Shoreline Armoring and the Public Trust Doctrine: Balancing Public and Private Interests as Seas Rise

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Summary

Coastal landowners have an acute interest in armoring the shoreline by erecting barriers to protect their property from inundation and erosion. One problem with armoring is that the barrier potentially destroys coastal wetlands and beaches and prevents them from migrating as sea levels rise. Under the public trust doctrine, the public has the right to use trust resources and, in some states, to conservation of trust resources and the ecological services they provide. This Article examines whether coastal states have authority to take preemptive action to adapt to sea-level rise and protect intertidal zones, and whether they also have an enforceable duty under the public trust doctrine to take preemptive action. It concludes that, given the magnitude of the problems presented by global climate change and sea-level rise, the doctrine demands that states take action to protect trust resources.

I. Introduction

Global climate change is transforming the face of the planet and will continue to do so at an accelerated rate in the coming centuries, with potentially devastating effects on coastal ecosystems and the people living in coastal areas.[1] Recent studies indicate that the average ambient temperature in the United States has increased by between 1.3° Fahrenheit (F) and 1.9°F since 1895,[2] and scientists project that the average global temperature will increase between 3.6°F and over 8°F above preindustrial levels by 2100.[3] This increase in surface temperature causes the sea level to rise, both because water expands as the ocean absorbs the ambient heat from the warming atmosphere and because melting glaciers and ice sheets add to the total volume of water in the ocean.[4]

Monitoring shows that since the late 1800s, the average global sea level has risen approximately eight inches.[5] Scientists predict that between now and 2100, sea level will rise between one and four feet, depending on the emissions scenario.[6] Sea-level rise of even two feet will have massive consequences for coastal ecosystems and for people living on and near the coasts.

1. *See* John Walsh et al., *Our Changing Climate*, *in* Climate Change Impacts in the United States: The Third National Climate Assessment 19, 28-29 (Jerry M. Melillo et al. eds., 2014), *available at* http://nca2014.globalchange.gov/downloads (click on "Our Changing Climate" file) [hereinafter Walsh et al., *Our Changing Climate*].
2. Walsh et al., *Our Changing Climate*, *supra* note 1, at 25 ("[T]emperatures generally rose until about 1940, declined slightly until about 1970, then increased rapidly thereafter. The year 2012 was the warmest on record for the contiguous United States."). Scientists reported that the average global temperature in 2014 was the warmest on record. Nat'l Oceanic & Atmospheric Admin., Nat'l Ctrs. for Envtl. Info., Global Analysis: Annual 2014, http://www.ncdc.noaa.gov/sotc/global/201413 (last visited Aug. 7, 2015).
3. Walsh et al., *Our Changing Climate*, *supra* note 1, at 26 fig. 2.4, 27 (relying on the most conservative model considered by the Intergovernmental Panel on Climate Change (IPCC) with "more than 70% reduction in human-related emissions by 2050, and net negative emissions by 2100" to get the estimate of 3.6°F and the model with the highest level of emissions, which is "roughly similar to a continuation of the current path of global emissions increases," to get the estimate of over 8°F); John Walsh et al., *Climate Science Supplement*, *in* Climate Change Impacts in the United States: The Third National Climate Assessment 735, 754 (Jerry M. Melillo et al. eds., 2014), *available at* http://nca2014.globalchange.gov/downloads (click on "Climate Science Supplement" file).
4. Walsh et al., *Our Changing Climate*, *supra* note 1, at 44.
5. *Id.*
6. *Id.* at 45; IPCC, *Summary for Policymakers*, *in* Climate Change 2013: The Physical Science Basis 26 (T.F. Stocker et al. eds., 2013) [hereinafter 2013 IPCC Summary]. The 2013 IPCC Summary states that "global mean sea level rise will continue beyond 2100, with sea level rise due to thermal expansion to continue for many centuries." *Id.* at 28. Additionally, sea-level rise has not been uniform across the globe. For example, scientists found that sea level has been rising about "three times faster than the global average" along the Atlantic Coast between Cape Hatteras, NC, and Boston, MA. Wynne Parry, *Northeastern US Coast Is "Hotspot" for Sea-Level Rise*, Livescience, June 25, 2012, http://www.livescience.com/21158-sea-level-rise-northeast-coast.html (last visited Nov. 28, 2014). Thus, when mean global sea-level rise is two feet, these areas could experience a sea-level rise of six feet.

Despite the implications of sea-level rise due to climate change, populations continue to increase on the U.S. coasts.[7] As the coastal population increases, the pressure to develop coastal land intensifies.[8] Some coastal landowners develop their properties by building homes for their families, while others build resorts, vacation homes, shopping centers, and marinas to accommodate people moving to and visiting the coasts.[9] The availability of amenities draws even more people to the coasts, which spurs more development. However, sea-level rise will potentially drown coastal landowners' investments in the developed land because rising sea levels will cause coastal properties to become inundated or to erode over time.[10] Thus, coastal landowners have an acute interest in armoring the shoreline by erecting barriers, such as bulkheads or seawalls, to protect their property from inundation and erosion.[11]

One problem with landowners armoring the shoreline to protect their coastal property is that the barrier potentially destroys the intertidal zone, that is, coastal wetlands and beaches.[12] Further, armoring the shoreline prevents wetlands and beaches from migrating as sea levels rise,[13] which is problematic because wetlands and beaches provide valuable and irreplaceable ecological services.[14] Moreover, armoring shorelines leads to a "clash of values" problem—the general public's interests directly conflict with those of the coastal landowner.

Under the public trust doctrine, the public has the right to use trust resources, including, in most states, the beds of navigable waters and tidelands below the ordinary high watermark.[15] The public's interest extends not only to the right to navigate, fish, and recreate, but also, in some states, to conservation of trust resources and the ecological services they provide.[16] Accordingly, a tension exists between the interests of coastal property owners in developing and protecting their property and the interests of the public in using and preserving coastal resources.[17]

Given these challenges, lawmakers must make difficult choices when balancing competing interests. Because states act as trustees of public trust resources for the benefit of the public,[18] they owe fiduciary duties to the general public, as discussed below. These duties include an "affirmative duty" to "take the public trust into account" when making planning decisions, and a duty to exercise continuing supervision over the trust resources.[19] For example, a California court of appeal decision, in *Citizens for a Sustainable Treasure Island v. City of San Francisco* (*Sustainable Treasure Island*),[20] concluded that a project to turn a former naval station into a "mixed-use community" could proceed on the condition that the agency that serves as trustee for coastal resources cooperate throughout the planning and building of the project to ensure that the project is consistent with the public trust.[21] Thus, the trustee must balance public uses against private interests when overseeing projects that will affect trust resources.[22]

Because states act as trustees for the public, where trust resources are owned by private landowners, the private owner's land is burdened by both the general public's right to use trust resources and the state restrictions imposed on private landowners to protect resources for the benefit of the public.[23] In practice, the public trust doctrine serves to allow property owners to freely exercise most property rights, including "the rights to possession, use, and alienation," while limiting the property owner's rights to exclude and develop where exclusion or development would interfere with the public's right to use trust resources.[24] States and courts have recognized this limitation on landowners' rights.[25]

7. Susanne C. Moser et al., *Coastal Zone Development and Ecosystems*, *in* Climate Change Impacts in the United States: The Third National Climate Assessment 579, 581 (Jerry M. Melillo et al. eds., 2014), *available at* http://nca2014.globalchange.gov/downloads (click on "Coasts" file) ("Each year, more than 1.2 million people move to the coast").
8. *See* Niki L. Pace, *Wetlands or Seawalls? Adapting Shoreline Regulation to Address Sea Level Rise and Wetland Preservation in the Gulf of Mexico*, 26 J. Land Use & Envtl. L. 327, 328 (2011).
9. *See* Martha Honey & David Krantz, Center on Ecotourism & Sustainable Dev., Global Trends in Coastal Tourism 77-78 (2007), *available at* http://www.responsibletravel.org/resources/documents/reports/Global_Trends_in_Coastal_Tourism_by_CESD_Jan_08_LR.pdf.
10. Pace, *supra* note 8, at 328.
11. *Id.* This Article will use the term "shoreline armoring" to describe the erection of hard structures, including seawalls and bulkheads, along the shore.
12. *See* Jessica Grannis, Georgetown Climate Ctr., Adaptation Toolkit: Sea-Level Rise and Coastal Land Use 38 tbl. 10 (2011), *available at* http://www.southernclimate.org/documents/resources/Adaptation_Tool_Kit_SLR.pdf.
13. *Id.*
14. U.S. Envtl. Prot. Agency (EPA), *Coastal Wetlands*, http://water.epa.gov/type/wetlands/cwt.cfm (last visited Oct. 14, 2014) (listing ecosystem services as including flood protection, erosion control, wildlife food and habitat, commercial fisheries, water quality, recreation, and carbon sequestration).
15. *See, e.g.*, Shively v. Bowlby, 152 U.S. 1, 11, 18 (1894) (interpreting Oregon law).
16. *See, e.g.*, Marks v. Whitney, 491 P.2d 374, 380, 2 ELR 20049 (Cal. 1971) (concluding that the public trust extends to include "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 area").
17. *See* Kiawah Dev. Partners v. South Carolina Dep't of Health & Envtl. Control (*Kiawah Dev.*), 766 S.E.2d 707, 716 (S.C. 2014) (concluding that the proposed bulkhead, although it would benefit the developer, would not benefit the public).
18. *See, e.g.*, Martin v. Waddell's Lessee, 41 U.S. 367, 432 (1842) (explaining that New Jersey holds trust resources for the benefit of New Jersey's citizens); *see also* Joseph L. Sax, *Liberating the Public Trust Doctrine From Its Historical Shackles*, 14 U.C. Davis L. Rev. 185, 188 (1980) ("The central idea of the public trust is preventing the destabilizing disappointment of expectations held in common but without formal recognition such as title.").
19. National Audubon Soc'y v. Superior Court of Alpine Cnty. (*Mono Lake*), 658 P.2d 709, 728, 13 ELR 20272 (Cal. 1983); Vermont v. Central Vt. Ry., Inc., 571 A.2d 1128, 1132 (Vt. 1989).
20. 174 Cal. Rptr. 3d 363 (Cal. Ct. App. 2014).
21. *Id.* at 388-89.
22. *See id.*
23. *See* Michael C. Blumm & Mary Christina Wood, The Public Trust Doctrine in Environmental and Natural Resources Law 9 (2013) ("Depending on the circumstances, the trust might be thought of as imposing an easement (allowing public access along tidelands, for example) or a servitude (preventing an owner from damaging the resource).").
24. *See* Michael C. Blumm, *The Public Trust Doctrine and Private Property: The Accommodation Principle*, 27 Pace Envtl. L. Rev. 649, 653 (2010).
25. *See* Lynch v. California Coastal Comm'n, 177 Cal. Rptr. 3d 654, 661-62 (Cal. Ct. App. 2014), *cert. granted*, 339 P.3d 328 (Cal. 2015); Kiawah Dev. Partners v. South Carolina Dep't of Health & Envtl. Control (*Kiawah Dev.*), 766 S.E.2d 707, 716 (S.C. 2014).

For example, in *Lynch v. California Coastal Commission*,[26] a California court of appeal upheld the California Coastal Commission's decision to grant homeowners' request for a permit for seawall reconstruction that included a condition limiting the term of the permit to 20 years and denying the homeowners' request to rebuild a staircase on the cliff.[27] The court concluded that the permit limitation was justified because the project could adversely affect adjacent unprotected land; and that, with sea-level rise, the Commission must revisit the need for the seawall in the future.[28] The Commission essentially placed limitations on the homeowners' right to build after it balanced the homeowners' interest in protecting their land against a broad public interest in "maximiz[ing] public access" and protecting the sensitive ecosystems along the coastline.[29]

States have been inconsistent in addressing the effects of global climate change and sea-level rise. Some states have reacted to the realities of sea-level rise by enacting legislation regulating shoreline armoring, and residential and commercial development in areas likely to be inundated, in a way that also protects coastal beaches and wetlands to benefit the public.[30] Other states have buried their heads in the sand, preferring to deny either the existence of global climate change or their ability to address the effects of global climate change.[31] States willing to fulfill their fiduciary duties by taking preemptive action, including regulating shoreline armoring and development in areas likely to be inundated, will not only be better prepared to protect public trust resources, but will also experience fewer of the adverse ecological effects—and consequently, economic costs—of sea-level rise than states that are unwilling to take preemptive action.

This Article examines whether coastal states have the authority to take preemptive action to adapt to sea-level rise and protect intertidal zones, and whether they also have an enforceable duty under the public trust doctrine to take preemptive action. Part II provides background on global climate change and the public trust doctrine. Part III analyzes the states' authority to use the public trust doctrine to protect coastal wetlands and beaches, examining whether states can impose restrictions on upland landowners based on the public trust doctrine while avoiding violations of the Fifth Amendment's Takings Clause. Part IV considers whether coastal states have a publicly enforceable duty to take preemptive action to preserve coastal wetlands and beaches by limiting a private landowner's right to develop and to armor the shoreline.

The Article concludes that, given the extraordinary magnitude of the problems presented by global climate change and sea-level rise and the imminence of its effects, the public trust doctrine demands that states take action to protect trust resources. The Article maintains that when states abdicate their trust responsibilities, citizens may invoke the public trust doctrine to sue the state to force it to take precautionary measures to address sea-level rise.

