531(a)(3).

183. *Id.* § 1531(a)(4); *see also* Klass, *supra* note 2, at 1034.

184. 16 U.S.C. §§ 1361-1421h (2012).

185. *Id.* § 1372(a).

186. *Id.* § 1361(6).

187. 379 F.3d 1363 (Fed. Cir. 2004).

Magnuson-Stevens Fishery Conservation Act¹⁸⁸ to bestow the “sovereign” with the public trust responsibility of the conservation of natural resources and fisheries of the EEZ.¹⁸⁹

There are also federal laws that grant states a role in the permitting process of offshore wind projects that contain inherent public trust values and language. As discussed previously, the Submerged Lands Act (SLA), which granted coastal states title to the submerged lands three nautical miles off their shore, was passed in part (as the Southern District of Florida interpreted)¹⁹⁰ to advance the PTD among the states. In addition, some states have judicially recognized that the PTD extends to their three nautical mile territorial sea.¹⁹¹ The SLA allows states to lease or sell tracts or rights of submerged lands to private parties (such as wind developers), subject to the federal government’s reserved right of ownership of “the water column and airspace above the state’s submerged lands.”¹⁹²

Another example is the Coastal Zone Management Act (CZMA), which encourages states to complete coastal zone management plans as a means to preserve coastal ecosystems and resources held within their coastal lands and waters.¹⁹³ The CZMA requires any federally permitted activities off a state’s coast, including offshore wind projects developed in federal waters, to be in compliance with the state’s coastal zone program.¹⁹⁴ The public trust value of intergenerational equity also is inherent in the CZMA, as coastal zone management plans are to be designed to “preserve, protect, develop, and where possible, to restore or enhance the resources of the Nation’s coastal zone for this and succeeding generations.”¹⁹⁵ The CZMA also finds that “[b]ecause global warming may result in a substantial sea level rise with serious adverse

188. 16 U.S.C. §§ 1801-91d (2012). The Magnuson-Stevens Act will also apply to most OSW projects. See THALER, PERMITTING, *supra* note 160, at 16.

189. *Am. Pelagic Fishing Co.*, 379 F.3d at 1378-79. The Magnuson-Stevens Acts requires offshore wind projects to conduct an assessment of federally managed fish and invertebrate species any time essential fish habitat (EFH) could potentially be affected. See 16 U.S.C. § 1855(b) (2012).

190. *Murphy v. Dep’t of Natural Res.*, 837 F. Supp. 1217, 1221 (S.D. Fla. 1993).

191. See *infra* notes 50-52 regarding the Submerged Lands Act.

192. Heimes, *supra* note 160, at 3 (citing Richard Breeden, *Federalism and the Development of Outer Continental Shelf Mineral Resources*, 28 STAN. L. REV. 1107, 1111-12 (1976)).

193. 16 U.S.C. §§ 1451-52 (2012).

194. *Id.* § 1456(a), (c); see also Thaler, *supra* note 97, at 1140.

195. 16 U.S.C. § 1452(1).

effects in the coastal zone, coastal states must anticipate and plan for such an occurrence.”¹⁹⁶

In sum, it becomes evident that a significant portion of the federal authority regulating offshore wind energy development contains some degree of public trust values or public trust-like language. But as has been discussed in previous scholarship,¹⁹⁷ the morass of regulations and statutes influencing offshore wind development have created substantial delays to project implementation.¹⁹⁸ The PTD can act as a means to expedite this permitting process for offshore wind by incorporating and applying the public trust values already inherent in federal statutes and regulations, together with new, direct statutory codification of the PTD.¹⁹⁹ Before addressing these possibilities, we turn to an analysis of marine hydrokinetic energy and the PTD’s influence over the technology and regulations guiding this early-stage industry.

B. Hydrokinetic Energy and the Public Trust Doctrine

The Federal Energy Regulatory Commission (FERC) defines hydrokinetic projects as operations that “generate electricity from waves or directly from the flow of water in ocean currents, tides, or inland waterways.”²⁰⁰ It is estimated that ocean hydrokinetic projects could produce 85,000 to 95,000 more megawatts (MW) of energy in the United States as compared to current hydrokinetic output, with 23,000 MW available by 2025.²⁰¹ The DOE has already issued licenses for the 1.5 MW Reedsport OPT commercial wave park in Oregon,²⁰² the 1.0 MW Roosevelt Island tidal energy pilot project in New York,²⁰³ and the 0.3

196. *Id.* § 1451(1).

197. Thaler, *supra* note 97, at 1141; Ian Boisvert, *Mountains of ‘Blue Tape’: Barriers to United States and New Zealand Renewable Energy Projects*, OCEAN ENERGY SYSTEMS: ANNUAL REPORT 2011, 115 (2012).

198. Thaler, *supra* note 97, at 1131-41.

199. *See infra* Part V.C.

200. *Hydrokinetic Projects*, FED. ENERGY REGULATORY COMM’N, <http://www.ferc.gov/industries/hydropower/gen-info/licensing/hydrokinetics.asp#timeline> (last visited July 30, 2013) [hereinafter FERC-Hydrokinetic Projects].

201. *Hydrokinetic and Ocean Energy*, PIKE RESEARCH EXECUTIVE SUMMARY 2, available at <http://www.navigantresearch.com/wp-assets/uploads/2012/02/HYDRO-12-Executive-Summary.pdf>.

202. *Reedsport OPT Wave Park*, OCEAN POWER TECHNOLOGIES, <http://www.oceanpowertechnologies.com/reedsport.html> (last visited July 31, 2013).

203. *Roosevelt Island Tidal Energy (RITE) Project*, VERDANT POWER, <http://verdantpower.com/what-initiative/> (last visited July 31, 2013).

MW Cobscook Bay tidal pilot project in Maine,²⁰⁴ which in September of 2012 became the first commercial tidal energy project in North America to generate electricity.²⁰⁵

Tidal energy harnesses the kinetic energy of the horizontal movements of tidal currents, often in straits, inlets, and other narrow channels.²⁰⁶ Tidal energy is captured using three types of technologies: tidal barrages or dams, tidal fences, and tidal turbines.²⁰⁷ Wave energy is an irregular, oscillating energy source derived from the movement of the ocean, specifically from the changes in the speed and height of swells.²⁰⁸ Wave energy technology is only capable of operating in the “wave power-rich” areas of the world, such as the northeastern and northwestern coasts of the United States, northern Canada, southern Africa, western Scotland, and Australia.²⁰⁹

204. Order Issuing Pilot Project License to Ocean Renewable Power Company Maine, available at http://www.orpc.co/permitting_doc/ORPC_FERC_pilotlicense_12711-05.pdf; see also PAC. VENTURES, LLC, U.S. DEP'T OF ENERGY, SITING METHODOLOGIES FOR HYDROKINETICS: NAVIGATING THE REGULATORY FRAMEWORK 38-180 (2009) [hereinafter SITING HYDROKINETICS] (assessment of the “nine key states” (Alaska, Washington, Oregon, California, Hawaii, Maine, Massachusetts, Rhode Island, and Florida) with current hydrokinetic development projects or likely project development in the near future).

205. Colin Woodard, *Maine Tidal Turbine Goes Online First in North America*, PORTLAND PRESS HERALD, Sept. 13, 2012, available at <http://www.pressherald.com/news/ORPC-turbine-off-Eastport-is-the-first-to-do-so-in-North-America.html>.

206. Frequently Asked Questions, OCEAN RENEWABLE POWER COMPANY, <http://www.orpc.co/faqs.aspx> (last visited July 30, 2013); see also *Tidal Energy Basics*, U.S. DEP'T OF ENERGY, ENERGY EFFICIENCY & RENEWABLE ENERGY, http://www.energy.gov/eere/energybasics/articles/tidal_energy-basics (last visited July 30, 2013) [hereinafter DOE EERE-Tidal] (using current technology the difference between high and low tides must be greater than sixteen feet (five meters) to harness tidal energy for electricity. There are only forty locations globally that meet this requirement).

207. Barrages or dams force water through gates and turbines, where the tides produce a sufficient difference in water level on the opposite side of the barrage or dam, driving the turbines to produce electricity. Tidal fences have the appearance of giant turnstiles, reaching across channels to harness the tidal energy of coastal water currents. Tidal turbines resemble wind turbines and are arranged underwater in a row, ideally placed in areas close to shore in water twenty to thirty meters (65.6-98.5 feet) deep. See DOE EERE-Tidal, *supra* note 204.

208. *Wave Energy*, OCEAN ENERGY COUNCIL, <http://www.oceanenergycouncil.com/index.php/Wave-Energy/Wave-Energy.html> (last visited July 30, 2013) (“An average 4-foot, 10-second wave striking a coast puts out more than 35,000 horsepower per mile of coast.”) [hereinafter OEC-Wave Energy].

209. Wave energy technology utilizes both offshore and onshore systems. Offshore technology is most often utilized in water forty meters (131 feet) or deeper, with a float or buoy system capturing the bobbing motion of waves to power a pump fixed to the ocean floor that generates electricity. Onshore technology is built along the shoreline to

All projects using marine hydrokinetic technologies are regulated under the Federal Powers Act, with FERC responsible for licensing, inspecting, and overseeing any hydrokinetic project.²¹⁰ In addition to FERC, there are numerous federal statutes and permits with which hydrokinetic projects must be in compliance for siting authorization.²¹¹ Among these statutes are many that are also required for offshore wind energy projects, including: the National Environmental Protection Act (NEPA), the Endangered Species Act, the Magnuson-Stevens Fishery Conservation and Management Act, the Coastal Zone Management Act, and the Marine Mammal Protection Act.²¹² As discussed in the preceding section, these statutes contain public trust values and language regarding the resources they aim to conserve and protect.

C. Public Trust Values and Ocean-based Renewable Energy

ORE projects directly impact state public trust resources, as most OSW projects, even those sited solely in federal waters, require transmission lines that impact state waters and submerged lands, while hydrokinetic projects thus far have been sited predominantly in state waters and on state submerged lands due to the ocean depths both tidal

utilize the energy of breaking waves, typically in one of three systems: oscillating water columns, tapchans, or pendular devices. *Wave Energy Basics*, U.S. DEP'T OF ENERGY, http://www.energy.gov/eere/energybasics/articles/wave_energy-basics (last visited July 30, 2013) [hereinafter DOE EERE-Wave].

210. 16 U.S.C. § 797 (2012); see SITING HYDROKINETICS, *supra* note 203, at 10 (the Energy Policy Act of 2005 was signed into law to provide federal regulation for new renewable energy technologies, but in fact created confusion over which federal agency had jurisdiction over hydrokinetic technologies in federal waters. In particular, the EP Act gave FERC the responsibility of licensing, inspecting, and overseeing all environmental aspects of hydrokinetic projects, while at the same time amended the OCSLA to give the Department of the Interior authority to regulate all renewable energy generation on the OCS, which the Secretary delegated to BOEM (the Minerals Management Service (MMS) at the time). To clarify this jurisdictional contradiction the Secretary of the Interior and the Chairman of FERC signed a Memorandum of Understanding (MOU) to clarify the responsibilities of each agency. The MOU gave FERC authority over hydrokinetic projects in state waters and on the OCS, and BOEM authority to issue leases and easements for hydrokinetic projects partially or completely on the OCS).

211. See generally SITING HYDROKINETICS, *supra* note 203 (providing a comprehensive overview for siting hydrokinetic projects in state waters, including a summary of the required principle Federal authorizations and nine key states' authorizations required for project approval).

212. See *supra* notes 159-196.

and wave technologies presently utilize.²¹³ With the use of state submerged lands and navigable waters comes the potential for conflict with the traditional public trust values of commerce, navigation, and fishing, in addition to other public trust values recognized in various state courts, such as ecological and wildlife preservation.

For the much maligned and controversial Cape Wind project,²¹⁴ offshore wind's impact on the Commonwealth's public trust submerged lands was legally challenged in *Alliance to Protect Nantucket Sound v. Energy Facilities Siting Board (Alliance II)*.²¹⁵ Opponents of the project challenged the ability of the Massachusetts siting board to approve the construction of transmission lines on state tidelands, claiming the board was never given the authority to delegate public trust rights.²¹⁶ The Massachusetts Supreme Court rejected this argument, finding the state legislature had delegated to the Department of Environmental Protection (DEP) the authority to license the development of tidelands and in general the ability to protect the Commonwealth's interests in the tidelands.²¹⁷ Klass notes several aspects of the majority and dissenting opinions in *Alliance II* that relate to public trust concepts or that have significant implications for the doctrine regarding ORE.²¹⁸ For example, though the Cape Wind project would be sited solely in federal waters, except for the transmission cables, the majority chose to focus narrowly on the impact of the transmission lines on state tidelands, while the dissent looked more broadly and considered the impact of the project in its entirety on state public trust values.²¹⁹ Additionally, both the majority and dissent chose not to note any of the benefits associated with renewable energy, with the dissent actually comparing the impacts of

213. See Klass, *supra* note 2, at 1050; SITING HYDROKINETICS, *supra* note 203, at 1.

214. The Cape Wind Project is in federal waters in the Nantucket Sound off the coast of Massachusetts and consists of 130 wind turbines. The project was delayed for almost ten years, slowed by federal and state environmental review and legal challenges. It was not until October 2010 that the project was awarded a twenty-eight year lease by the Secretary of the Interior. Klass, *supra* note 2, at 1053. As of March 2014, construction has still not commenced.

215. 932 N.E.2d 787 (Mass. 2010).