II. Background

Global climate change is causing rapid, unprecedented ecological changes across the planet and will continue to do so in the coming centuries.[32] Traditional environmental law has failed to adequately respond to these changes for various reasons that include congressional and state denial of global climate change,[33] stalemate in the U.S. Congress,[34] and inadequate statutory and regulatory mechanisms.[35] Given the problems traditional environmental law has in addressing global climate change, potential plaintiffs look to other legal tools—including the public trust doctrine—to force the government to take action to mitigate or adapt to the effects of climate change.[36]

A. *Global Climate Change and Rising Seas*

Coastal wetlands protect infrastructure and human life in coastal areas by serving as a buffer from flooding[37]

26. 177 Cal. Rptr. 3d 654 (Cal. Ct. App. 2014).
27. *Id.* at 661-63.
28. *Id.*
29. *Id.* at 663.
30. *See, e.g.*, Cal. Pub. Res. Code §§30235, 30604 (West 2014) (requiring shoreline projects to conform to public access policies); Md. Code. Ann., Envir. §16-201 (West 2014) (restricting a landowner's right to armor the shoreline to protect property); S.C. Code Ann. §48-39-30 (2014) (same).
31. *See, e.g.*, Douglas Main, *North Caroline Sea Level Rise Accelerating, Researchers Report*, Huffington Post, Nov. 8, 2012, http://www.huffingtonpost.com/2012/11/08/north-carolina-sea-level-_n_2095100.html (last visited Nov. 29, 2014) ("[T]he North Carolina Senate passed a bill banning researchers from reporting predicted increases in the rate of sea level rise. But the ocean, unbound by legislation, is rising anyway—and in North Carolina this rise is accelerating."); Terrence McCoy, *Fla. Scientists Told to Remove Words "Climate Change" From Study on Climate Change*, Wash. Post, Mar. 10, 2015, http://www.washingtonpost.com/news/morning-mix/wp/2015/03/10/why-this-florida-scientist-had-to-remove-the-term-climate-change-from-her-study/ (reporting that an attorney and his colleagues from Florida's Department of Environmental Protection were "told not to use the terms 'climate change,' 'global warming,' or 'sustainability'").
32. *See* Walsh et al., *Our Changing Climate*, *supra* note 1, at 20.
33. *See* Katie Valentine, *24 House Republicans Just Voted to Deny the Reality of Climate Change*, Climate Progress, Jan. 28, 2014, http://thinkprogress.org/climate/2014/01/28/3215971/house-members-deny-climate-change/ (last visited Dec. 2, 2014).
34. *See* Drew DeSilver, *Congress Still on Track to Be Among Least Productive in Recent History*, Pew Research Ctr., Sept. 23, 2014, http://www.pewresearch.org/fact-tank/2014/09/23/congress-still-on-track-to-be-among-least-productive-in-recent-history/ (last visited Dec. 2, 2014).
35. *See infra* Parts III. & IV.B.1.
36. *See, e.g.*, Kanuk ex rel. Kanuk v. State Dep't of Natural Res., 335 P.3d 1088, 1099 (Alaska 2014) (explaining that the court would not declare "that the State's duty to protect the atmosphere is 'dictated by best available science'" because "[t]he limited institutional role of the judiciary supports a conclusion that the science- and policy-based inquiry here is better reserved for executive-branch agencies or the legislature"); Sanders-Reed v. Martinez, 350 P.3d 1221, 1222-23 (N.M. Ct. App. 2015):
    > Plaintiffs asked the district court to declare that the State has a public trust duty to protect the atmosphere, and that its "failure to investigate the threat posed by unlimited greenhouse gas emissions into the atmosphere, as it relates to climate change" and to devise a plan to "mitigate the effects of climate change" is a breach of the public trust duty.

    See also Chernaik v. Kitzhaber, 328 P.3d 799 (Or. Ct. App. 2014) (seeking a declaration that the state and the governor of Oregon "have violated their duties to uphold the public trust and protect the State's atmosphere as well as the water, land, fishery, and wildlife resources from the impacts of climate change").
37. Claudia Copeland, Cong. Research Serv., RL33483, Wetlands: An Overview of Issues 4 (2013) [hereinafter Wetlands: An Overview].

and coastal storms.[38] Additionally, they purify water,[39] absorb pollutants,[40] serve as a sink for atmospheric carbon dioxide,[41] and protect shorelines from erosion.[42] Moreover, coastal wetlands provide habitat for wildlife, including fish and shellfish that are important economically and recreationally.[43] Beaches are also ecologically important, providing essential habitat for various species of shorebirds, sea turtles, and fish.[44] Both coastal beaches and wetlands provide open space and aesthetic value for the public.[45]

As seas rise as a result of global climate change, coastal wetlands and beaches are threatened with inundation and erosion.[46] According to scientists, sea-level rise will cause "shoreline erosion, storm-surge flooding, saltwater intrusion into groundwater aquifers, inundation of wetlands and estuaries, and threats to cultural and historic resources and infrastructure."[47] Global climate change will also cause more frequent and intense flooding and storms, which will increase coastal communities' reliance on wetlands as a buffer.[48] Despite these necessary services, policymakers rarely take these risks into account when making land use planning decisions.[49]

Coastal communities have two general approaches for dealing with sea-level rise: retreat or defend.[50] Retreat involves prohibiting or removing obstructive structures, including seawalls, bulkheads, and buildings.[51] Then, as seas rise over time, people abandon property that is eroded away or inundated (either by being permanently flooded or flooded for a certain period of time or with a certain frequency) and move inland.[52] Retreating allows intertidal zones to migrate inland, but also displaces communities and results in the loss of infrastructure.[53]

Alternatively, coastal communities may defend by armoring the shoreline, for example, by building seawalls, bulkheads, or dikes to keep the ocean at bay.[54] This approach allows communities to remain on land that would have otherwise been inundated had the shoreline not been armored.[55] However, defending also prevents wetlands and beaches from migrating inland as seas rise, which could result in loss of all or most coastal beaches and wetlands in these areas.[56]

California has used a third approach that combines retreat and defend.[57] This approach involves allowing a project, or parts of the project, to go forward, but with conditions that allow for flexibility by limiting the duration of the permit to allow future changes to the project[58] or by requiring the trustee agency to oversee the planning and implementation of the project to ensure consistency with public trust uses.[59] It enables states to balance the various interests while allowing for changes as circumstances change.[60]

A downside of California's approach is that it could allow projects that are inconsistent with trust uses to go forward on the assumption that the project could be fixed later. Relying on later fixes could cause landowners to expect that they will be permitted to continue to use their land in the future to the same extent that they are permitted today. Such an expectation could lead to backlash when the state later tries to place restrictions on the ways in which owners may use their land. Moreover, permit-

38. *Id.*
39. *Id.* at 3.
40. *Id.* at 5-6.
41. *Id.* at 6.
42. *Id.*
43. *Id.* at 4; *see also* Thomas E. Dahl, U.S. Fish & Wildlife Serv., Status and Trends of Wetlands in the Conterminous United States 1998 to 2004 48 (2006) [hereinafter Status and Trends of Wetlands 1998-2004] ("Wetlands along the nation's coastline have provided valuable resources and supported large sections of the nation's economy. Wetlands have also provided opportunities for recreation and supported commercially valuable fish and crustacean populations.") (internal citation omitted).
44. Status and Trends of Wetlands 1998-2004, *supra* note 43, at 50. Approximately 70% of commercially valuable fish rely on near-shore habitat during at least one stage in its life cycle. Mark S. Peterson et al., *Habitat Use by Early Life-History Stages of Fishes and Crustaceans Along a Changing Estuarine Landscape: Differences Between Natural and Altered Shoreline Sites*, 8 Wetlands Ecology & Mgmt. 209, 209 (2000).
45. Wetlands: An Overview, *supra* note 37, at 3.
46. Donald Scavia et al., *Climate Change Impacts on U.S. Coastal and Marine Ecosystems*, 25 Estuaries 149, 153 (2002); Wetlands: An Overview, *supra* note 37, at 6:

> Using a rapid sea-level rise scenario, the scientists estimated that most coastal wetlands worldwide will experience inundation that leads to rapid and irreversible conversion of marshland into unvegetated, subtidal surfaces and will disappear near the end of the 21st century. Under moderate and slow sea-level rise scenarios, some coastal wetlands would be vulnerable to inundation, depending on amounts of sediment present: larger amount of sediment would enable the wetland to adapt and modify naturally and thus be more likely to survive sea-level rise.

47. Elizabeth A. Pendleton et al., U.S. Geological Survey, Coastal Vulnerability Assessment of the Northern Gulf of Mexico to Sea-Level Rise and Coastal Change 1 (2010), *available at* http://pubs.usgs.gov/of/2010/1146/pdf/ofr2010-1146.pdf.
48. *See* Rajendra K. Pachauri et al., Climate Change 2014: Synthesis Report 72 fig. 2.5 (2014):

> A 10- to more than 100-fold increase in the frequency of floods in many places would result from a 0.5 m rise in sea level in the absence of adaptation. Local adaptation capacity (and, in particular, protection) reaches its limits for ecosystems and human systems in many places under a 1 m sea-level rise.

See also James G. Titus et al., *State and Local Governments Plan for Development of Most Land Vulnerable to Rising Sea Level Along the US Atlantic Coast*, Envtl. Res. Letters, Oct.-Dec. 2009, at 1, 2, *available at* http://iopscience.iop.org/1748-9326/4/4/044008/pdf/1748-9326_4_4_044008.pdf [hereinafter Titus et al., Envtl. Res. Letters].
49. Pace, *supra* note 8, at 333.
50. Titus et al., Envtl. Res. Letters, *supra* note 48, at 2; *see also* Scavia et al., *supra* note 46, at 159.
51. Titus et al., Envtl. Res. Letters, *supra* note 48, at 2.
52. *Id.*
53. *Id.*
54. *Id.*
55. *See id.*
56. Titus et al., Envtl. Res. Letters, *supra* note 48, at 2; Robert L. Fischman, *Global Warming and Property Interests: Preserving Coastal Wetlands as Sea Levels Rise*, 19 Hofstra L. Rev. 565, 567 (1991) ("Construction of bulkheads to protect economic development may prevent new marsh from forming and result in a total loss of marsh in some areas.").
57. *See* Citizens for Sustainable Treasure Island v. City of San Francisco, 174 Cal. Rptr. 3d 363, 388-89 (Cal. Ct. App. 2014); Lynch v. California Coastal Comm'n, 177 Cal. Rptr. 3d 654, 661-62 (Cal. Ct. App. 2014), *cert. granted*, 339 P.3d 328 (Cal. 2015).
58. *Lynch*, 177 Cal. Rptr. 3d at 661-62.
59. *Sustainable Treasure Island*, 174 Cal. Rptr. 3d at 388-89.
60. *See id.*

ting projects to go forward could damage trust resources that are difficult or impossible to restore later.[61]

Historically, states have implicitly chosen to defend the shoreline. Land use planners routinely submit to private landowner pressure to protect property from intermittent flooding.[62] As a result, states have allowed landowners to armor large swaths of the coast, resulting in the loss of hundreds of thousands of acres of coastal wetlands and beaches. In 1950, approximately six million acres of wetlands existed on the coasts of the United States.[63] Since then, approximately 700,000 acres of intertidal wetland have been lost.[64]

Between 1986 and 1997, urban and rural development combined were the largest cause of coastal wetland destruction, accounting for 43% of the wetland losses.[65] The main causes for the loss of coastal wetland and beach acreage during the period between 1998 and 2004 included dredging, water control activities,[66] coastal erosion,[67] and deficiencies in sediment deposition.[68] And between 2004 and 2009, the rate at which coastal wetlands and beaches were destroyed increased[69] due to severe weather in the Gulf of Mexico (including Hurricane Katrina), relative sea-level rise, and urban and rural development.[70] In Connecticut and Massachusetts, landowners destroyed more than 50% of coastal wetlands and beaches in just two decades.[71] Additionally, by 1998, landowners in Maryland armored over 300 miles of shoreline.[72]

As seas rise, if coastal states continue to prefer to defend rather than retreat, those states will likely continue to allow landowners to armor most of the coastal shoreline. Along the Atlantic Coast, landowners have developed approximately 42% of dry land within one meter above the ordinary high watermark and have lightly developed or expect to develop another 15%.[73] This level of development means that landowners most likely have or will armor the shoreline in these areas as seas rise if the states continue to allow business-as-usual practices.[74] Atlantic Coast states have designated only about 9% of land within one meter above the ordinary high watermark for conservation purposes, which will allow coastal wetlands there to migrate inland as seas rise.[75] The remaining 34% of low-lying land is mostly rural, so states likely have no current plans to develop those areas.[76] However, states will likely allow landowners to develop at least some of the 34%, especially in states with few regulatory restrictions on coastal development, such as Georgia, North Carolina, and Virginia.[77]

According to scientists, with the majority of low-lying coastal land already developed or likely to be developed in the future, "large-scale [wetland] migration would require either a halt to construction in most coastal floodplains or an eventual abandonment of many developed areas."[78] The problem is that current policies promote the opposite: development with ambitious shoreline protection.[79]

As landowners armor the shoreline, the public loses irreplaceable wetland services, wildlife habitat, and access to the shoreline.[80] Over time, bulkheads and seawalls cause the intertidal zone to erode away, destroying wildlife habitat and thereby reducing diversity of many near-shore species including fish, shorebirds, and plants.[81] Moreover, shoreline armoring prevents wetlands from migrating inland as seas rise.[82] Failure to allow inland migration will likely result in complete loss of wetlands and beaches in some areas because the ocean will inundate or erode away coastal beaches and wetlands up to the bulkhead or seawall.[83] Not only do bulkheads and seawalls serve as a barrier preventing new wetlands from forming beyond the armor to replace those lost,[84] they also cause increased flooding and erosion of adjacent non-armored tidelands.[85] This inundation and erosion damages the remaining unar-

61. For example, many scientists have concluded that restored wetlands are unable to support the same level of biodiversity and to provide the same ecological functions as natural wetlands. *See* Joy B. Zedler, *Progress in Wetland Restoration Ecology*, 15 Trends Ecology & Evolution 402, 406 (2000) (describing various wetland restoration studies).
62. Mary Christina Wood, Nature's Trust: Environmental Law for a New Ecological Age 320 (2014).
63. Status and Trends of Wetlands 1998-2004, *supra* note 43, at 56 fig. 37-A.
64. Thomas E. Dahl, U.S. Fish & Wildlife Serv., Status and Trends of Wetlands in the Conterminous United States 2004 to 2009 72 (2013) [hereinafter Status and Trends 2004-2009]. Under business-as-usual policies, this number will increase dramatically as seas rise and more property owners wish to protect property from inundation or erosion. *See infra* Part IV.A.2.
65. Thomas E. Dahl, U.S. Fish & Wildlife Serv., Status and Trends of Wetlands in the Conterminous United States 1986 to 1997 30-31 (2000). Between 1986 and 1997, the United States lost approximately 10,400 acres of marine and estuarine intertidal wetlands. *Id.* at 29. Upland land uses, including fill and spoil deposition, accounted for 30% of the loss. *Id.* at 31.
66. Status and Trends of Wetlands 1998-2004, *supra* note 43, at 49. This study by the U.S. Fish and Wildlife Service (FWS) estimated that in 2004, there were approximately 5.3 million acres of coastal wetlands in the United States. *Id.* at 48. Between 1998 and 2004, approximately 28,500 acres were destroyed. *Id.* at 44 tbl. 2, 46.
67. *Id.* at 50, 54.
68. *Id.* at 54.
69. Status and Trends 2004-2009, *supra* note 64, at 16. During this period, coastal states lost more than 84,100 acres of intertidal wetlands. *Id.*
70. *Id.* at 47.
71. Wood, *supra* note 62, at 320.
72. James G. Titus, *Rising Seas, Coastal Erosion, and the Takings Clause: How to Save Wetlands and Beaches Without Hurting Property Owners*, 57 Md. L. Rev. 1279, 1281-82 (1998).
73. Titus et al., Envtl. Res. Letters, *supra* note 48, at 3. The percentage of developed land varies greatly between states. For example, in Florida and states north of Rhode Island, more than 80% of land within one meter above the ordinary high watermark is developed or contains some development (for example, roads to access remote communities). *Id.* Conversely, in Delaware and Maryland, where the states restrict coastal development, only 45% of low-lying land is developed. *Id.*
74. *See id.*
75. *Id.* at 4.
76. *Id.*
77. *Id.* at 4.
78. Titus et al., Envtl. Res. Letters, *supra* note 48, at 5.
79. *Id.*
80. Pace, *supra* note 8, at 328, 339.
81. *Id.* at 339.
82. James G. Titus et al., *Greenhouse Effect and Sea Level Rise*, 19 Coastal Mgmt. 1, 10 (1991).
83. *Id.*
84. *Id.*
85. Grannis, *supra* note 12, at 37.

mored shoreline, further exacerbating the environmental effects caused by the original project.[86]

Much of the coastal wetland and beach destruction is the result of a large number of isolated state and local government decisions to allow shoreline armoring and development on small tracts of coastal property.[87] Scholars, including Prof. Mary Christina Wood, have called this phenomenon the "tragedy of fragmentation."[88] Professor Wood explained that "boundaries produce fragmentation, and fragmentation, in turn, fosters myopic decisions; these small decisions, however, eventually aggregate to produce a large decision that is never directly made."[89] The tragedy is that policymakers fail to consider the aggregate environmental and social effects of hundreds of isolated projects that destroy small tracts of wetlands.[90]

For example, had policymakers in Connecticut or Massachusetts considered the cumulative ecological consequences of destroying 50% of the states' coastal wetlands, they surely would have at least considered less-destructive options.[91] The "tragedy of fragmentation" underscores the need for states to consider the aggregate effects of each decision to armor the shoreline on the environment, other landowners, and the public. The public trust doctrine mandates just this sort of inquiry.[92]

B. *The Public Trust Doctrine*

Under the public trust doctrine, each state in its sovereign capacity[93] holds trust resources—including trust lands, waters, and wildlife, among others—as trustee for the benefit of present and future generations.[94] The doctrine is ancient, originating under Roman law and resurfacing in medieval England,[95] and is a matter of state law.[96] It "aims to ensure that government safeguards and makes publicly accessible natural resources which are necessary for public welfare and survival."[97] The government owns trust resources in its sovereign capacity and must manage those resources for the benefit of the public.