216. *Id.* at 799; see Klass, *supra* note 2, at 1053-55.

217. The DEP in turn had granted this power to the siting board, allowing it to "stand in the shoes" of the agency and hold permitting authority over structures on submerged lands. *Alliance II*, 932 N.E.2d at 799.

218. Klass, *supra* note 2, at 1056-57.

219. *Id.*

offshore wind development to fossil fuel extraction and nuclear energy.²²⁰

Public trust conflicts were also confronted by BOEM and other agencies involved in permitting the Cape Wind project. Specifically, during the leasing process numerous comments were made expressing concern regarding loss of access to the waters surrounding and within the wind energy facility.²²¹ Because of this, when BOEM issued the lease it explicitly stated that Cape Wind was not allowed to prohibit ships and other vessels from “entering, operating, or anchoring in the [l]eased area or established exclusionary zones in the [l]eased areas.”²²² In addition, general criticism had been raised regarding the noise, visual, and physical impacts of offshore wind farms on both humans and wildlife, including localized disturbance of the seabed and the avian and aquatic species that live in or migrate through the area.²²³

Similarly, hydrokinetic projects also present issues regarding conflicting uses with public trust values. Specifically, tidal power plants and tidal fences can inhibit sea life migration and cause silt build-ups that could impact local ecosystems.²²⁴ Changing tidal flows by damming a bay or estuary could also negatively impact navigation and recreation,²²⁵

220. *Alliance II*, 932 N.E.2d at 816; *Klass*, *supra* note 2, at 1056-57 (comparing the Cape Wind situation to the BP Oil Spill, Chief Justice Marshall wrote “the failure to take into account in-State consequences of federally authorized energy projects in Federal waters can have catastrophic effects on State tidelands and coastal areas, and on all who depend on them”).

221. See U.S. Coast Guard Assessment of Potential Impacts to Navigation Safety of the Nantucket Sound Wind Farm as Proposed by Cape Wind, LLC (Nov. 14, 2008) (on file with author) (“It has not been suggested or requested by Cape Wind, nor any other entity, to control or restrict mariner access to Horseshoe Shoal during the construction or operation of the wind facility, and none is contemplated.”).

222. Cape Wind Associates, LLC, BOEM Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf, C-33 (Nov. 1, 2010).

223. *Offshore Wind Energy*, OCEAN ENERGY COUNCIL, <http://www.oceanenergycouncil.com/index.php/Offshore-Wind/Offshore-Wind-Energy.html> (last visited July 30, 2013) [hereinafter OEC-*Offshore Wind Energy*].

224. DOE EERE-Tidal, *supra* note 204.

225. *Tidal Energy*, OCEAN ENERGY COUNCIL, <http://www.oceanenergycouncil.com/index.php/Tidal-Energy/tidal-energy.html> (last visited Feb. 5, 2014) (“The few studies that have been undertaken to date to identify the environmental impacts of a tidal power scheme have determined that each specific site is different and the impacts depend greatly upon local geography. Local tides changed only slightly due to the La Rance barrage, and the environmental impact has been negligible, but this may not be the case for all other sites. It has been estimated that in the Bay of Fundy, tidal power plants could decrease local tides by 15 cm. This does not seem like much when one considers that natural variations such as winds can change the level of the tides by several meters.”).

while careful site selection can help mitigate any negative environmental effects of wave power systems through avoiding scenic shorefronts and project areas that would considerably alter sediment flow patterns.²²⁶

Any negative impacts ORE may have on public trust resources pale in comparison to the current and impending impacts of climate change on public trust resources.²²⁷ Because of the climate crisis facing U.S. ecosystems and wildlife, the National Wildlife Federation (NWF) has called for rapid deployment of clean, renewable energy sources such as ORE as a means to reduce carbon emissions.²²⁸ In fact, NWF highlighted the potential offshore wind has in offsetting carbon pollution and protecting ocean biodiversity from the risk of ocean acidification, rising water temperatures and sea level rise caused by climate change.²²⁹ As we will see in the next section, ORE and PTD have the potential to form a powerful, synergistic team in combating climate change: ORE can help protect public trust resources through the mitigation of climate change while the PTD provides a means to support the development of ORE by placing ORE values and benefits on equal footing with traditional public trust values.

V. ON EQUAL FOOTING: INCORPORATING OCEAN-BASED RENEWABLE ENERGY AS A PUBLIC TRUST VALUE

A. Ocean-based Renewable Energy Satisfies the Core Values of Both the Traditional and Modern Understanding of the Public Trust Doctrine

After considering the threat climate change imposes on public trust resources and the need to reduce carbon and other GHGs, the value of incorporating ORE as a public trust value becomes apparent. But as we have noted, just what values legitimately fall under the purview of the PTD have been thoroughly debated in legal scholarship.²³⁰ Lazarus argued that the PTD's traditional application has been used as a means to ensure utilization of trust resources, acting as a legal basis for economic

226. OEC-*Wave Energy*, *supra* note 208.

227. See *supra* Part III.

228. NWF WILDLIFE REPORT, *supra* note 130, at 3, 38-40; NWF BIRDS REPORT, *supra* note 130, at 30.

229. NWF WILDLIFE REPORT, *supra* note 130, at 39. NWF acknowledges OSW will result in unavoidable impacts to wildlife and stresses the importance of working with stakeholders in order to avoid or minimize wildlife losses, highlighting their work with industry leaders on protecting the endangered North Atlantic right whale from noise impacts resulting from OSW.

230. See *supra* Part II.

expansion rather than as a tool for resource preservation.²³¹ Specifically, Lazarus pointed to numerous applications of the doctrine by states that use it not for resource protection but instead focus on utilization and exploitation of resources, highlighting the doctrine's "flexible application" to a range of activities.²³² Lazarus argued that the utilitarian origins of the doctrine make it ill-suited as a means of resource protection, writing:

[T]he promotion of commerce, a traditional public trust doctrine objective, is hardly a focus of resource protection values. Indeed, more often than not it serves as a counterweight to those values in the formulation of public policy because of its pro-development bias. Finally, public access, undoubtedly the single most important public trust guarantee, is often at odds with modern environmental conservation and protection laws. Increasingly, those laws must restrict access to protect resources.²³³

In acknowledging the utilitarian origins of the PTD, Professors Ruhl and Salzman argue for the incorporation of the public trust values of natural capital and ecosystem services into the doctrine.²³⁴ Specifically, they suggest that considering the economic benefits provided by ecosystem service (storm surge and flood mitigation, sequestration of pollutants, carbon, and nutrients), those values "fit neatly" into the utilitarian scope of the doctrine.²³⁵ Ruhl and Salzman conclude that "neither the 'modern' [Sax] public trust doctrine nor the 'traditional' [Lazarus] public trust doctrine should have the slightest objection to integrating natural capital and ecosystem service values."²³⁶

In a similar vein, this Article argues that neither the modern nor traditional PTDs should have any objections to the incorporation of ORE into public trust values. Establishing ORE as a public trust value would enable the doctrine to act as a means to help preserve the resources subject to public ownership. Public trust resources, both modern and traditional, are presently being severely degraded and significantly

231. Lazarus, *supra* note 13, at 641.

232. "Courts have found . . . production of oil and construction of bridges, a YMCA, restaurants, bars, and a shipping complex" in addition to airport runways, highways, and driving ranges all to fall within the scope of the doctrine. Ruhl & Salzman, *supra* note 36, at 226 (citing Lazarus, *supra* note 13, at 651-62) (citations omitted).

233. Lazarus, *supra* note 13, at 711.

234. Ruhl & Salzman, *supra* note 36, at 233.

235. *Id.*

236. *Id.* at 238.

altered by climate change, and if fossil fuel emissions are left unchecked these resources and ecosystems will be changed in ways that will leave them in a state unrecognizable by present standards.²³⁷ ORE's ability to mitigate carbon emissions complements other modern trust values, as stemming the impacts of climate change helps preserve coastal, tideland, and wetland ecosystems, along with the wildlife dependent on those ecosystems.²³⁸ Moreover, ORE can be sited in a way as to prevent, or at least mitigate, impacts on trust resources,²³⁹ and as Klass wrote, "the ability of renewable energy projects to positively impact climate change causes many to pause before arguing that such projects are an inappropriate use of public lands or waters This is particularly true because climate change, while significant for the current generation, is most critical for future generations."²⁴⁰ Indeed, a consistent theme found throughout the PTD since *Illinois Central* has been preserving trust resources for future generations,²⁴¹ a core value of ORE.²⁴²

Using the PTD to support ORE also directly promotes the traditional trust value of commerce, as a burgeoning ORE industry that has the potential to generate billions of dollars in economic activity through utilization of trust resources.²⁴³ Offshore wind, tidal, and wave energy would spur the growth of an entire economic sector, as these projects require the engineering and fabrication of complex materials and the use of specialized labor, equipment, and air and sea vessels.²⁴⁴ In addition, ORE projects can be sited as not to interfere with the traditional trust values of fishing and navigation through ecosystem-based, sea use planning policies, such as marine spatial planning (MSP).²⁴⁵ Already, in

237. See *supra* notes Part III.

238. See *supra* notes Part IV.

239. See *supra* notes 219-227.

240. Klass, *supra* note 2, at 1064.

241. *Id.* at 1065.

242. See *infra* notes 19, 54-60.

243. See NAVIGANT CONSULTING, INC., OFFSHORE WIND MARKET AND ECONOMIC ANALYSIS xx (2013), available at https://www1.eere.energy.gov/wind/pdfs/offshore_wind_market_and_economic_analysis.pdf (the U.S. offshore wind industry could generate between \$10 and \$70 billion per year in economic activity by 2030).

244. *Id.* at 110-112. A 500 MW offshore wind project could support 3,000 job-years over the construction period and drive \$584 million in local spending over the same period. By 2030 the U.S. offshore wind could support between 50,000 to 350,000 full time employees, depending on overall growth of the industry. *Id.* at xx.

245. See Fanny Douvere, *The Importance of Marine Spatial Planning in Advancing Ecosystem-Based Sea Use Management*, 32 MARINE POLICY 762 (2008); see also Fanny Douvere & Charles N. Ehler, *New Perspectives on Sea Use Management: Initial*

the U.S., BOEM expressly prohibited Cape Wind from preventing ships and other vessels from entering the leased project area.²⁴⁶ As ORE aligns with the core principles behind both the traditional and modern PTDs, it is now up to legislatures and courts to put ORE on equal footing with other trust values.

B. The Malleability of the Public Trust Doctrine

One of the PTD's most effective qualities is its malleability, allowing it to evolve in scope and application from *Arnold v. Mundy*²⁴⁷ to *Center for Biological Diversity, Inc. v. FPL Group, Inc.*,²⁴⁸ becoming an effective tool for resource protection.²⁴⁹ Timothy P. Brady argued that it is this malleability that allows the public trust to "leap ahead" of societal norms and public acceptance, as the law is both a "reflection of and a challenge to societal values."²⁵⁰ Expressing similar sentiment, the Hawaii Supreme Court in *In re Water Use Applications*²⁵¹ averred that "[t]he public trust, by its very nature, does not remain fixed for all time, but must conform to changing needs and circumstances."²⁵²

This ability to leap ahead of societal norms and meet changing needs is quite valuable for environmental issues, as scientific understanding usually far outpaces appropriate legislative action—as currently is the case with climate change.²⁵³ As our understanding of ecology progresses, it becomes clearer how traditional public trust resources are interrelated with and dependent on ecosystems, such as tidelands, marshes, and freshwater wetlands, among others.²⁵⁴ As the trust has been

Findings from European Experience with Marine Spatial Planning, 90 J. ENVIRONMENTAL MANAGEMENT 77 (2009).

246. See *supra* note 219-20.

247. *Arnold v. Mundy*, 6 N.J.L. 1 (S. Ct. 1821).

248. *Ctr. for Biological Diversity v. FPL Group Inc.*, 83 Cal. Rptr. 3d 588 (Cal. Ct. App. 2008).

249. Sagarin & Turnipseed, *supra* note 37, at 484 (citing Hope M. Babcock, *The Public Trust Doctrine: What a Tall Tale they Tell*, 61 S.C. LAW REV. 393, 414 (2009)).

250. *Id.* (citing Timothy P. Brady, *But Most of it Belongs to Those Yet to be Born: the Public Trust Doctrine, NEPA, and the Stewardship Ethic*, 17 B.C. ENVIRON. AFF. L. REV. 629-30 (1990)).

251. *In re Water Use Permit Applications*, 9 P.3d 409 (Haw. 2000), *aff'd in part and vacated in part by In re Water Use Permit Applications*, 105 Haw. 1 (2004).

252. *Id.* at 447.

253. *Id.* There has been no significant legislation at the federal level to address the issue, and only in 2013 did President Obama announce his Climate Action Plan. THE PRESIDENT'S CLIMATE ACTION PLAN, *supra* note 1.

254. Ruhl & Salzman, *supra* note 36, at 232-33.

applied to these modern values, in part due to the recognition of their ecological interrelatedness, the next step is to apply the PTD governing tidal waters to the interrelated federal waters of the continental shelf and EEZ.²⁵⁵

A federal PTD could enable courts to review natural resource agency decisions without the judicial constraints imposed by the Administrative Procedure Act (APA).²⁵⁶ This would permit more robust judicial review of administrative appeals, as breach of trust claims are not limited by deference to agency decisions, allowing judges more freedom in entertaining arguments contrary to the agencies' positions.²⁵⁷ Moreover, by expressly elevating ORE to an equal footing with other trust values and establishing a "green thumb" rebuttable presumption favoring ORE, express guidance could be given as how to manage conflicting trust values to promote ORE in mitigating impacts of climate change and protecting trust resources for future generations. But before the public trust can be used to advance ORE as a means to protect trust resources and future generations from climate change, there is first a need to establish the existence of a public trust in federal waters.