A state may not abdicate its trust responsibilities except in two narrow situations.[98] In the lodestar case *Illinois Central R.R. Co. v. Illinois*, the U.S. Supreme Court reversed the lower court and concluded that the legislature had the authority to repeal a statute that conveyed away much of the bed of the Chicago harbor to the Illinois Central Railroad.[99] The Court explained that Illinois serves as trustee over submerged lands and the waters above them, so it must "preserve such waters for the use of the public."[100] Consequently, the grant of title to the submerged lands was void because it "divest[ed] all the citizens of their common right" to use the harbor for navigation, commerce, and fishing.[101] The Court held that the Illinois Legislature may not alienate "the navigable waters of [Chicago] harbor and the lands under them" because ownership of those trust resources is "a subject of public concern to the whole people of the state."[102] The Court noted two exceptions to this restraint on alienation: The state may convey trust land if (1) "such parcels are used in promoting the interests of the public therein" or (2) they are parcels that "can be disposed of without any substantial impairment of the public interest in the lands and waters remaining."[103]

Contrary to the seemingly broad restriction on the conveyance of trust land to private owners, states have the power to convey an interest in these lands to private parties.[104] However, the public trust doctrine continues to burden private title in trust resources[105] and, because the doctrine imposes fiduciary duties on states, the states must protect public uses in privately held trust resources.[106] A conveyance to a private landowner does not terminate the public's right to continue to use those lands for protected trust purposes,[107] because the courts have recognized the legal fiction of a split title.[108] The private landowner holds the proprietary title, or the *jus privatum*, while the state continues to hold the equitable title, or the *jus publicum*, in trust.[109]

86. *See id.*
87. Wood, *supra* note 62, at 320.
88. *Id.*; Eric T. Freyfogle, Lecture, *The Tragedy of Fragmentation*, 36 Val. U. L. Rev. 307, 324 (2002) (describing many problems caused by landscape and regulatory fragmentation, including "the increased difficulty of addressing ecological challenges that require planning at the landscape level"); *see also* Dale D. Goble, *The Property Clause: As if Biodiversity Mattered*, 75 U. Colo. L. Rev. 1195, 1196 (2004).
89. Wood, *supra* note 62, at 320 (quoting Goble, *supra* note 88, at 1196).
90. *Id.*
91. *Id.*
92. *See, e.g.*, McQueen v. South Carolina Coastal Council, 580 S.E.2d 116, 119-20 (S.C. 2003) ("The State . . . cannot permit activity that substantially impairs the public interest in marine life, water quality, or public access.") (citations omitted).
93. Illinois Cent. R.R. Co. v. Illinois, 146 U.S. 387, 455 (1892) ("[S]uch property is held by the state, by virtue of its sovereignty in trust for the public.").
94. *See* David C. Slade et al., Coastal States Org., Inc., Putting the Public Trust Doctrine to Work 3 (2d ed. 1997). State legislatures often delegate to executive branch agencies and local governments the authority to oversee trust resources. *Illinois Cent.*, 146 U.S. at 453-54. *See, e.g.*, Wis. Stat. Ann. §28.04(2) (West) (assigning the Wisconsin Department of Natural Resources the responsibility of managing state forests "to benefit the present and future generations"). Additionally, some courts have concluded that a county, as a "subdivision of the state," shares in the state's responsibility for protecting natural resources. Center for Biological Diversity, Inc. v. FPL Grp., Inc., 83 Cal. Rptr. 3d 588, 605 n.19 (Cal. Ct. App. 2008). So, because the state may not abdicate its duties under the public trust doctrine, neither can the local government. *See id.* Delegations by the state to local government entities are revocable, however, because the state is the trustee and has an ongoing duty to oversee the management of trust resources. *Illinois Cent.*, 146 U.S. at 453-54.
95. Slade et al., *supra* note 94, at 1.
96. Blumm & Wood, *supra* note 23, at 4 ("Each jurisdiction has its own interpretation of the doctrine.").
97. *Id.* at 3.
98. Illinois Cent. R.R. Co. v. Illinois, 146 U.S. 387, 453 (1892).
99. *Id.* at 449, 452.
100. *Id.* at 453, 455.
101. *Id.* at 456.
102. *Id.* at 455-56.
103. *Id.* at 453.
104. Slade et al., *supra* note 94, at 6.
105. *Id.* at 3.
106. *Id.*
107. A state, as trustee, does not lose ownership of trust resources unless it intends to do so. Titus, *supra* note 72, at 1286.
108. *See* Slade et al., *supra* note 94, at 6.
109. *Id.* at 6.

The *jus publicum* burdens the *jus privatum* where the titles overlap, which means that the landowner can own the trust resource, but may not interfere with the public's protected uses of the trust resources.[110] A state cannot convey the *jus publicum* to a private landowner, nor can it abdicate its duties as trustee.[111] However, in some states, where the state conveys the *jus privatum* to a private landowner, and the land is no longer useful for trust purposes, the *jus publicum* is extinguished and the land is no longer burdened by the public trust doctrine.[112]

The public trust doctrine in the United States evolves with the changing needs of society; thus, over time, states and courts have both expanded trust resources and protected more public uses under the doctrine.[113] With regard to expanding trust resources, the doctrine has proven to be amphibious in nature, migrating from navigable waters to land.[114] Traditionally, states held—and continue to hold—in trust all navigable waters and the lands beneath them up to the ordinary high watermark.[115] As the Washington Supreme Court explained, "[r]ecognizing modern science's ability to identify the public need, state courts have extended the doctrine beyond its navigational aspects."[116] The court stated that "[h]istorically, the trust developed out of the public's need for access to navigable waters and shorelands, and thus the trust encompassed the right of navigation and fishery," and noted that "[t]he trust's relationship to navigable waters . . . resulted not from a limitation, but rather from a recognition of where the public need lay."[117]

Historically, the need lay in navigation, but today, uses evolve as science identifies public need.[118] Accordingly, various courts have recognized as trust resources wildlife,[119] water,[120] parks and other public lands,[121] dry sand above the ordinary high watermark,[122] and a historic battlefield.[123]

Moreover, the public uses that states protect under the public trust doctrine have expanded from originally including only navigation, commerce, and fishing,[124] to more recently including recreation (including sunbathing and swimming),[125] wildlife habitat,[126] ecological conservation (including preservation of ecological services),[127] and aesthetic and scenic values.[128] Given the expanding nature of the public trust to meet the needs of society, courts are increasingly willing to expand the trust to include various other natural resources as trust resources and to conclude that the public trust doctrine protects various other uses of those resources.

III. States' Authority to Protect Migrating Coastal Wetlands

In the age of global climate change, the public trust doctrine should expand to meet society's need to ensure the continued existence of coastal wetlands and beaches. Some states have already taken actions to protect the public's interest in coastal wetlands and beaches; however, the majority of states' efforts are inadequate because they protect only specified wetlands or fail to protect wetlands at all. If states take action well before coastal wetlands and beaches are lost to rising seas, those states will benefit

110. *See* Shively v. Bowlby, 152 U.S. 1, 57 (1894). The *jus publicum* is "the bundle of trust rights of the public to fully use and enjoy trust lands and waters for commerce, navigation, fishing, bathing and other related public purposes." Slade et al., *supra* note 94, at 7.
111. Slade et al., *supra* note 94, at 8 (explaining that the state has the power to convey the *jus privatum*, but may not convey the *jus publicum*).
112. City of Berkeley v. Superior Court, 606 P.2d 362, 376 (Cal. 1980). The landowner effectively takes full title to the former trust land because the land is no longer burdened by *jus publicum*. *See id.*
113. In re Water Use Permit Applications (*Waiahole Ditch*), 9 P.3d 409, 447 (Haw. 2000) ("The public trust, by its very nature, does not remain fixed for all time, but must conform to changing needs and circumstances."); Vermont v. Central Vt. Ry., Inc., 571 A.2d 1128, 1130 (Vt. 1989) ("The doctrine is not fixed or static, but one to be molded and extended to meet changing conditions and needs of the public it was created to benefit." (quoting Matthews v. Bay Head Improvement Ass'n, 471 A.2d 355, 365 (N.J. 1984)) (internal quotation marks omitted)).
114. *See* Blumm, *supra* note 24, at 665 (describing the evolution of the public trust doctrine as amphibious).
115. *See, e.g.*, Illinois Cent. R.R. Co. v. Illinois, 146 U.S. 387, 453 (1892); Martin v. Waddell's Lessee, 41 U.S. 367, 413 (1842). All states own the *jus privatum* at least up to the ordinary high watermark regardless of the landowner's *jus privatum* boundary. *See* Slade et al., *supra* note 94, at 7.
116. Orion Corp. v. State, 747 P.2d 1062, 1073, 18 ELR 20697 (Wash. 1987).
117. *Id.*
118. *See id.*
119. *See, e.g.*, Geer v. Connecticut, 161 U.S. 519, 529 (1896), *partially overruled by* Hughes v. Oklahoma, 441 U.S. 322, 9 ELR 20360 (1979) (explaining that the state holds game in "trust for the benefit of the people").
120. *See, e.g.*, National Audubon Soc'y v. Superior Court of Alpine Cnty. (*Mono Lake*), 658 P.2d 709, 712, 13 ELR 20272 (Cal. 1983) ("[B]efore state courts and agencies approve water diversions they should consider the effect of such diversions upon interests protected by the public trust, and attempt, so far as feasible, to avoid or minimize any harm to those interests."). Some states have even extended the public trust to cover groundwater. *See, e.g.*, In re Water Use Permit Applications (*Waiahole Ditch*), 9 P.3d 409, 490 (Haw. 2000) (concluding that the public trust doctrine applies to all water resources, including groundwater).
121. *See, e.g.*, Sierra Club v. U.S. Dep't of the Interior, 376 F. Supp. 90, 96, 4 ELR 20444 (N.D. Cal. 1974) (explaining that the Secretary of the Interior has a trust responsibility to protect Redwood National Park).
122. *See, e.g.*, Raleigh Avenue Beach Ass'n v. Atlantis Beach Club, 879 A.2d 112, 113 (N.J. 2005) (holding that "the public trust doctrine requires the [private, dry sand beach to] be open to the general public").
123. Commonwealth v. National Gettysburg Battlefield Tower, Inc., 311 A.2d 588, 591, 3 ELR 20876 (Pa. 1973).
124. Illinois Cent. R.R. Co. v. Illinois, 146 U.S. 387, 456 (1892).
125. *See, e.g.*, Matthews v. Bay Head Improvement Ass'n, 471 A.2d 355, 358 (N.J. 1984) ("The public's right to use the tidal lands and water encompasses navigation, fishing and recreational uses, including bathing, swimming and other shore activities.").
126. Marks v. Whitney, 491 P.2d 374, 380, 2 ELR 20049 (Cal. 1971) (explaining that the uses protected by the public trust include, among other things, "habitat for birds and marine life").
127. National Audubon Soc'y v. Superior Court of Alpine Cnty. (*Mono Lake*), 658 P.2d 709, 719, 13 ELR 20272 (Cal. 1983):
> There is a growing public recognition that one of the most important public 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 area.

(quoting *Marks*, 491 P.2d at 380).
128. Payne v. Kassab, 312 A.2d 86, 93 (Pa. Commw. Ct. 1973) ("The people have a right to . . . the preservation of the natural, scenic, historic and esthetic values of the environment.") (quoting Pa. Const. art. I, §27).

because they will likely be shielded from takings claims[129] and the public will benefit because state action will protect coastal beaches and wetlands.

A. *Applying the Public Trust Doctrine to Upland Property*

As explained in Part II.B., the public trust doctrine expands to meet the changing needs of society, and courts have been increasingly willing to protect new public uses and natural resources under the doctrine. Professor Wood has argued that the view that the public trust is tied to navigability is "superficial and at odds with the overriding truth of nature that all ecological resources are interconnected and interdependent."[130] As seas rise as a result of global climate change,[131] the continued existence of coastal wetlands and beaches will depend on the availability of suitable, open uplands where wetlands and beaches can reestablish.[132] Thus, given the scientific certainty that seas will continue to rise, causing particular uplands to foreseeably become public trust land in the future,[133] and that losing coastal wetlands and beaches will impose enormous costs on society, states and courts should logically expand the resources protected by the public trust doctrine to uplands along coasts that will be flooded in the coming century.[134]

States and courts have used the public trust doctrine to alter private property rights with changes in public need. The land-water boundary is ambulatory, and thus the landowner's property boundary is ambulatory.[135] The common law has long dealt with gradually shifting land-water boundaries with the laws of accretion and erosion.[136] When the boundaries shift gradually, ownership boundaries shift as well.[137] So, when the shoreline accretes (expands due to the gradual deposition of sediment) the riparian owner gains ownership of the newly created shoreline subject to the *jus publicum* below the ordinary high watermark.[138] Conversely, when the shoreline gradually erodes away, the riparian owner loses ownership of the newly submerged upland.[139] And the public trust expands automatically as trust resources migrate.[140] Thus, when navigable water encroaches on previously dry uplands to create new wetlands, the public trust burdens those wetlands, even though they were previously unburdened.[141] So, the upland landowner continues to own the *jus privatum*, while the state owns the *jus publicum* in the newly created wetlands.