C. Establishing a Federal Public Trust and Ocean-based Renewable Energy Values

Sovereignty (legal authority) in the territorial sea and the "sovereign rights" in the EEZ should be sufficient to support the doctrine in U.S. waters.²⁵⁸ To support this, Turnipseed et al. cites foundational public

255. Sagarin & Turnipseed, *supra* note 37, at 479.

256. 5 U.S.C.A §§ 551-59 (2013). The APA limits judicial review of agency decisions to the record compiled by the agency and requires courts to defer to agency expertise for any agency action that is deemed reasonable. *See Chevron U.S.A., Inc. v. Natural Res. Def. Council*, 467 U.S. 837 (1984).

257. Turnipseed et al., *supra* note 15, at 57 (citing Arnold L. Lum, *How Goes the Public Trust Doctrine: Is the Common Law Shaping Environmental Policy?*, 18 NATURAL RESOURCES & ENV'T 73, 74-75 (2003)).

258. Turnipseed et al., *supra* note 15, at 37 ("The formal establishment of sovereign rights [over the resources of the EEZ] arguably carries with it an increased role of public stewardship over these resources. . . . In my judgment, the public trust doctrine naturally extended from navigable waters and the territorial sea to the EEZ with the expansion of U.S. sovereign rights over this area.") (citations omitted) (quoting Peter H. Sand, *Sovereignty Bounded: Public Trusteeship for Common Pool Resources?* 4 GLOBAL ENVTL. POL. 47, 48 (2004)).

trust jurisprudence²⁵⁹ and U.S. policy makers,²⁶⁰ among other sources, that view sovereignty in its own right as sufficient to impose the fiduciary obligations of the public trust in federal waters.²⁶¹ The Hawaiian Supreme Court shared this viewpoint, finding that “history and precedent have established the public trust as an inherent attribute of sovereign authority. . . .”²⁶²

Given this legal authority imposed by sovereignty to extend the PTD to federal oceans, we must now establish the existence of a federal public trust. The present lack of a recognized federal public trust is a result of the issue having never been thoroughly raised at the federal level, as nothing actually prevents its application to federal law.²⁶³ For instance, federal district courts have invoked the existence of the federal PTD in *In re Complaint of Steuart Transportation Co.*²⁶⁴ and *United States v. 1.58 Acres of Land*,²⁶⁵ finding both the state and federal governments by nature of their sovereignty have public trust responsibilities.²⁶⁶ Specifically, the *1.58 Acres of Land* court found the federal and state governments to be “co-trustees” of public trust resources, with distinct but concurring trust obligations:

259. See *Ill. Central R.R. Co. v. Illinois*, 146 U.S. 387, 459-60 (1892) (public trust lands are held “by the people in trust for their common use and of common right, as an incident of their sovereignty.”).

260. See *Administration of Coral Reef Resources in the Northwest Hawaiian Islands*, 2000 O.L.C. LEXIS 30 (2000), at *30-31 (Assistant Attorney General Moss: “although [nations] do not have [full] sovereignty over the EEZ, they do possess sovereign rights for specific purposes. One of these purposes is the conservation of the ‘natural resources of the sea-bed and subsoil and of the superjacent waters.’”) (citation omitted).

261. Turnipseed et. al., *supra* note 15, at 31-40.

262. *In re Water Use Permit Applications*, 9 P.3d at 443 (Haw. 2000); see also Coplan, *supra* note 95, at 311 (“[t]he idea that public trust limits and powers in here in the very nature of sovereignty is one consistent thread in public trust cases.”).

263. See Craig, *supra* note 42, at 11116 (“Nothing in the origins of the public trust doctrine, however, prevents it from applying to the federal government, because the doctrine derives from the English monarch’s national sovereignty”); see also Turnipseed et al., *supra* note 37, at 10 (“[N]o one has forced the issue at the national level in the way that it has been pushed at the state level.”) (remarks of Patrick Parenteau).

264. 495 F. Supp. 38 (E.D. Va. 1980).

265. 523 F. Supp. 120 (D. Mass. 1981).

266. *In re Complaint of Steuart Transp. Co.*, 495 F. Supp., at 40 (holding “[u]nder the public trust doctrine, the State of Virginia and the United States have the right and the duty to protect and preserve the public’s interest in natural wildlife resources.”); *1.58 Acres of Land*, 523 F. Supp., at 124 (holding that “[s]ince the trust impressed upon this property is governmental and administered jointly by the state and federal governments by virtue of their sovereignty, neither sovereign may alienate this land free and clear of the public trust . . . the federal government is as restricted as the Commonwealth in its ability to abdicate to private individuals its sovereign jus publicum in the land.”).

This formulation recognizes the division of sovereignty between the state and federal governments, those aspects of the public interest in the tideland and the land below the low water mark that relate to the commerce and other powers delegated to the federal government are administered by Congress in its capacity as trustee of the *jus publicum*, while those aspects of the public interest in this property that relate to nonpreempted subjects reserved to local regulation by the states are administered by state legislatures in their capacity as co-trustee of the *jus publicum*.²⁶⁷

A federal PTD can be derived from the Commerce Clause,²⁶⁸ with congressional preemption as a means to regulate vital waterways for navigation and commerce.²⁶⁹ Turnipseed et al. used similar arguments regarding the Constitution, looking to the federal government's power to regulate commerce in navigable waterways under the Commerce Clause, originally articulated in *Gibbons v. Ogden*²⁷⁰ and later affirmed in *United States v. Rands*.²⁷¹ The doctrine's influence is also found in the Property Clause,²⁷² and specifically in Assistant Attorney General Moss's 2000 interpretation that the sovereignty and sovereign rights the United States holds over the territorial sea and EEZ, respectively, allow Congress to regulate federal waters under the Property Clause.²⁷³

As is the case with state PTDs, a federal PTD also could be developed through federal common law. The circumstances under which the federal common law can be invoked are limited by *Texas Industries*,

267. *1.58 Acres of Land*, 523 F. Supp., at 123.

268. See U.S. CONST. art. 1, § 8, cl. 3 (Congress has the power "[t]o regulate Commerce with Foreign Nations, and among the several States, and with the Indian Tribes.").

269. Wilkinson, *supra* note 7, at 455-59.

270. 22 U.S. 1 (1824).

271. 389 U.S. 121, 122-23 (1967) ("The power to regulate commerce comprehends the control for that purpose, and to the extent necessary, of all the navigable waters of the United States ...[f]or this purpose they are the public property of the nation, subject to all the requisite legislation by Congress.") (citation omitted).