Therefore, the laws of accretion and erosion and public trust jurisprudence provide riparian landowners with notice that their ownership is subject to the gradual changes of the ocean. Sea-level rise will gradually inundate uplands, causing coastal wetlands and beaches to migrate inland; the state will take title to newly submerged lands and the intertidal zone up to the ordinary high watermark, so long as bulkheads or seawalls do not prevent migration.[142] Because both the state and riparian landowners are subject to the laws that could change their interests in property based on the land-water boundary, riparian landowners may not fix the boundary by armoring the shoreline because it would unfairly deprive the state—and the public—of wetlands that it would otherwise gain.[143]

The practice of states and courts extending the public trust doctrine to land above the ordinary high watermark is not unprecedented. Several states, including Hawaii, Louisiana, New Jersey, New York, Oregon, and Washington, have extended the trust inland of the ordinary high watermark to include dry sand beach up to the vegetation line.[144] Additionally, courts have upheld restrictions on landown-

129. *See* Fischman, *supra* note 56, at 595. ("The sooner a bulkhead ban is enacted, . . . the greater the time available for adjustment of investment-backed expectations. A bulkhead ban passing constitutional muster today might fail if it were enacted at a later time when sea level rise is imminent.").

130. Mary Christina Wood, *"You Can't Negotiate With a Beetle": Environmental Law for a New Ecological Age*, 50 Nat. Res. J. 167, 205 (2010).

131. Poh Poh Wong et al., *Coastal Systems and Low-Lying Areas*, *in* Climate Change 2014: Impacts, Adaptation, and Vulnerability; Part A: Global and Sectoral Aspects 361, 367 (2014).

132. J. Peter Byrne, *Rising Seas and Common Law Baselines: A Comment on Regulatory Takings Discourse Concerning Climate Change*, 11 Vt. J. Envtl. L. 625, 636 (2010) ("Armoring would also force rising waters onto existing wetlands and prevent reestablishment of wetlands in geologically suitable locations further inland, thus seriously reducing the quantity of wetlands in violation of long-standing cornerstones of environmental policy.").

133. *See* Titus et al., Envtl. Res. Letters, *supra* note 48 (studying development along the Atlantic coast within one meter above the ordinary high watermark).

134. *See* Byrne, *supra* note 132, at 636.

135. United States v. Milner, 583 F.3d 1174, 1186-87, 39 ELR 20232 (9th Cir. 2009) ("[C]ourts have long recognized that an owner of riparian or littoral property must accept that the property boundary is ambulatory, subject to gradual loss or gain depending on the whims of the sea.").

136. Compare to the law of avulsion, which governs rapid or sudden shifts in the land-water boundary, caused by natural events like hurricanes or floods. *See* Joseph L. Sax, *The Accretion/Avulsion Puzzle: Its Past Revealed, Its Future Proposed*, 23 Tul. Envtl. L.J. 305, 306 (2009). The law of avulsion provides that land-water boundary shifts caused by avulsive events do not change ownership boundaries. *Id.*

137. Robert Meltz, Cong. Research Serv., R42613, Climate Change and Existing Law: A Survey of Legal Issues Past, Present, and Future 23 (2014); Sax, *supra* note 136, at 306.

138. *See* Meltz, *supra* note 137, at 23.

139. *Id.*

140. *See* McQueen v. South Carolina Coastal Council, 580 S.E.2d 116, 150 (S.C. 2003) (holding that the state need not compensate the landowner for denial of a permit to bulkhead his lots after the lots had reverted to tideland because the lots were burdened by the public trust even though historically they were not).

141. *Id.*

142. *See* Fischman, *supra* note 56, at 581 ("Sea level rise induced by global warming would threaten coastal wetlands at a speed that would provide upland owners with a period of time of similar duration to landowners experiencing conventional erosion, accretion, and reliction to adjust their expectations.").

143. *See* United States v. Milner, 583 F.3d 1174, 1187, 39 ELR 20232 (9th Cir. 2009) (concluding that the riparian landowners may not erect bulkheads to "fix the property boundary" because it would "depriv[e] the Lummi Tribe of tidelands that they would otherwise gain").

144. Titus, *supra* note 72, at 1366; *see* La. Civ. Code Ann. art. 451 (2014) ("Seashore is the space of land over which the waters of the sea spread in the highest tide during the winter season."); Wash. Rev. Code Ann. §90.58.030(2)(b) (West 2014) (defining ordinary high watermark with respect to the vegetation line); In re Ashford, 440 P.2d 76, 77 (Haw. 1968) (defining the seaward boundary mark to be the vegetation line, which was approximately 30 feet inland of the ordinary high watermark); Matthews v. Bay Head Improvement Ass'n, 471 A.2d 355, 358 n.1, 364-65 (N.J. 1984) (extending public's right to use beaches up to dry sand area "defined as the land west (landward) of the high water mark to the vegetation line"); Dolphin Lane Assocs. v. Town of Southampton, 333 N.E.2d 358, 360 (N.Y. 1975) (locating the high waterline by reference to the line of vegetation); State ex rel. Thornton v. Hay, 462 P.2d 671, 674 (Or. 1969) (applying the law of custom to set the high watermark as equal to the vegetation line).

ers' rights to exclude the public and to develop in areas not traditionally burdened by the public trust doctrine, based on the premise that the trust allows states to protect trust resources and the public's interest in those resources. For example, the New Jersey Supreme Court in *Matthews v. Bay Head Improvement Ass'n*[145] concluded that the riparian landowner must allow public access to the sea by permitting members of the public to cross privately owned dry, sandy beach and must allow the public to use the dry beach "to sunbathe and generally enjoy recreational activities."[146]

The *Matthews* case shows the court's willingness to impose restrictions on uplands so that traditional trust resources can serve public needs.[147] Moreover, courts have concluded that upland wildlife and their habitat[148] and parklands[149] are burdened by the public trust. Thus, even though these upland areas were not traditionally burdened by the trust, the courts concluded that imposing *jus publicum* was necessary to protect the public's interests in these important resources.[150]

For a state or a court to extend the *jus publicum* above the ordinary high watermark to facilitate wetland and beach migration would not greatly expand the public trust doctrine, given the public need and the fact that courts have already burdened uplands for similar protected interests—recreation and ecological interrelation and services.[151] Even in states that continue to interpret the public trust doctrine as tied to navigability, the stakes are high and the science is certain enough that expansion of the doctrine in the context of global climate change and coastal wetland and beach migration is warranted.

B. The States' Authority to Regulate Uplands

States are not required to allow riparian landowners to armor the shoreline in a way that privatizes the shoreline.[152] However, states consistently acquiesce to landowners' pressure to armor the shoreline and develop coastal property.[153] In most states, a landowner who armors the shoreline is allowed to exclude the public from the area inland from the bulkhead or seawall, thus effectively privatizing what was public shore before the wall was built.[154] Additionally, over time, the intertidal area—what is left of the public shoreline—will be inundated or will erode away as seas rise; shoreline armoring exacerbates these problems. Thus, when states allow riparian landowners to armor the shoreline, the states essentially fail to protect trust resources by allowing their destruction and the privatization of the shoreline, and so fail to carry out their trust duties.[155]

Currently, all coastal states regulate private landowners' right to armor the shoreline.[156] For example, some states have enacted anti-armoring statutes and regulations. These regulations include outright bans on shoreline armoring in areas likely to be inundated as seas rise to ensure inland wetland migration.[157] Maine's Coastal Sand Dune Rules[158] prohibit building new bulkheads in sand dune areas.[159] Additionally, some states, including Maine, limit or prohibit reconstruction and maintenance of existing infrastructure and bulkheads damaged by flooding or erosion in ecologically sensitive areas.[160] In these areas, as the

145. 471 A.2d 355 (N.J. 1984).

146. *Id.* at 364-65; *see also* Raleigh Ave. Beach Ass'n v. Atlantis Beach Club, 879 A.2d 112, 124 (N.J. 2005) (requiring the riparian landowner to allow public access on privately owned upland dry beaches for recreational activities). Other states have relied on the doctrine of custom to grant the public rights to use upland sand beaches. *See, e.g.*, City of Daytona Beach v. Tona-Rama, Inc., 294 So. 2d 73, 78 (Fla. 1974) ("If the recreational use of the sandy area adjacent to mean high tide has been ancient, reasonable, without interruption and free from dispute, such use, as a matter of custom, should not be interfered with by the owner."); *State ex rel. Thornton*, 462 P.2d at 673 (enjoining the riparian landowner from building fences to exclude the public from upland dry beach).

147. *Matthews*, 471 A.2d at 364-65; Fischman, *supra* note 56, at 583.

148. *See, e.g.*, Geer v. Connecticut, 161 U.S. 519, 529 (1896), *partially overruled by* Hughes v. Oklahoma, 441 U.S. 322, 9 ELR 20360 (1979) (explaining that the government holds game in "trust for the benefit of the people"); State v. Sour Mountain Realty, Inc., 276 A.D.2d 8, 15 (N.Y. App. Div. 2000) (requiring a landowner to remove a snake-proof fence to allow an endangered rattlesnake to access habitat on the landowner's property); *see also* Marks v. Whitney, 491 P.2d 374, 380, 2 ELR 20049 (Cal. 1971):

> There is a growing public recognition that one of the most important public 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 area.

149. *See, e.g.*, Sierra Club v. U.S. Dep't of the Interior, 376 F. Supp. 90, 96, 4 ELR 20444 (N.D. Cal. 1974) (explaining that the Secretary of the Interior has a trust responsibility to protect Redwood National Park); Paepcke v. Public Bldg. Comm'n of Chicago, 263 N.E.2d 11, 15, 1 ELR 20172 (Ill. 1970) (holding that the agencies in charge of a dedicated park hold the park "in trust for . . . the benefit of the public"); Friends of Van Cortlandt Park v. City of N.Y., 750 N.E.2d 1050, 1055 (N.Y. 2001) (concluding that legislative approval is required before the city may build a water treatment plant in a city park because "dedicated park areas in New York are impressed with a public trust for the benefit of the people of the State").

150. *See Matthews*, 471 A.2d at 364-65 ("Beaches are a unique resource and are irreplaceable. The public demand for beaches has increased").

151. Fischman, *supra* note 56, at 583 ("Just as the public right of recreation along a tideland is frustrated if the public cannot use the adjacent dry sand beach, so the public's environmental and health interest in coastal wetlands will be frustrated if upland owners erect bulkheads that block marsh migration.").

152. Titus, *supra* note 72, at 1286.

153. Wood, *supra* note 62, at 320.

154. Titus, *supra* note 72, at 1281:

> Most states tacitly reward riparian owners who build these walls with sole custody of what had been the public shore, by allowing the owners to exclude the public from the area inland from the wall, where there would have been a public beach or wetland had the wall not been built.

155. Pace, *supra* note 8, at 350-51.

156. Grannis, *supra* note 12, at 38 tbl. 10.

157. *See id.* at 41.

158. 06-096-355 Me. Code R. §§1-10 (LexisNexis 2014).

159. *Id.* §5(E) ("No new seawall or similar structure may be constructed."); 16-2-1 R.I. Code R. §300.7(D) (LexisNexis 2014) (prohibiting the construction of new shoreline armoring in conservation areas and coastal beaches); *see also* S.C. Code Ann. §48-39-290(B)(2)(a) (2014) (prohibiting "new erosion control structures . . . seaward of the setback line"); Tex. Nat. Res. Code Ann. §61.013(b) (West 2014) (prohibiting the "construction landward of and adjacent to a public beach . . . in a manner that will or is likely to affect adversely public access to and use of the public beach"); Rhode Island Coastal Res. Mgmt. Program §210.3(B)(4) ("The construction of new shoreline protection structures and the bulkheading and filling along the inland perimeter of a marsh prevents inland migration of wetland vegetation as sea level rises, and will very likely result in the eventual permanent loss of coastal wetlands in these circumstances."); *id.* §210.3(D)(1) ("In Type 1 waters, structural shoreline protection may be permitted only when used for Council-approved coastal habitat restoration projects.").

160. 06-096-355 Me. Code R. §10 ("If the shoreline recedes such that a coastal wetland . . . extends to any part of the structure . . . for a period of six

coasts are inundated or eroded, landowners are required to retreat. Some states limit development in areas adjacent to riparian areas. Maine's Coastal Sand Dune Rules prohibit development on property adjacent to coastal sand dunes that is likely to be eroded or "severely damaged" within the next century.[161] Under this scheme, residents must retreat as seas rise.

Conversely, other states explicitly defend against rising seas by granting to riparian landowners the right to reclaim property that was eroded or inundated, thus obstructing wetland and beach migration.[162] Experts estimate that in many cases, the long-term environmental and social costs of armoring the shoreline outweigh the short-term economic benefits to private landowners.[163] Indeed, the U.S. Environmental Protection Agency (EPA) recommends that states limit shoreline armoring, and prefers living shorelines to allow wetland migration.[164]

States also use rolling easements to ensure that riparian landowners do not impede coastal wetland and beach migration.[165] Rolling easements allow riparian landowners to fully use land adjacent to coastal wetlands and beaches until the land is eroded or inundated by rising seas.[166] Then, upon inundation or erosion, the rolling easement prevents the landowner from reclaiming land that was lost, thus allowing wetlands and beaches to migrate inland; consequently, as the seas rise, the coastal population retreats.[167] Maine's Coastal Sand Dune Rules explicitly provide for retreat, requiring that people move inland as seas rise.[168]

James Titus, an expert in sea-level rise and applicable laws, has argued that rolling easements are an important tool that states should use to promote coastal wetland and beach migration.[169] He has maintained that rolling easements put property owners on notice that eventually sea-level rise will inundate or erode much coastal property, rendering landowners' property economically useless, and that "the state will not allow the landowner to protect her investment at the expense of the public."[170] States and the public benefit because these easements allow coastal wetlands and beaches to migrate inland; riparian landowners benefit because they are able to use their property for economically beneficial purposes in the years prior to inundation or erosion.[171]

C. *Private Landowners' Potential Constitutional Takings Claims*

Regulations or statutes that impose limitations on property owners' ability to protect property from sea-level rise, or on their ability to develop in areas likely to be inundated in the next century, raise takings issues. The Takings Clause of the Fifth Amendment of the U.S. Constitution states that the federal government may not deprive a person of property "without due process of law; nor shall private property be taken for public use, without just compensation."[172] The Supreme Court has stated that one purpose of the Takings Clause is to protect individuals from "bear[ing] public burdens" that are more fairly "borne by the public as a whole."[173] Accordingly, the government may interfere with private property owners' rights, but in some cases must pay compensation when the interference rises to the level of a constitutional taking.[174]

1. The Public Trust Doctrine as a Background Principle

Most regulations imposing limitations on private landowners' use of property do not rise to the level of a regulatory taking that requires compensation.[175] The Supreme Court in *Lucas v. South Carolina Coastal Council*[176] concluded that a regulation amounts to a compensable taking when a regulation deprives a property owner of "all economically viable use" of property, unless the limitations in the regulations "inhere in the title itself" as a result of the state's "background principles" of property or nuisance.[177] Courts have interpreted this language to mean that background principles restricting the use of the landowner's property serve as a complete defense to a takings claim.[178] Thus, when assessing regulatory takings claims, courts consider as a threshold matter the nature of the property at

months or more, then the approved structure along with appurtenant facilities must be removed and the site must be restored to natural conditions within one year."); *see also* S.C. Code Ann. §48-39-290(B)(2)(b) (2014) ("Erosion control structures or devices which existed on the effective date of this act must not be repaired or replaced if destroyed . . . more than fifty percent above grade").

161. 06-096-355 Me. Code R. §5(C) ("A project may not be permitted if, within 100 years, the property may reasonably be expected to be eroded as a result of changes in the shoreline such that the project is likely to be severely damaged after allowing for a two foot rise in sea level over 100 years.").
162. Md. Code Ann., Envir. §16-201 (2014) ("A person who is the owner of land bounding on navigable water is entitled . . . to reclaim fast land lost by erosion [by making] improvements into the water.").
163. Grannis, *supra* note 12, at 37.
164. U.S. EPA, Climate Ready Estuaries Program, Synthesis of Adaptation Options for Coastal Areas 12, 14 (2009), *available at* http://www2.epa.gov/sites/production/files/2014-04/documents/cre_synthesis_1-09.pdf (explaining that although states will likely employ both hard and soft shoreline armoring strategies, hard armoring "may provide immediate remediation, [but] may not be sustainable in protecting coastal land in the long term").
165. Grannis, *supra* note 12, at 41.
166. *Id.* at 44 tbl. 22.
167. *See* Titus, *supra* note 72, at 1377-79.
168. 06-096-355 Me. Code R. §10 ("If the shoreline recedes such that a coastal wetland . . . extends to any part of the structure . . . for a period of six months or more, then the approved structure along with appurtenant facilities must be removed and the site must be restored to natural conditions within one year.").
169. Titus, *supra* note 72, at 1389-90.
170. *Id.* at 1389.
171. *Id.* at 1390.
172. U.S. Const. amend. V. By its explicit terms, the Fifth Amendment applies only to the federal government, however the Fourteenth Amendment later applied this prohibition on takings to the states. U.S. Const. amend. XIV, §1 (stating that no state shall "deprive any person of . . . property, without due process of law").
173. Armstrong v. United States, 364 U.S. 40, 49 (1960).
174. Lingle v. Chevron U.S.A., Inc., 544 U.S. 528, 536-37, 35 ELR 20106 (2005).
175. *See* Pennsylvania Coal Co. v. Mahon, 260 U.S. 393, 413 (1922).
176. 505 U.S. 1003, 22 ELR 21104 (1992).
177. *Id.* at 1029.
178. Michael C. Blumm & Lucas Ritchie, Lucas' *Unlikely Legacy: The Rise of Background Principles as Categorical Takings Defenses*, 29 Harv. Envtl. L. Rev. 321, 327 (2005).

issue to ascertain whether a background principle applies to defeat takings claims.[179] The public trust doctrine is one such background principle that "inhere[s] in the title" of private property.[180]

In cases in which regulatory limitations are applied to riparian landowners restricting the landowner's right to armor or develop public trust property, courts conclude that the restriction is not a taking. For example, in *McQueen v. South Carolina Coastal Council*,[181] the South Carolina Supreme Court on remand from the U.S. Supreme Court held that wetlands created by tidal water encroaching on formerly upland portions of a riparian landowner's lot "belong[ed] to the State" and thus became public trust property.[182] Consequently, the court concluded that no compensable taking had occurred when the state denied the landowner's permits to build bulkheads to protect his lots from inundation because "the reversion to tidelands effected a restriction on [the landowner's] property rights. . . ."[183] The public trust doctrine served as a background principle to defeat the landowner's takings claim because the landowner never had a property right to build bulkheads on trust property.[184]

2. Applying the Supreme Court's Regulatory Takings Tests

A regulation causes a taking when, as Justice John Harlan explained in *Pennsylvania Coal Co. v. Mahon*, it "goes too far."[185] To determine precisely when a regulation "goes too far," courts evaluate takings claims using the *Lucas* test (as described above) and the *Penn Central* test (described below). Under both tests, the public trust doctrine is relevant because the doctrine helps define whether the landowner had a property right capable of being taken in the first place.

In *Lucas*, the Supreme Court explicitly stated that when landowners bring constitutional takings claims, the inquiry into the background principles "is the logically antecedent inquiry."[186] Accordingly, even courts applying the *Penn Central* test must first consider whether the public trust doctrine serves as a background principle, and whether it serves as a complete defense to the takings challenge.[187] Then, in the unlikely cases in which a court concludes that the public trust doctrine does not afford a complete defense to a regulatory takings claim, the doctrine remains relevant to the *Penn Central* test analysis.[188]

In *Penn Central Transportation Co. v. City of New York*,[189] the Supreme Court set out three factors to be balanced in the traditional regulatory takings analysis: (1) "[t]he economic impact of the regulation"; (2) the regulation's "interfere[nce] with [the property-owner's reasonable] investment-backed expectations"; and (3) "the character of the governmental action."[190] When courts consider the third factor, they decide whether the government physically invaded the landowner's property,[191] and some courts assess whether the regulation confers a benefit or prevents harm to the public.[192] The public trust doctrine is relevant to the second and third factors (specifically, whether the regulation confers a benefit or prevents a harm).[193]

Few cases have considered the issue of whether restrictions on development or on armoring shoreline just upland of existing public trust land[194] are compensable takings.

179. *Lucas*, 505 U.S. at 1027 (describing the inquiry into background principles as a "logically antecedent" issue in a takings claim); Blumm & Ritchie, *supra* note 178, at 327. *See, e.g.*, Hearts Bluff Game Ranch v. United States, 669 F.3d 1326, 1329, 42 ELR 20020 (Fed. Cir. 2012) ("First, as a threshold matter, the court determines whether the claimant has identified a cognizable Fifth Amendment property interest that is asserted to be the subject of the taking."); Appolo Fuels, Inc. v. United States, 381 F.3d 1338, 1347, 34 ELR 20087 (Fed. Cir. 2004) ("It is a settled principle of federal takings law that under the *Penn Central* analytic framework, the government may defend against liability by claiming that the regulated activity constituted a state law nuisance without regard to the other *Penn Central* factors."); Coalition for Gov't Procurement v. Federal Prison Indus., Inc., 365 F.3d 435, 481 (6th Cir. 2004) ("First, the court must examine whether the claimant has established a cognizable "property interest" for the purposes of the Just Compensation Clause."); Zealy v. City of Waukesha, 548 N.W.2d 528, 532 (Wis. 1996). The nature of property is relevant because private title to public trust land, including tidelands, is burdened by traditional common law principles, including the public trust doctrine. Meltz, *supra* note 137, at 25.

180. Blumm & Wood, *supra* note 23, at 129; *see, e.g.*, McQueen v. South Carolina Coastal Council, 580 S.E.2d 116, 119-20 (S.C. 2003) (denying the landowner's takings claim because the public trust doctrine is a background principle so the landowner did not have a property right to fill tidal wetlands subject to the trust); Stevens v. City of Cannon Beach, 854 P.2d 449, 456-57, 24 ELR 20913 (Or. 1993) (holding that "the doctrine of custom as applied to public use of Oregon's dry sand areas is one of 'the restrictions that background principles of the State's law of property . . . already place upon land ownership'" so "exclusive use of their dry sand areas was not a part of the 'bundle of rights' that they acquired") (quoting *Lucas*, 505 U.S. at 1029)).

181. 580 S.E.2d 116 (S.C. 2003).

182. *Id.* at 150.

183. *Id.*

184. *Id.*

185. 260 U.S. 393, 413-15 (1922) (explaining that "[g]overnment hardly could go on if to some extent values incident to property could not be diminished without paying for every such change in the general law").

186. Lucas v. South Carolina Coastal Council, 505 U.S. 1003, 1027, 22 ELR 21104 (1992).

187. Blumm & Ritchie, *supra* note 178, at 366 ("The background principles inquiry does not supplant the *Penn Central* balancing test . . . ; it simply precedes it."); *see Lucas*, 505 U.S. at 1027.

188. Robin Kundis Craig, *Public Trust and Public Necessity Defenses to Takings Liability for Sea Level Rise Responses on the Gulf Coast*, 26 J. Land Use & Envtl. L. 395, 404 (2011).

189. 438 U.S. 104, 8 ELR 20528 (1978).

190. *Id.* at 124.

191. *See, e.g.*, FIC Homes of Blackstone, Inc. v. Conservation Comm'n of Blackstone, 673 N.E.2d 61, 71 (Mass. App. Ct. 1996).

192. *See* Just v. Marinette Cnty., 201 N.W.2d 761, 767-68, 3 ELR 20167 (Wis. 1972). Although the Supreme Court has downplayed this dichotomy, lower courts still employ it. *See, e.g.*, R.W. Docks & Slips v. State, 628 N.W.2d 781, 790 (Wis. 2001) ("The DNR acted primarily to protect an emergent weedbed on behalf of the public, and secondarily, to prevent interference with the rights of neighboring riparian owners.").

193. Blumm & Wood, *supra* note 23, at 129. *See, e.g.*, *R.W. Docks & Slips*, 628 N.W.2d at 790 (explaining "the character of the governmental action . . . weighs against a finding that the Docks has suffered a compensable regulatory taking" and the state did not interfere with investment-backed expectations because "the riparian owner does not have a right to the issuance of a permit if it is detrimental to the public interest").

194. For example, this situation involves land that remains upland of the ordinary high watermark in many states. *See, e.g.*, *FIC Homes of Blackstone*, 673 N.E.2d at 71 (concluding that a bylaw requiring "buildings to be set back 100 feet from a wetlands resource" did "not constitute a compensable taking").

Applying the regulatory takings tests, these types of restrictions are probably not takings. First, the restriction would not be a per se taking under *Lucas*. In *Tahoe-Sierra Preservation Council, Inc. v. Tahoe Regional Planning Agency*,[195] the Supreme Court concluded that a temporary moratorium on development did not constitute a per se taking under the *Lucas* test.[196] In coming to this conclusion, the Supreme Court focused on the fact that the moratorium prohibited development for a limited period of time, so the limitation was not a "complete elimination of value" or a "total loss" as is required under the *Lucas* test.[197] Similarly, in the case of regulations limiting future development and use of property, the affected property owners could continue to use their property in economically beneficial ways on at least part of the property for years after the state implemented the restriction and before the property is inundated.[198] Thus, the property owner is not being deprived of "all economically viable use" of property under the *Lucas* test.

Second, under the *Penn Central* balancing test, courts are likely to conclude that laws restricting shoreline armoring or prohibiting development in areas likely to be inundated in the next century are not takings. Under the first factor, "economic impact," landowners in some cases will be greatly affected because they will be unable to protect their property and investments from being flooded or eroded away, or they may be prevented from building at all.[199] However, the second factor, reasonable "investment-backed expectations," tempers this economic loss to favor a judicial finding of no compensable taking. Coastal landowners are, or at least should be, on notice that sea level is rising and coastal properties are likely to be inundated in the foreseeable future.[200]

Moreover, states play dual roles as regulators on the one hand and proprietors of trust lands on the other.[201] So as proprietor, when a state asserts its rights on behalf of the public and a court weighs the competing interests, the state's position should be accorded equal weight—if not greater weight, given the fact that the state is a sovereign and is protecting the public's interests—to the position of any other proprietor.[202] According to Prof. Joseph L. Sax, courts considering takings claims "should seek an equitable balance between the legitimate claims of both the upland owner and the state."[203] Thus, where the state acts to promote the public's interest in advance of inundation, those state and public interests are known to landowners and act to reduce the landowners' expectations.[204] Accordingly, because landowners have notice of both sea-level rise and the public's interest in preserving coastal wetlands and beaches, when a state acts well in advance of inundation, courts are likely to conclude that the landowners' investment-backed expectations to develop or armor shoreline on their property are not reasonable.

The third *Penn Central* factor, "the character of the governmental action," also likely favors the state because regulation does not cause the state to physically intrude on private property.[205] Moreover, the purpose of allowing wetlands and beaches to migrate is to prevent harm, rather than to confer a benefit on the public.[206] Allowing coastal migration creates new wetlands and beaches to replace those lost by erosion or inundation as seas rise, thus causing, on average, no net increase in public trust lands.[207] A state acting to maintain the status quo is not securing a benefit for the public.[208] Further, restrictions on armoring shorelines and development prevent harm because wetlands ameliorate pollution, reduce flooding, buffer storms, and provide wildlife habitat. The public will be harmed if those environmental services vanish with disappearing intertidal zones.[209] Accordingly, the restriction prevents the

195. 535 U.S. 302, 32 ELR 20627 (2002).
196. *Id.* at 330-31.
197. *Id.* (quoting Lucas v. South Carolina Coastal Council, 505 U.S. 1003, 1019-20 n.8, 22 ELR 21104 (1992)).
198. Byrne, *supra* note 132, at 636.
199. For example, a landowner might be prohibited from constructing a hotel or a home "if, within 100 years, the project may . . . be eroded as a result of changes in the shoreline such that the project is likely to be severely damaged after allowing for a two foot rise in sea level over 100 years." Maine Dep't of Envtl. Prot. Admin. Code ch. 355 §5.C. Or a landowner might be barred from protecting the development from the rising seas. In either case, the landowner's property is less economically valuable than it would be without the restrictions.
200. Major news outlets have been reporting on sea-level rise for years. *See, e.g.*, John Upton, *Coastal Cities Are Drowning, Thanks to New Reality of Sea Level Rise*, Huffington Post, Oct. 8, 2014, http://www.huffingtonpost.com/2014/10/08/sea-level-rise_n_5951472.html (last visited Oct. 29, 2014) (including a list of expected number of flooding events per year in various cities now, in 2030, and in 2045); Justin Gillis, *Rising Sea Levels Seen as Threat to Coastal U.S.*, N.Y. Times, Mar. 13, 2012, http://www.nytimes.com/2012/03/14/science/earth/study-rising-sea-levels-a-risk-to-coastal-states.html?_r=0 (last visited Oct. 29, 2014); Peter Wilkinson, *Sea Level Rise Could Cost Port Cities $28 Trillion*, CNN, Nov. 23, 2009, http://www.cnn.com/2009/TECH/science/11/23/climate.report.wwf.allianz/index.html?iref (last visited Oct. 30, 2014); *Scientists Warn of Catastrophic Sea Level Rise*, Fox News, Mar. 11, 2009, http://www.foxnews.com/story/2009/03/11/scientists-warn-catastrophic-sea-level-rise/ (last visited Oct. 30, 2014); *Tree Death Linked to Rise in Sea Level*, CNN, Oct. 20, 1999, http://www.cnn.com/NATURE/9910/20/trees.enn/index.html?iref (last visited Oct. 30, 2014).
201. Joseph L. Sax, *Some Unorthodox Thoughts About Rising Sea Levels, Beach Erosion, and Property Rights*, 11 Vt. J. Envtl. L. 641, 643 (2010).
202. *Id.* at 644.
203. *Id.*
204. Fischman, *supra* note 56, at 568. Prof. Robert L. Fischman explained that "[t]he sooner the bulkhead ban is enacted, the less the cost to the landowner and the greater the time available for adjustment of investment-backed expectations." *Id.* at 595. Thus, underscoring a need for states to act sooner rather than later, "[a] bulkhead ban passing constitutional muster today might fail if it were enacted at a later time when sea level rise is imminent." *Id. See, e.g.*, FIC Homes of Blackstone, Inc. v. Conservation Comm'n of Blackstone, 673 N.E.2d 61, 70 (Mass. App. Ct. 1996) (concluding that because the bylaw prohibiting building within 100 feet of a wetland was in effect at the time the landowner purchased the property at issue, the landowner's investment-backed expectations to build within 100 feet of a wetland was not reasonable).
205. *See, e.g.*, *FIC Homes of Blackstone, Inc.*, 673 N.E.2d at 71 (holding that a bylaw that prohibited building within 100 feet of a wetland was not a physical invasion of the plaintiff's property).
206. *See* Just v. Marinette Cnty., 201 N.W.2d 761,767-68, 3 ELR 20167 (1972).
207. *See* Meltz, *supra* note 137, at 29; *see also Just*, 201 N.W.2d at 768 (explaining that the state acting to "eradicate the present pollution and to prevent further pollution in its navigable waters . . . is not, in a legal sense, a gain or securing of a benefit by the maintaining of the natural *status quo* of the environment").
208. *See Just*, 201 N.W.2d at 768.
209. The harms shoreline armoring causes are increased pollution, more severe flooding and storms, economic effects on fisheries, and diminished tourism.

harm of losing public trust land and the ecosystem services associated with it as seas rise.[210]

Under these circumstances, when weighing the *Penn Central* factors, courts would likely conclude that the regulation does not cause a taking, especially in cases in which the state provided ample notice to landowners that they would not be allowed to erect bulkheads or develop on property that is likely to be inundated in the next century. Thus, states have the authority to take preemptive measures to address sea-level rise, and those efforts are unlikely to cause takings. However, many states have failed to take adequate action necessary to protect trust resources for future generations. The question, then, is whether states have a duty to take preemptive action to facilitate coastal wetland and beach migration.