272. See U.S. CONST. art. IV, § 3, cl. 2 (granting Congress the authority "to dispose of and make all needful Rules and Regulations respecting the Territory or other Property belonging to the United States").

273. Administration of Coral Reef Resources, *supra* note 258, at *39-40 ("[W]e believe that the significant amount of control and sovereign rights that the United States possesses over the EEZ are sufficient to authorize Congress to make rules and regulations governing the EEZ, at least with respect to protecting marine resources.").

Inc. v. Radcliff Materials, Inc.,²⁷⁴ holding that any court wishing to invoke federal common law must show that state law is unable to resolve the issue because “the authority and duties of the United States as sovereign are intimately involved or because the interstate or international nature of the controversy makes it inappropriate for state law to control.”²⁷⁵ But as Turnipseed et al. have argued, the prerequisites required to create federal common law under *Texas Industries* are present under the current regulations influencing federal oceans: (1) unique federal interests are involved, as states cannot assert authority in federal waters, and (2) the interstate and international nature of the EEZ makes state law ineffective and requires U.S. sovereign action.²⁷⁶ Consequently, *Texas Instruments* would then apply to elevating ORE to equal footing with other public trust values as a means to mitigate climate change, as it represents the ultimate international controversy.

A great deal of federal legislation impacting ORE already contains language referencing public trust values or federal trust obligations.²⁷⁷ As discussed earlier, NEPA—which applies to all federal agencies—establishes a national duty to “fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.”²⁷⁸ Also, intergenerational equity values are found in the CZMA, with its goal to “preserve, protect, develop, and where possible, to restore or enhance the resources of the Nation’s coastal zone for this and succeeding generations”²⁷⁹ in addition to its language directly addressing climate change, stating “[b]ecause global warming may result in a substantial sea level rise with serious adverse effects in the coastal zone, coastal states must anticipate and plan for such an occurrence.”²⁸⁰ Parties could therefore urge federal courts to interpret this language so as to establish a public trust burden on the U.S. federal government, forcing government agencies to focus on intergenerational equity and the long term impacts on trust resources, which would have particular relevance

274. 451 U.S. 630, 640 (1981) (“[t]here is, of course, ‘no federal general common law.’ Nevertheless, the Court has recognized the need and authority in some limited areas to formulate what has come to be known as ‘federal common law.’ These instances are ‘few and restricted,’ and fall into essentially two categories: those in which a federal rule of decision is ‘necessary to protect uniquely federal interests,’ and those in which Congress has given the courts the power to develop substantive law.”) (citations omitted).

275. *Id.* at 641.

276. Turnipseed, *supra* note 15, at 48.

277. *See supra* Part I. A.

278. NEPA, *supra* note 174, at § 101(b)(1).

279. CZMA, *supra* note 191, at § 1452(m)(1).

280. *Id.* § 1451(l).

to impacts from climate change.²⁸¹ Moreover, a recognized federal PTD that elevates ORE to equal footing with other trust values would give federal courts more discretion in reviewing agency decisions regarding ORE projects as they pertain to NEPA and other statutes containing public trust language, preventing undue delay or compelling agency action in regards to ORE project siting.

Existing federal statutes coupled with specific, focused public trust legislation would create a definitive federal public trust responsibility in federal waters.²⁸² Though ORE is developing without a federal PTD, these projects have experienced significant delays due to daunting federal and state regulations and legal challenges.²⁸³ Even with BOEM's new Smart from the Start program and Wind Energy Areas, a federal PTD with ORE values would much better ensure permitting and construction of these projects.²⁸⁴ Specifically, a federal PTD could unite federal agencies around a common mission—"to protect, grow, and repair the *corpus* of the trust," encouraging cooperation to ensure preservation of trust resources.²⁸⁵

A strong, legislatively enacted federal PTD that recognizes ORE as a trust value and means of mitigating climate change would greatly aid these projects during the permitting process, rebuffing undue agency delay and legal challenges. This federal PTD legislation would first establish the obligation of the federal government to protect ocean,

281. See JEFFREY A. THALER, DUSTIN T. TILL & BRADLEY M. MARTIN, TREATMENT OF GREENHOUSE GASES UNDER THE NATIONAL ENVIRONMENTAL POLICY ACT 16 (2010). In February 2010, the White House Council on Environmental Quality (CEQ) issued for public comment a draft guidance document that directs federal agencies on how to assess climate change impacts under NEPA. National Environmental Policy Act Draft Guidance, *Consideration of the Effects of Climate Change and Greenhouse Gas Emissions*, 75 Fed. Reg. 8046 (Feb. 18, 2010). However, these standards have been "kept on ice" for over three years now, as the White House is taking "the time necessary to carefully consider all input . . ." Patrick Rucker & Valerie Volcovici, *Obama Leaves Climate Change-Fighting Tool on Shelf for Now*, REUTERS, June 16, 2013, available at <http://www.reuters.com/article/2013/06/16/us-usa-climate-whitehouse-idUSBRE95F02N20130616>.

282. Klass, *supra* note 2, at 1036.

283. See *supra* Part III.

284. Under current law, courts are highly deferential to the amount of time an agency takes in making a decision, and there is a high bar for courts to find any unreasonable delay in agency action. See *Telecomm. Research and Action Ctr. v. FCC*, 750 F.2d 70 (U.S. App. D.C. 1984) (a federal PTD with ORE values would permit courts to give agency action less deference regarding permitting and approval of ORE projects); Statutory codification of a federal PTD would also allow for more rigorous judicial review in general, potentially encouraging better cooperation among agencies. Turnipseed et al., *supra* note 15, at 11 (Blumm comments).

285. Turnipseed et al., *supra* note 15, at 10 (Sagarin comments).

coastal, and tidal resources, ecosystems, and the species within, for current and future generations. This could be accomplished using similar language employed by Congress in drafting the NEPA or CZMA.²⁸⁶ The statute would also need to acknowledge the threat climate changes poses to trust resources and the obligation to mitigate its negative impacts in order to fulfill the government's responsibilities of ensuring the health of these resources for all people, both living and yet to be born. In addition, Congress would need to expressly acknowledge the existence of a federal PTD in all federal waters—including territorial waters and the EEZ—by acknowledging sovereignty and sovereign rights to be sufficient to impose the fiduciary obligations of the PTD, and then expressly list the specific values protected by the trust. This would include the traditional values of commerce, navigation, and fishing protected under *Illinois Central*, while also broadening the scope of the doctrine to incorporate other values already included in numerous state PTDs, such as protecting tidal and freshwater ecosystems and wildlife.