IV. States' Duty to Protect Migrating Coastal Wetlands

Given scientific certainty that global climate change will cause sea levels to rise and the adverse effects of sea-level rise on coastal trust resources, the public trust doctrine not only gives states the authority, but may impose on them a duty, to take preemptive action to preserve trust resources for the benefit of current and future generations. Some statutes and cases declare that states have an affirmative duty to preserve trust resources for the benefit of present and future generations. Further, a state's role is that of a fiduciary, and courts have the authority to enforce states' fiduciary duties when the state fails to comply.[211]

A. *Imposing an Affirmative Duty on States to Preserve Trust Resources*

State constitutions, statutes, and cases often use broad language to explain the scope of states' duties under the public trust doctrine. As discussed below, many laws and cases describe the public trust as imposing an affirmative duty on states to protect trust resources, suggesting that states must take preemptive action if necessary to preserve resources. State statutes and cases also state that the beneficiaries of the trust include present and future generations, meaning that the states must preserve trust resources for the long term.[212] Additionally, in *Illinois Central*, the Supreme Court declared that a state may not abdicate its trust duties by permitting "substantial impairment" of trust resources.[213] These directives together impose a duty on states to take preemptive action to preserve trust resources when, absent state action, destruction is imminent.

1. A Duty to Preserve

States must take into account the public trust doctrine when making decisions that will affect trust resources.[214] Courts often use broad language explaining that states have an active or affirmative duty to preserve trust resources.[215] For example, the Wisconsin Supreme Court in *Just v. Marinette County* stated that under the public trust doctrine, the state's "active public trust duty . . . in respect to navigable waters requires the state not only to promote navigation but also to *protect and preserve* those waters for fishing, recreation, and scenic beauty."[216] The *Just* court explained that the state "under the trust doctrine has a duty to *eradicate* the present pollution and to *prevent* further pollution in its navigable waters. . . ."[217] This language implies that the state must affirmatively act to protect and prevent destruction of trust resources for the benefit of the public.

Some courts, including the Supreme Court, have gone a step further by declaring that states have a duty to pass laws to preserve trust resources. For example, in *Geer v. Connecticut*,[218] the Supreme Court stated that "it is the duty of the legislature *to enact such laws as will best preserve* the subject of the trust and secure its beneficial uses in the future to the people of the State."[219] This language seems to impose a duty on states to take action by passing laws to

210. Fischman, *supra* note 56, at 596-97:

> The permissible, non-compensatory regulation view would focus on the damage to public resources avoided by restricting the harmful practice of building a bulkhead. It would view a bulkhead prohibition not as imposing a flowage easement, but rather as preventing a property owner from diverting a naturally-formed body of water off of her property.

211. *See infra* Part IV.B.

212. *See* In re Water Use Permit Applications (*Waiahole Ditch*), 9 P.3d 409, 451 (Haw. 2000) ("[T]he state has a comparable duty to ensure the continued availability and existence of its water resources for present and future generations."); *see infra* Part IV.A.1.

213. *See infra* Part IV.A.2.

214. *See* National Audubon Soc'y v. Superior Court of Alpine Cnty. (*Mono Lake)*, 658 P.2d 709, 721, 13 ELR 20272 (Cal. 1983) (explaining that the state has a continuous supervisory duty over trust resources); Idaho Forest Indus., Inc. v. Hayden Lake Watershed Improvement Dist., 733 P.2d 733, 738 (Idaho 1987) ("The public trust doctrine is based upon common law equitable principles. That is, the administration of land subject to the public trust is governed by the same principles applicable to the administration of trusts in general."); Slocum v. Borough of Belmar, 569 A.2d 312, 316-17 (N.J. Super. Ct. Law Div. 1989) (explaining that the Borough of Belmar is a trustee over the public beach and, as trustee, it has a duty of loyalty, disclosure, and "to keep clear and adequate records").

215. *See* Illinois Cent. R.R. Co. v. Illinois, 146 U.S. 387, 453 (1892) (explaining that exercising the public trust "requires the government of the state to preserve such waters for the use of the public"); *Waiahole Ditch*, 9 P.3d at 465 ("[T]he Commission has an affirmative duty under the public trust to protect and promote instream trust uses."); United Plainsmen Ass'n v. North Dakota State Water Conservation Comm'n, 247 N.W.2d 457, 463, 7 ELR 20117 (N.D. 1976) ("The State has not only the right but also the affirmative fiduciary obligation to ensure that the rights of the public to a viable marine environment are protected, and to seek compensation for any diminution in that trust corpus.") (quoting State v. Jersey Cent. Power & Light Co., 308 A.2d 671, 674, 3 ELR 20840 (N.J. Super. Ct. 1973).

216. Just v. Marinette Cnty., 201 N.W.2d 761, 768, 3 ELR 20167 (Wis. 1972) (emphasis added). The court affirmed the lower court's conclusion that an ordinance requiring a permit to fill wetlands in a conservancy district did not cause a compensable taking. *Id.* at 772.

217. *Id.* at 768 (emphasis added).

218. 161 U.S. 519 (1896), *partially overruled by* Hughes v. Oklahoma, 441 U.S. 322, 9 ELR 20360 (1979).

219. *Id.* at 534 (quoting Magner v. People, 97 Ill. 320, 334 (1881) (emphasis added)). The Supreme Court ruled that a Connecticut law prohibiting the transport of game killed in Connecticut out of state was a lawful exercise of the state's public trust duties. *Id.* at 532.

preserve trust resources even in the absence of affirmative state action.[220]

The language in these cases arose from situations in which the state had taken some action, either to protect a trust resource[221] or to destroy or damage the resource.[222] In either case, the state had already taken action and went to court to defend its action against a challenger. Courts are less receptive to forcing a state to take action to preserve trust resources when the state takes no action in the first place.[223] Courts have not yet interpreted the language from the cases that seemingly mandate that the state has an affirmative duty to preserve trust resources to impose on states a duty to take preemptive action to prevent destruction of trust resources. However, given the forecasted adverse ecological effects of sea-level rise, courts should interpret this broad preservation language to impose on states an active duty to take preemptive action to protect coastal trust resources to meet the societal need to address sea-level rise.

State constitutions[224] and statutes[225] that include public trust language, and cases interpreting the doctrine, often state that the beneficiaries of the public trust include present and future generations. Including future generations as beneficiaries undoubtedly implies that trust resources will exist in such condition that future generations may benefit from the resources in much the same way current generations benefit.[226] By allowing shoreline armoring and development along much of the coast to destroy the uses enjoyed by present generations, the states abdicate their responsibility as trustees to preserve trust resources for the benefit of future generations.[227]

220. The definition of "preserve" is "to keep (something) safe from harm or loss" or "to keep (something) in its original state or in good condition." Merriam-Webster Dictionary, http://www.merriam-webster.com/dictionary/preserve (last visited Nov. 2, 2014). "To keep" is "to watch over and defend." Merriam-Webster Dictionary, http://www.merriam-webster.com/dictionary/keep (last visited Nov. 2, 2014). Courts describing the public trust doctrine as imposing an active duty to preserve trust resources necessarily suggest that states must take action to preserve the resources rather than having to consider its duties only when deciding whether to destroy trust resources on a case-by-case basis. The California Supreme Court concluded that, similar to the duty to preserve trust resources, the state has a continuous supervisory duty to oversee trust resources. National Audubon Soc'y v. Superior Court of Alpine Cnty. (*Mono Lake)*, 658 P.2d 709, 727-29, 13 ELR 20272 (Cal. 1983). In that case, the state had taken action by granting water use permits to the city of Los Angeles. *Id.* at 711. However, the time between the original action and the lawsuit was about 40 years. *Id.* at 711. In exercising its continuing supervision, the state is not necessarily reconsidering the validity of its original decision to allocate water, but is supervising the trust resource's condition today to determine whether the allocation is still consistent with the public trust doctrine. *See id.* at 728 ("The state . . . has the power to reconsider allocation decisions even though those decisions were made after due consideration of their effect on the public trust."). Logically, the state need not take explicit action while it is supervising the trust for it to be deemed to have abdicated its duties.

221. Landowners challenge state action protecting trust resources by asserting takings claims. *See, e.g.*, *Just*, 201 N.W.2d at 767.

222. *See, e.g.*, *Mono Lake*, 658 P.2d at 729 (concluding that the state "has the power to reconsider allocation decisions" especially when the initial decision to allocate "failed to weigh and consider public trust uses").

223. *See* McCleary v. State, 269 P.3d 227, 248 (Wash. 2012). ("The vast majority of constitutional provisions . . . are framed as negative restrictions on government action. With respect to those rights, the role of the court is to police the outer limits of government power. . . . This approach ultimately provides the wrong lens for analyzing positive constitutional rights, where the court is concerned not with whether the State has done too much, but with whether the state has done enough. Positive constitutional rights do not restrain government action; they require it.").

224. *See, e.g.*, Ala. Const. art. XI, §219.07 (establishing the Forever Wild Land Trust "to protect, manage, and enhance certain lands and waters" "to protect the natural heritage and diversity of Alabama for future generations"; recognizing "that this generation is a trustee of the environment for succeeding generations"); Haw. Const. art. XI, §1 ("For the benefit of present and future generations, the State and its political subdivisions shall conserve and protect Hawaii's natural beauty and all natural resources, including land, water, air, minerals and energy sources").

225. *See, e.g.*, Alaska Stat. §46.03.010(b) ("It is the policy of the state . . . to develop and manage the basic resources of water, land, and air to the end that the state may fulfill its responsibility as trustee of the environment for the present and future generations."); Fla. Stat. §258.36 ("It is the intent of the Legislature that the state-owned submerged lands in areas which have exceptional biological, aesthetic, and scientific value, as hereinafter described, be set aside forever as aquatic preserves or sanctuaries for the benefit of future generations."); Md. Code Ann., Nat. Res. §1-302 (West); N.Y. Envtl. Conserv. Law §1-0101 (McKinney) (declaring that the Environmental Conservation Law's purpose is to "fulfill [the state's] responsibility as trustee of the environment for the present and future generations"); Wis. Stat. Ann. §28.04(2)(a) (West) ("The department shall manage the state forests to benefit the present and future generations of residents of this state, recognizing that the state forests contribute to local and statewide economies and to a healthy natural environment.").

226. *See* Juan Antonio Oposa v. The Honorable Fulgencio S. Factoran Jr., G.R., No. 101083 (July 30, 1993) (Phil.) ("Needless to say, every generation has a responsibility to the next to preserve that rhythm and harmony for the full enjoyment of a balanced and healthful ecology."). As discussed above, the uses protected by the public trust doctrine have expanded over time as the needs of society change. A decrease in public interest in using beaches for recreational purposes and in coastal wetlands for ecological services seems unlikely. *See* Matthews v. Bay Head Improvement Ass'n, 471 A.2d 355, 364 (1984) ("Beaches are a unique resource and are irreplaceable. The public demand for beaches has increased with the growth of population."). In the case of coastal beaches, the state must ensure that coastal beaches exist to provide future generations with the benefits of fishing and recreation including sunbathing, swimming, and other associated activities. *See* Illinois Cent. R.R. Co. v. Illinois, 146 U.S. 387, 452 (1892); *Matthews*, 471 A.2d at 333-34 (deciding that "private land is not immune from a possible right of access to the foreshore for swimming or bathing purposes, nor is it immune from the possibility that some of the dry sand may be used by the public incidental to the right of bathing and swimming"). Likewise, states must ensure that wetlands are available to provide the ecological services that current generations enjoy. Even though only a few states have acknowledged that the public trust protects ecological services, as discussed herein the trust evolves with the changing needs of society. As global climate change causes more frequent and severe flooding and storms, future generations will be more reliant on coastal wetlands to buffer floods and storms. So, even though today wetlands are not considered a matter of "public concern" under the *Illinois Central* test in many states, they will be—or should be—in the future as humans become more reliant on the services provided by coastal wetlands. *See generally* Marks v. Whitney, 491 P.2d 374, 380, 2 ELR 20049 (Cal. 1971) ("One of the most important public uses of tidelands—a use encompassed within the tidelands trust—is the preservation of those lands in their natural state.").

227. A state abdicates its trust responsibilities in cases in which it allows shoreline armoring or development that destroys a public trust resource, whether or not the resource is on trust property. *See, e.g.*, Geer v. Connecticut, 161 U.S. 519, 529 (1896), *partially overruled by* Hughes v. Oklahoma, 441 U.S. 322, 9 ELR 20360 (1979) (explaining that the state holds game in "trust for the benefit of the people" regardless of whether the game is found on trust property). Given that coastal wetlands and beaches, like wildlife, are inherently mobile, the state must protect not only the land on which the resource is located today, but must also allow the resource to migrate to ensure its continued existence. *See* State v. Sour Mountain Realty, Inc., 276 A.D.2d 8, 15 (N.Y. App. Div. 2000) (requiring a landowner to remove a snake-proof fence from his property to allow an endangered rattlesnake to access habitat on the landowner's property).

2. *Illinois Central*'s "Substantial Impairment" Exception

When courts use broad language such as "[t]he state can no more abdicate its trust over property in which the whole people are interested . . . than it can abdicate its police powers in the administration of government,"[228] the question becomes: When does a state's failure to take action "abdicate its trust"? As explained in Part II.B., in *Illinois Central*, the Supreme Court stated that a state may not alienate trust property that "is a subject of public concern to the whole people of the state," with two exceptions.[229] The first exception is not relevant for this discussion.

Under the second exception, the state may convey a parcel only if the parcel "can be disposed of without any substantial impairment of the public interest in the lands and waters remaining."[230] The "substantial impairment" exception to the prohibition on alienation provides insight as to whether failure to act abdicates the state's trust duty. Courts have interpreted this exception to provide a standard for deciding whether states have met their fiduciary obligations under the public trust doctrine to preserve trust resources.[231] And the courts have expanded the public trust servitude to meet new public needs over time.[232]

Climate change is causing sea levels to rise, thus causing inland migration of coastal wetlands and beaches. Allowing landowners to armor shores or develop in areas likely to be inundated will damage or destroy those areas, effectively eliminating the trust uses of those resources. Historically, when sea levels were not rising, allowing some landowners—presumably those affected by normal erosion and storm surges or flooding—to destroy coastal resources may not have "substantially impaired" the public's interests because the inundation and erosion affected fewer riparian landowners. However, scientists project that sea levels will rise up to four feet in the next century, so the number of private landowners along the coasts interested in armoring shorelines or in developing areas likely to be eroded away or inundated will increase dramatically to include nearly all coastal landowners, along with inland landowners below the new sea level.[233]

Allowing all, or even most, of these landowners to armor the shoreline adjacent to their property or to develop it will likely "substantially impair" public trust interest in the remaining undeveloped shoreline.[234] The reason that armoring or developing shorelines will likely cause "substantial impairment" is because of the cumulative effects of hundreds or thousands of small decisions.[235] Much of the coastline has already been armored or developed. With less open shoreline available for public trust uses, the public has greater interest in preserving and using what is left for various uses, including recreational purposes and ecological services.[236]

Given the massive implications of sea-level rise and the length of shoreline that has already been armored or developed, states authorizing private landowners to armor or develop on more shoreline will probably "substantially impair" the public's interest in coastal beaches and wetlands. Consequently, when a state allows all or even most of the shoreline armoring and development requested by landowners, that state "abdicates its trust."[237] Therefore, the public trust mandates states take preemptive action to limit these activities.

B. The Courts' Role in Enforcing States' Fiduciary Duties

Traditional environmental laws tend to allow individuals to degrade natural resources, including water and air, so long as the individual has a permit. Given the administrative and statutory limitations of traditional environmental law, courts are often unable to order a remedy that is adequate to preserve the resource for future generations. The public trust doctrine gives courts more discretion in fashioning remedies. Although formulating an adequate remedy can be complicated, judges are well equipped to take on the

228. *Illinois Cent.*, 146 U.S. at 453.

229. *Id.* at 455-56. The Supreme Court concluded 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." *Id.* at 455.

230. *Id.* at 453.

231. *See, e.g.*, McQueen v. South Carolina Coastal Council, 580 S.E.2d 116, 119-20 (S.C. 2003) ("The State has the exclusive right to control land below the high water mark for the public benefit and cannot permit activity that substantially impairs the public interest in marine life, water quality, or public access.") (citations omitted); Esplanade Props., LLC v. City of Seattle, 307 F.3d 978, 985, 33 ELR 20056 (9th Cir. 2002) ("[T]he state may only divest itself of interests in the state's waters in a manner that does not substantially impair the public interest.").

232. *See* Orion Corp. v. State, 747 P.2d 1062, 1072-73, 18 ELR 20697 (Wash. 1987) (en banc) ("The trust's relationship to navigable waters and shorelands resulted not from a limitation, but rather from a recognition of where the public need lay. Recognizing modern science's ability to identify the public need, state courts have extended the doctrine beyond its navigational aspects.") (citations omitted).

233. *See generally* Titus et al., Envtl. Res. Letters, *supra* note 48 (examining the amount of coastline that has been developed or will likely be developed in the foreseeable future within one meter above the ordinary high watermark).

234. *See* Mackenzie S. Keith, *Judicial Protection for Beaches and Parks: The Public Trust Doctrine Above the High Water Mark*, 16 Hastings W.-Nw. N. Envtl. L. & Pol'y 165, 178, 178 n.86 (2010) (explaining that "upland beaches are a finite resource susceptible to private 'holdout' power" and that the "increasingly high demand for access to and use of unique upland beaches for recreational purposes . . . makes the finite nature of those lands particularly apparent").

235. *See* Wood, *supra* note 62, at 320.

236. This increase in interest is especially true given that public interest in ecological services will increase as a result of global climate change and the associated sea-level rise.

237. *See* Illinois Cent. R.R. Co. v. Illinois, 146 U.S. 387, 453 (1892). Some courts have concluded that the state alienates trust land when it expressly grants title to trust land, conveying *jus privatum*, and the land is no longer useful for trust purposes, making it no longer subject to the public trust (as in the case of armoring a shoreline or developing in areas likely to be inundated because the area no longer allows for public recreation or ecosystem services). In states where this rule is not in effect, the land that is no longer useful for trust purposes is still subject to *jus publicum*, but the land no longer provides public uses. Thus, the state alienated away the public's interest in the land.

challenge. However, potential litigants will likely discover that finding a judge who is willing to take the time and effort to order a specific remedy can be difficult.[238]

1. The Failures of Traditional Environmental Law

Traditional (statutory and regulatory) environmental law has utterly failed to adequately address many problems associated with human-caused environmental destruction.[239] Some environmental laws today essentially legalize damage to resources through permit schemes,[240] despite statutory goals to preserve or minimize destruction of natural resources.[241] Agencies typically have considerable discretion in implementing the statutes they administer and in deciding whether to issue permits for projects that will likely degrade the resource the statute was designed to protect.[242] Some agencies essentially act as a rubber stamp, approving most permit applications with little consideration of the environmental effects of the particular project.[243]

For example, the U.S. Army Corps of Engineers (the Corps) has the authority to issue local, regional, or nationwide general permits for the discharge of fill material into the waters of the United States, provided the project "will have only minimal cumulative adverse effect on the environment."[244] Although this requirement seems to impose on the Corps a duty to consider the environmental effects of each proposed project to ensure minimal adverse cumulative effect, the Corps' policy is to routinely issue permits to armor shorelines without assessing the cumulative environmental effects of the particular project standing alone, or in light of other armoring projects that have been implemented or will likely be approved in the future.[245] In reality, shoreline armoring has a cumulative effect on the environment because it prevents wetlands from migrating inland as seas rise.[246] Thus, some statutory and regulatory laws essentially legalize the destruction of natural resources with little consideration of the environmental effects that might affect the public's interest in natural resources.

Additionally, traditional environmental law has made protecting natural resources challenging for average citizens. First, environmental laws provide a legal means for destruction of the environment, so citizens may not bring a colorable claim in court against polluters by alleging that the polluter violated the public's right to a healthy, clean environment in cases in which the polluter complies with its permit conditions.[247] Second, environmental laws are nearly incomprehensible to the average citizen, making citizen enforcement of the law difficult, if not impossible, without a lawyer.[248] Third, citizens' success in lobbying for additional environmental protections depends upon their influence over political decisionmakers, and typically such influence requires an investment of substantial amounts of money and time.[249] These factors combine to make enforcing or influencing statutory and regulatory environmental laws extremely difficult for average citizens; accordingly, the general public is excluded both from the courts and the political process.

In cases in which citizens overcome the hurdles to get into court, they often lose because courts afford great discretion to agency actions under the statutory and regulatory environmental law framework.[250] As Professor Wood has explained, "the modern statutory era of environmental law in the United States postured courts in a way that caused them to retreat from their meaningful role."[251] The

238. *See* Wood, *supra* note 62, at 255-56.

239. Wood, *supra* note 130, at 172 ("Environmental lawyers and regulators are still doing things very much the same way they did things 30 years ago. If the natural devastation allowed by environmental law over the past 30 years is any indication, it is a system doomed to failure."); *see also* Wood, *supra* note 62, at 262.

240. Wood, *supra* note 130, at 172; *see, e.g.*, Federal Water Pollution Control Act, 33 U.S.C. §§1342, 1344 (2012) (allowing EPA or authorized states to issue §402 permits authorizing the discharge of pollutants from a point source into the waters of the United States and the U.S. Army Corps of Engineers (the Corps) to issue §404 permits authorizing the discharge of dredge and fill material into waters of the United States, including wetlands); Clean Air Act, 42 U.S.C. §7661c (2012) (authorizing EPA or authorized states to issue permits allowing facilities to discharge air pollutants).

241. *See, e.g.*, 33 U.S.C. §1251(a) ("The objective of this chapter is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."); 42 U.S.C. §7401(c) ("A primary goal of this chapter is to encourage or otherwise promote reasonable Federal, State, and local governmental actions, consistent with the provisions of this chapter, for pollution prevention.").

242. Wood, *supra* note 130, at 172.

243. *See* Wetlands: An Overview, *supra* note 37, at 8 (explaining that the Corps evaluates about 85,000 permits every year, and that it authorizes more than 90% under a general nationwide or regional permit; the Corps denies less than 0.3% of permits, and landowners withdraw about 5% of permit applications prior to the final decision); *see also* David Sunding & David Zilberman, *The Economics of Environmental Regulation by Licensing: An Assessment of Recent Changes to the Wetland Permitting Process*, 42 Nat. Resources J. 59, 73 (2002) ("Projects in our sample had an approval rate of over 90 percent, consistent with national figures.") (citing U.S. Army Corps of Engineers, Section 404 of the Clean Water Act and Wetlands: Special Statistical Report 5 (1995)).

244. 33 U.S.C. §1344(e) (2012). The Corps has jurisdiction over the waters of the United States, meaning that it has jurisdiction when fill will be placed below the ordinary high watermark of navigable waters. *See id.*

245. *See* Reissuance of Nationwide Permits, 72 Fed. Reg. 11092, 11183 (2007) (finding that shoreline armoring will not have a cumulative effect as long as the project is less than 500 feet in length); Titus et al., Envtl. Res. Letters, *supra* note 48, at 2, 5. The Corps based its conclusion that projects less than 500 feet in length would have minimal cumulative effects by assuming "that building a shore protection structure threatens an area of habitat equal to the footprint of the construction, but that no additional habitat is lost over time." *Id.* at 5.

246. Titus et al., Envtl. Res. Letters, *supra* note 48, at 5. This study argued that the Corps should reconsider its finding and, in doing so, consider wetland migration as an effect on habitat when it assesses whether it will grant a permit. *Id.* ("Ignoring the habitat eventually lost by blocking wetland migration is unreasonable, in our view, because preventing the landward migration of aquatic habitat (wetlands, beaches, floodplains, and shallow waters) onto the land being protected is the main reason for shore protection.").

247. Wood, *supra* note 62, at 261-62 ("Egregious harms become defined as permissible and legitimate—indeed fully legalized—exploits.").

248. *Id.* at 273 (describing environmental laws as "disguised by acronyms and techno-jargon").

249. *See id.* at 272 ("Within a political framework, citizens must press for environmental protections by lobbying Congress, state legislatures, and state and federal agencies The success of this lobbying effort depends in large part on the political clout the citizen holds—which, in turn, may correlate with wealth.").

250. *See id.* at 235.

251. *Id.* at 230; *see also id.* at 236 ("As a practical reality, judicial deference leaves agencies nearly unsupervised.").

public trust doctrine affords a remedy for this problem because it requires judges to perform a more searching judicial inquiry, similar to the inquiry in private trust cases.[252]

Although judges may be unwilling to substitute their judgment for the judgment of the legislative or executive branches,[253] judicial review is necessary in the trust context to ensure that the state as trustee carries out the fiduciary duties imposed by the public trust doctrine.[254] The Arizona Court of Appeals has agreed, stating that "[j]udicial review of public trust dispensation complements the concept of a public trust. . . . Just as private trustees are judicially accountable to their beneficiaries for dispositions of the res, so the legislative and executive branches are judicially accountable for the dispositions of the public trust."[255] Using the private trust as the framework allows courts to confer some discretion on the state as trustee to carry out its fiduciary duties, but would also allow courts to order effective remedies against states that abrogate their trust duties.[256]

A searching judicial review in the context of the public trust doctrine is necessary because various institutional problems lead to policymakers making decisions when they have not adequately considered the general public's interests.[257] Particularly relevant to coastal management is the public choice theory.[258] As Prof. Michael C. Blumm has explained, under this theory "small, well-organized special interest groups exert a disproportionate influence on policymaking."[259] Thus, those groups with strong interest in the outcome of a decision are more likely to ensure that their views are heard by policymakers, while the diffuse public remains largely unrepresented.[260] Policymakers assume that the views most consistently presented represent the views of the general public, and consequently make policy based on those limited interests.[261]

In the case of restrictions on shoreline armoring and development, coastal landowners have acute economic interests in developing property in areas likely to be inundated in the next century or in armoring the shoreline to protect their property from rising seas.[262] In contrast, the public is disorganized and dispersed over large areas with less personal stake in what happens on the coast.[263] The public trust doctrine provides a remedy to this problem by ensuring that policymakers take into account the public's interests in trust resources, regardless of whether the public actively lobbies to promote those interests. Without searching judicial review and effective remedies, states are free to ignore the fiduciary duties imposed on them by the public trust doctrine.