Finally, to offer the federal PTD doctrine a means of better empowering itself to fulfill its fiduciary obligations, the statute could establish ORE as a trust value, both as a means to promote the traditional value of commerce and to mitigate the impacts of climate change on all trust resources. An example of this language could be:

Congress finds and declares that each person, both living and yet to be born, is entitled to the preservation, protection, development, and where possible, the restoration or enhancement of the resources of the Nation's oceans, coastal and tidal waters and lands located within the territory governed under the sovereign authority of the United States. This fiduciary obligation ensures the right to commerce, navigation, and fishing, as well as the continued and improved health of all ecosystems and wildlife species utilizing trust waters and lands. This legislation further acknowledges the threat that anthropogenic climate change poses to the health and viability of these trust resources, and declares the federal government's support and preference for the utilization of said resources through promoting the development, as soon as feasible, of additional ocean-based renewable energy (ORE) to both encourage commerce and reduce carbon and other greenhouse gas emissions as a means to mitigate the adverse impacts of climate change upon trust resources. Preference for ORE in

286. NEPA, *supra* note 174; CZMA, *supra* note 191.

context of permitting, regulatory, and judicial review shall mean there is a rebuttable presumption in favor of ORE over other trust values because of its ability to mitigate the adverse impacts of climate change.

Thus, the PTD would require “greater use of evidentiary rebuttable presumptions for when environmental impacts from an offshore wind project should be deemed acceptable absent compelling scientific evidence to the contrary.”²⁸⁷ For example, for many onshore wind projects in Maine, their visual impacts are presumed reasonable if the project is more than 2,500 feet from a full-time residence; thus, opponents must prove significant harm that is irremediable in order to defeat the project.²⁸⁸

Similarly, the incidental take or biological assessment processes under the Endangered Species Act or the Marine Mammal Protection Act should (1) compare the positive GHG emission-free benefits from offshore wind projects with the negative damage to ecosystems and species nationwide from continued carbon emissions in the absence of the wind project, (2) utilize rebuttable presumptions that presume an offshore wind project’s benefits to the ecosystem in the absence of strong evidence to the contrary, given climate-driven extinction risks and NREL’s assessment that each megawatt of GHG-free wind power would displace almost ninety percent of the GHGs being emitted by a megawatt

287. Thaler, *supra* note 97, at 1151. Contrary to how 1970s-era environmental laws were drafted or applied, where there is uncertainty about the impact of a clean renewable energy project upon a particular species or variable, the PTD’s green thumb requires that the benefit of the doubt go to approval of the project, not denial. Additionally, fossil fuel energy sources have already benefited from rebuttable presumptions. *See infra* note 288 and accompanying text.

288. *Id.* at 1151; *see* Maine’s Wind Energy Act, ME. REV. STAT. tit. 35-A, § 3452(4) (2011) (“There is a rebuttable presumption that a visual impact assessment is not required for those portions of the development’s generating facilities that are located more than 3 miles, measured horizontally, from a scenic resource of state or national significance. The primary siting authority may require a visual impact assessment for portions of the development’s generating facilities located more than 3 miles and up to 8 miles from a scenic resource of state or national significance if it finds there is substantial evidence that a visual impact assessment is needed to determine if there is the potential for significant adverse effects on the scenic resource of state or national significance. Information intended to rebut the presumption must be submitted to the primary siting authority by any interested person within 30 days of acceptance of the application as complete for processing. The primary siting authority shall determine if the presumption is rebutted based on a preponderance of evidence in the record.”).

of carbon-based electricity.²⁸⁹ There is precedent for use of rebuttable presumptions in energy permitting processes; indeed, oil and gas have benefitted from a rebuttable presumption that Categorical Exclusions under NEPA apply to certain proposals on public lands and in national forest system lands “if the activity is conducted pursuant to the Mineral Leasing Act for the purpose of exploration or development of oil or gas.”²⁹⁰

Finally, a federal PTD could be created through executive order or presidential proclamation. Executive orders have the full force of the law, and are usually used to direct agencies of the executive branch to manage federal government regulations.²⁹¹ Both Presidents George W. Bush²⁹² and Clinton²⁹³ used executive orders to further conservation goals. In June 2013, President Obama issued his Climate Action Plan which, using public trust language such as intergenerational equity, specifically directed the EPA to complete carbon pollution standards for new and existing power plants.²⁹⁴ In a similar fashion, an executive order directing all agencies to recognize and implement, through permitting and regulatory activities, public trust responsibilities in the language of existing federal legislation, such as the NEPA or CZMA,

289. Thaler, *supra* note 97, at 1151-52; NREL FUTURES, *supra* note 151, app. at A-53; In light of the NREL report and many other studies analyzed in this Article, we disagree with the assertion that having the ESA place a “green thumb” on the scale for wind and other renewables would “subvert the ESA’s precautionary purpose.” J.B. Ruhl, *Harmonizing Commercial Wind Power and the Endangered Species Act through Administrative Reform*, 65 VAND. L. REV. 1769, 1792 (2012). To the contrary, it would be consistent with the purposes of the ESA and NEPA to conserve ecosystems in order to avoid extinctions—all of which are directly being impacted by fossil-fueled climate changes.

290. 42 U.S.C. § 15942(a) (2006).

291. Thaler, *supra* note 97, at 1142 n. 230, (citing JOHN CONTRUBIS, CONG RESEARCH SERV., 96-772A, EXECUTIVE ORDERS AND PROCLAMATIONS, at CRS-2 to -3 (1999)), available at <http://www.11sdc.org/attachments/wysiwyg/544/crs-95-772.pdf>.

292. Exec. Order No. 13,352, 3 C.F.R. 210 (2004) (ordering agencies to engage in “cooperative conservation”). President Bush also used four proclamations to establish the Papahānaumokuākea, (Proclamation No. 8031, 3 C.F.R. 57 (2006)), the Marianas Trench, (Proclamation No. 8335, 3 C.F.R. 1 (2009)), the Pacific Remote Islands (Proclamation No. 8336, 75 Fed. Reg. 1565 (Jan. 6, 2009)), and the Rose Atoll, (Proclamation No. 8337, 74 Fed. Reg. 1577 (Jan. 6, 2009)) as Marine National Monuments designed to protect marine ecosystems of high conservation concern in the U.S. Pacific.

293. Exec. Order No. 13,158, 65 Fed. Reg. 34,909 (May 31, 2000) (developing a national system of marine protected areas); Exec. Order No. 13,186, 66 Fed. Reg. 3,853 (Jan. 17, 2001) (designed to protect migratory birds).

294. THE PRESIDENT’S CLIMATE ACTION PLAN, *supra* note 1, at 6.

would be appropriate. More explicitly, and preferably from the perspective of climate change mitigation, an executive order could direct all federal agencies having statutory authority over any ocean or coastal trust resources to acknowledge the fiduciary obligations of intergenerational equity, the threat of climate change to trust resources, the explicit existence of a federal PTD, and the incorporation of ORE as a value to that trust. This could help guide agency action and expedite the permitting process and provide a “green thumb” for ORE if any competing interest conflicts arise. Whether through common law, existing or new statutory enactment, executive order, or through a combination of the three, a federal PTD can be established, and used to promote ORE and its associated values to address the impacts of climate change on federal and state trust resources.

*D. Placing Ocean-based Renewable Energy on
Equal Footing with State Public Trust Values*

The discretion afforded to the states in defining the scope of the PTD in *Illinois Central* and *Phillips Petroleum*, coupled with the common law’s ability to evolve to meet the needs of an ever-changing society²⁹⁵ and its inherent mutability, allows for the public trust to act as an effective means for states to manage and protect trust resources beyond the traditional scope of fishing, commerce and navigation.²⁹⁶ As we have seen, a variety of state courts have expanded their PTDs to include modern preservation values designed to protect tidelands, wetlands, and coastline ecosystems and wildlife.²⁹⁷ The incorporation of ORE as a trust value at both the federal and state level would further these preservation values, as a means to mitigate the negative impacts of climate change on all trust resources, while aligning with the traditional trust value of commerce.²⁹⁸

States seeking to take measures to protect their trust resources from the impacts of climate change using the PTD to promote ORE can do so

295. Wilkinson, *supra* note 7, at 468-69 (quoting JEROME FRANK, *LAW AND THE MODERN MIND* 6-7 (1930) (“Our society would be straitjacketed were not the courts, with the able assistance of lawyers, constantly overhauling the law and adapting it to the realities of ever-changing social, industrial and political conditions . . .”).

296. Turnipseed et al., *supra* note 15, at 19, 47; *see also* Robin Kundis Craig, *Climate Change, State Public Trust Doctrines, and PPL Montana*, 120 *THE WATER REPORT* 16-21 (Feb. 15, 2014) (arguing state public trust doctrines can act as a powerful common-law tool to adapt to climate change impacts).

297. *Supra* Part V. B.

298. *Supra* Part II. C.

using constitutional and statutory provisions, in addition to the common law.²⁹⁹ Klass found these public trust principles work best in concert, through integrating the common law, state constitutions and statutory provisions, creating a synergy that can position the doctrine to have significant influence on state environmental protection efforts,³⁰⁰ acting as an effective and useful tool, especially when state legislative efforts fail to take the necessary environmental protective measures.³⁰¹ Powerful constitutional provisions that protect natural resources and the environment already exist in many states today,³⁰² creating inalienable fiduciary obligations to “maintain and improve a clean and healthful environment” for “present and future generations.”³⁰³ These constitutional provisions can be adopted and built upon by states through language that specifically applies these fiduciary obligations to ocean, coastal, tidal, and freshwater ecosystems while acknowledging the threat climate change and other human activities pose to these trust resources.

Many states have already enacted “environmental rights” legislation establishing legal rights to a healthy environment,³⁰⁴ while others have promulgated legislation instituting specific public trust responsibilities³⁰⁵ or have drafted statutes requiring state agencies to account for carbon and GHG admissions.³⁰⁶ Moving forward, states can modify this legislation or create new legislation that explicitly incorporates ORE as a public trust value through express legislation in a similar manner, as was proposed by this Article for the federal level, establishing the PTD as a means to mitigate the impacts of climate change and both traditional and modern trust resources.

States have already begun to prioritize ORE through legislative efforts, such as Maine, which passed legislation to facilitate the

299. *Supra* Part II. C.

300. Klass, *supra* note 10, at 713-14.

301. *Id.* at 748; *see also* Turnipseed et al., *Reinvigorating the Public Trust Doctrine: Expert Opinion on the Potential of a Public Trust Mandate in U.S. and International Environmental Law*, 52 ENV'T 6, 9 (2010) (“The PTD is a common law doctrine in some states, and a statutory or constitutional doctrine in others. Courts seem more willing to scrutinize an administrative decision that affects trust resources if the PTD has a statutory or constitutional basis rather than just a common law basis.”).

302. *See supra* Part II. C.

303. Klass, *supra* note 10, at 715 (quoting MONT. CONST. art II., § 3).

304. *See supra* Part II. C.

305. *Supra* Part II. C.

306. *See* THALER, TILL & MARTIN, *supra* note 279, at 22-47 (assessing climate change legislation under state “Little NEPAs” for California, Massachusetts, Minnesota, Michigan, and Washington).

development of ORE in state waters,³⁰⁷ designating “Ocean Energy Testing Areas” and establishing a special general permit program to expedite regulatory review of demonstration ORE projects.³⁰⁸ This has led to Maine producing the first offshore wind turbine to generate electricity in the United States. Like with a federal PTD, state PTDs that incorporate ORE values into their PTD could aid this type of legislation supporting ORE, providing a “green thumb” to resolve issues relating to conflicts over competing trust values to further aid in encouraging swift agency permitting or limiting legal challenges. Perhaps equally important, a state legislature that elevates ORE to a public trust value would show its commitment to both protecting its public trust resources and to ORE, encouraging development of this nascent U.S. industry.

VI. CONCLUSION

As President Obama said, “no single step can reverse the effects of climate change,”³⁰⁹ and in all certainty ORE alone cannot protect trust resources from rising seas, warming waters, or ocean acidification. But inherent to the PTD is an intergenerational fiduciary obligation to preserve these resources for the public, and unique to ocean, coastal, and tidal ecosystems is that they provide a means of protecting themselves from the impacts of climate change—abundant natural resources that can be harnessed to generate renewable, emission free energy. The challenges climate change pose are dire and daunting, and the U.S. must use every available means to combat its destructive forces. Establishing a federal PTD and ORE values in all PTDs will enable governments to better fulfill their fiduciary obligations, while empowering the doctrine to proactively protect trust resources—both traditional and modern—from the impacts of climate change. Ironically, it was just over fifty years ago that one of the leading songwriters wrote and sang these words:

Come gather around people, wherever you roam / And admit that
the waters around you have grown / And accept it that soon
you'll be drenched to the bone / If your time to you is worth

307. An Act to Facilitate Testing and Demonstration of Renewable Ocean Energy Technology, P. L. 270 LD 1465 (2009).

308. 38 M.R.S.A. § 480-HH (2013).

309. Kent Klein, *Obama to Unveil Climate Plan Tuesday*, VOICE OF AMERICA, (June 22, 2013), available at <http://www.voanews.com/content/obama-climate-change/1687375.html>.

savin' / Then you better start swimmin' or you'll sink like a stone
/ For the times they are a-changin'.³¹⁰

Isn't it well past time to heed that warning and combat the rising levels of greenhouse gases, temperatures, seas, health care costs and storm damages by making maximum use of the clean, renewable energy available and waiting off our shores?

310. BOB DYLAN, THE TIMES THEY ARE A-CHANGIN (Colombia Records 1964).