The South Carolina Supreme Court engaged in a searching review of a proposed plan to armor almost 3,000 feet of the shoreline along the coast in *Kiawah Development Partners v. South Carolina Department of Health and Environmental Control*.[264] The project consisted of a plan to construct a 2,783-foot-long and 40-foot-wide bulkhead and revetment over "pristine tidelands" for the purpose of preventing erosion and allowing for residential development on the adjacent highlands.[265] The South Carolina Department of Health and Environmental Control (DHEC) denied all but 270 feet of the project—the approved length would protect an existing county park.[266] DHEC explained that it denied the majority of the project because the structure "would affect the ability of the inlet and the beach/dune system to migrate" and that the structure would "have long-range and cumulative effects on [sensitive areas] and on the general character of the area."[267] The developer challenged the denial of the majority of the permit in front of the administrative law court (ALC), which reversed DHEC's decision and granted the permit in its entirety.[268]

The South Carolina Supreme Court reversed the ALC and remanded.[269] The court first explained that "the basic premise undergirding our analysis must be the public trust doctrine"; accordingly, "the public's interest must be the lodestar which guides our legal analysis in regards to the State's tidelands."[270] The court concluded that the ALC erred in several ways. First, inconsistent with the South

252. *Id.* at 236.
253. *See, e.g.*, Citizens to Pres. Overton Park, Inc. v. Volpe, 401 U.S. 402, 416, 1 ELR 20110 (1971); Sierra Club v. U.S. Dep't of the Interior, 398 F. Supp. 284, 286, 5 ELR 20514 (N.D. Cal. 1975) ("[R]eviews of decisions of the executive branch—such as here requested—lie in the narrowest area of judicial review wherein the court must stop short of merely substituting its own judgment for that of the Secretary.").
254. *See* Arizona Ctr. for Law in Pub. Interest v. Hassell, 837 P.2d 158, 168, 23 ELR 20348 (Ariz. Ct. App. 1991) ("The check and balance of judicial review provides a level of protection against improvident dissipation of an irreplaceable res."). As is the case with private trusts, the state as trustee for the public has fiduciary duties under the public trust doctrine. *See, e.g.*, Defenders of Wildlife v. Hull, 18 P.3d 722, 729 (Ariz. Ct. App. 2001) (explaining that the state has a fiduciary duty to the public in managing trust resources); Arno v. Commonwealth, 931 N.E.2d 1, 14 (Mass. 2010) ("These constraints on the Legislature's authority reflect its role not as an owner but as a fiduciary for the public"); Lawrence v. Clark Cnty., 254 P.3d 606, 612-13 (Nev. 2011) (adopting the public trust doctrine and explaining "the Legislature has the power only to act as a fiduciary of the public in its administration of trust property").
255. *Arizona Ctr. for Law*, 837 P.2d at 168 (internal citations omitted).
256. *See* Wood, *supra* note 62, at 237 ("Trustees must adhere to a panoply of duties, all vitally important to the beneficiaries. If any one of these duties cannot be enforceable in court, it ceases to be a trust duty.").
257. *See id.* at 236. Institutional problems include agency capture and conflicts of interests.
258. *See generally* Michael C. Blumm, *Public Choice Theory and the Public Lands: Why "Multiple Use" Failed*, 18 Harv. Envtl. L. Rev. 405, 407 (1994).
259. *Id.*
260. *See id.* at 422.
261. *See id.*
262. *See generally id.* at 407-08, 422 (explaining that the public choice theory "predict[s] that those who have an immediate economic stake in a particular outcome will be more willing to pay for political influence").
263. For example, a South Carolina resident living in the western part of the state has an interest in recreation, aesthetic beauty, or in the ecological services provided by the beaches and coastal wetlands, but those interests are highly attenuated compared to the interests of property owners hoping to protect their property from flooding.
264. 766 S.E.2d 707 (S.C. 2014).
265. *Id.* at 711.
266. *Id.*
267. *Id.* at 713.
268. *Id.*
269. *Id.* at 711.
270. *Id.* at 715.

Carolina's Coastal Zone Management Act (CZMA),[271] which codifies aspects of the public trust doctrine, the ALC made no finding that the project would benefit the public.[272] The court explained that only the developer, and not the public, would benefit from the armoring project.[273] In fact, the court concluded that "there is often great value in allowing nature to take its course, rather than having our coast become an armored, artificial landscape."[274] Moreover, because the CZMA encourages the preservation of natural processes, the court concluded that the ALC erred by considering only alternatives that would stabilize the eroding tideland.[275] The court explained that under the CZMA, the ALC must consider a "no action alternative" that "would permit[ ] natural processes to continue. . . ."[276] Thus, the ALC erred in concluding that the CZMA was satisfied.[277]

The court also held that the ALC erred in its conclusion that Regulation 30-12(C) (which codifies the public trust doctrine's public access requirements) was satisfied.[278] The regulation requires balancing environmental against economic concerns, and public access rights against the private landowner's need for the armoring.[279] The court explained that the ALC's conclusion that the project will have no adverse effect on public access was erroneous because the ALC concluded, contrary to the evidence presented—that over 2.5 acres of beach that members of the public use regularly would be covered with concrete—that "there would be no substantial adverse effect on public access."[280] The court concluded that the project would have an adverse effect on public access because, if the project was permitted, members of the public would not be able to walk along or land a boat on the beach as they had been able to in the past.[281] Accordingly, the court remanded to the ALC for further consideration consistent with its opinion.[282]

As *Kiawah Development Partners* illustrates, the public trust doctrine injects public interests into the trustee's decisionmaking process. The courts' role is to ensure that the trustee considers the public's interest in the balancing when it decides whether to approve or deny a project that will adversely affect a trust resource. Where the trustee does not adequately consider the public's interests, the rights afforded to the public by the public trust are meaningless absent effective judicial oversight. Thus, judges must formulate effective judicial remedies to ensure that states uphold their trust duties.

2. Judicial Remedies for State Inaction

Although judges are hesitant to force states to act in cases of state inaction,[283] in the public trust context, effective judicial remedies are necessary to ensure that states comply with their fiduciary duty to preserve trust resources for the benefit of the public.[284] Importantly, the majority of cases in which plaintiffs have requested the court to declare the atmosphere to be a trust resource and to impose specific duties on states to protect the atmosphere have been dismissed for various reasons.[285] However, a court remedy forcing the state to take action is especially important where, absent state intervention, global climate change will cause the destruction of trust resources.[286] Courts have various tools at their disposal that would force states to adhere to their fiduciary duties without the court overstepping its institutional role as interpreter of the law.[287]

271. S.C. Code Ann. §§48-39-10 et seq. (2014).
272. *Kiawah Dev. Partners*, 766 S.E.2d at 716.
273. *Id.*
274. *Id.* at 716-17.
275. *Id.* at 723.
276. *Id.*
277. *Id.* at 716-17. The court explained that the ALC incorrectly concluded that "erosion has no positive benefit for anyone." *Id.* This conclusion was wrong, the court explained, because the CZMA gives priority to natural systems. S.C. Code Ann. §48-39-30 (2014). "Thus, the CZMA provides that it is to the public's benefit to protect natural processes like the cyclical erosion, breach, and accretion process. . . ." *Kiawah Dev. Partners*, 766 S.E.2d at 716.
278. *Kiawah Dev. Partners*, 766 S.E.2d at 720. Regulation 30-12(C)(d) provides: "Bulkheads and revetments will be prohibited where public access is adversely affected unless no feasible alternative exists." S.C. Code Ann. Regs. 30-12(C).
279. *Kiawah Dev. Partners*, 766 S.E.2d at 721.
280. *Id.* at 722.
281. *Id.*
282. *Id.* at 723.
283. *See* Kanuk ex rel. Kanuk v. State Dep't of Natural Res., 335 P.3d 1088, 1099 (Alaska 2014) (explaining that the court would not declare "that the State's duty to protect the atmosphere is 'dictated by best available science'" because "[t]he limited institutional role of the judiciary supports a conclusion that the science- and policy-based inquiry here is better reserved for executive-branch agencies or the legislature").
284. *See supra* Part IV.B.1.
285. *See, e.g.*, Alec L. v. Jackson, 863 F. Supp. 2d 11, 16-17, 42 ELR 20115 (D.D.C. 2012) (stating that the determination of whether "current levels of carbon dioxide are too high" and whether the state violated its fiduciary duties are "determinations that are best left to the federal agencies that are better equipped, and that have a Congressional mandate, to serve as the 'primary regulator of greenhouse gas emissions'") (quoting American Elec. Power Co. v. Connecticut, 131 S. Ct. 2527, 2539, 41 ELR 20210 (2011)); *Kanuk*, 335 P.3d at 1099 (affirming the lower court's dismissal of the plaintiffs' claims that the state has a duty to protect the atmosphere as a trust resource and that the best available science requires the state to annually reduce by 6% the state's carbon emissions because the claims are nonjusticiable; also dismissing on prudential grounds claims for declaratory relief that the atmosphere is a trust resource and that the state has a fiduciary duty to protect it); Sanders-Reed v. Martinez, 350 P.3d 1221, 1227 (N.M. Ct. App. 2015) (affirming the lower court's grant of summary judgment in favor of the state because "where the State has a duty to protect the atmosphere under . . . the New Mexico Constitution, the courts cannot independently regulate greenhouse gas emissions in the atmosphere as Plaintiffs have proposed, based solely upon a common law duty established under the public trust doctrine as a separate cause of action"). *But see* Chernaik v. Kitzhaber, 328 P.3d 799, 808 (Or. Ct. App. 2014) (remanding to the lower court because
> plaintiffs are entitled to a judicial declaration of whether, as they allege, the atmosphere is a trust resource that the State of Oregon, as a trustee, has a fiduciary obligation to protect from the impacts of climate change, and whether the other natural resources identified in plaintiffs' complaint also are trust resources that the state has a fiduciary obligation to protect. The answers to those questions necessarily will inform the court's determination whether plaintiffs are entitled to any of the other relief they request.

(internal quotations omitted).
286. With global climate change, the state is not directly causing the destruction of resources, but the state acquiesces in their destruction by allowing business to go on as usual. In the case of coastal development and shoreline armoring, rising seas will destroy coastal wetlands and beaches absent state intervention to prohibit development and armoring.
287. *See* Wood, *supra* note 62, at 240 (including structural injunctions and legislative or agency remands).

a. Structural Injunctions

Courts could order a structural injunction. Professor Wood has described structural injunctions as "system-wide, macro-scale remedies . . . to address mismanagement on a systemic level."[288] Courts typically would order structural injunctions in cases in which a state's failure to address the destruction of trust resources extends across several governmental bodies and where an adequate remedy requires those bodies to take specific actions.[289] Courts have also ordered structural injunctions against defendants who failed to comply with previous court orders.[290] The New York Appellate Court in *Ackerman v. Steisel*[291] reversed the lower court and ordered a structural injunction after the city failed to comply with an earlier court order to remove equipment the town was storing in a park.[292] The court concluded that the park was a trust resource and ordered the city to remove all equipment, fences, and structures within 90 days.[293] The injunction ordered the city to perform a specific action within a specified amount of time. However, U.S. judges seem wary of ordering structural injunctions in the public trust context.

Courts in other countries have been more willing to order structural injunctions in the public trust context.[294] For example, the Supreme Court of the Philippines, in *Metropolitan Manila Development Authority v. Concerned Residents of Manila Bay*,[295] issued a structural injunction forcing several agencies to perform specific duties to restore Manila Bay. The court ordered the agencies to "rehabilitate and preserve Manila Bay," restock fish to the bay, and construct a sewage plant within one year.[296] Structural injunctions are an effective way for courts to ensure that the state takes action to preserve trust resources when it has refused to do so in the past. This remedy requires judges to make complex decisions, often based on scientific studies.[297] In public trust cases, structural injunctive relief is appropriate because many states have shirked their fiduciary duties to the public for years and are unlikely to change absent a court order detailing specific obligations.[298]

b. Declaratory Judgment and Legislative Remand

Courts also have the option of issuing a declaratory judgment and remanding the case to the state.[299] A court granting declaratory relief describes the state's obligations under the public trust doctrine.[300] Explicitly defining the state's specific obligations toward the beneficiaries limits states' discretion, but also allows the state to decide which particular actions are necessary to meet its obligations as trustee.[301]

In a series of cases, the *Redwood Trilogy*,[302] the Northern District of California found that the U.S. Department of the Interior (DOI) "refused and neglected to take steps to exercise and perform its duties" to protect Redwood National Park[303] from damage caused by logging activities on privately owned land surrounding the park.[304] The court entered declaratory judgment and essentially remanded to DOI, requiring it to "take reasonable steps within a reasonable time to exercise the powers vested in [it] by law and perform the duties imposed upon them by law . . . to afford as full protection as is reasonably possible. . . ."[305] Additionally, the court ordered DOI to take specific actions, including "acquisition of interest in land and/or execution of contracts or cooperative agreements with [surrounding landowners,] modification of the boundaries of the park," and lobbying Congress for more funding.[306] Thus, the

288. *Id.* at 247-48.

289. *See id.* For example, in *National Wildlife Fed'n v. National Marine Fisheries Serv.*, No. CV 01-640-RE, 2005 WL 2488447 (D. Or. Oct. 7, 2005), Judge James Redden issued a structural injunction when the National Marine Fisheries Service (NMFS) failed to take action to protect endangered salmon after, in an earlier case, he ordered NMFS to take specific actions within one year. *Id.* at *1. Specifically, Judge Redden ordered NMFS to file status reports every 90 days, to "make a jeopardy determination that complies with the requirements of the [Endangered Species Act]," and collaborate with interested sovereigns. *Id.* at **5-6.

290. *See, e.g.*, *National Wildlife Fed'n*, 2005 WL 2488447, at *1. For an in-depth analysis of Judge Redden's role in the salmon biological opinion cases, see Michael C. Blumm & Aurora Paulsen, *The Role of the Judge in ESA Implementation: District Judge James Redden and the Columbia Basin Salmon Saga*, 32 Stan. Envtl. L.J. 87 (2013) (describing Judge Redden as a "managerial judge" who "remained deferential to the government agencies throughout his decade of involvement with the case").

291. 104 A.D.2d 940 (N.Y. App. Div. 1984).

292. *Id.* at 941.

293. *Id.* at 942. The court ordered removal even though it concluded that the city had made reasonable efforts to find a new location to store the equipment but was unsuccessful in its attempts because of community opposition to each proposed location. *Id.* ("[C]ommunity opposition to proposed sites cannot stand as justification for remaining unlawfully in parkland protected by the public trust.").

294. *See, e.g.*, Waweru v. Republic, 1 K.L.R. 677 (2006) (Kenya) (relying on the public trust doctrine to issue a structural injunction ordering the government to build a sewage facility to prevent the local community from "discharg[ing] raw sewage into the Kisserian River").

295. 574 S.C.R.A. 661 (2008) (Phil.).

296. *Id.*

297. *See* Wood, *supra* note 62, at 248; *see also* Alec L. v. Jackson, 863 F. Supp. 2d 11, 16-17, 42 ELR 20115 (D.D.C. 2012) (stating that the determination of whether "current levels of carbon dioxide are too high" and whether the state violated its fiduciary duties are "determinations that are best left to the federal agencies that are better equipped, and that have a Congressional mandate, to serve as the 'primary regulator of greenhouse gas emissions'") (quoting American Elec. Power Co. v. Connecticut, 131 S. Ct. 2527, 2539, 41 ELR 20210 (2011)).

298. Wood, *supra* note 62, at 250.

299. *See id.* at 239-40, 248. For ease of reading, this Article refers to both legislative and agency remands as "legislative remand."

300. *See id.* at 248.

301. *See id.* ("Such parameters create the framework for a more detailed remedy by forming the sidewalls of expected behavior beyond which the parties cannot deviate without judicial retribution.").

302. The trilogy is *Sierra Club v. U.S. Dep't of the Interior*, 376 F. Supp. 90, 4 ELR 20444 (N.D. Cal. 1974); *Sierra Club v. U.S. Dep't of the Interior* (*Sierra Club II*), 398 F. Supp. 284, 5 ELR 20514 (N.D. Cal. 1975); and *Sierra Club v. U.S. Dep't of the Interior*, 424 F. Supp. 172, 6 ELR 20605 (N.D. Cal. 1976).

303. *Sierra Club II*, 398 F. Supp. at 293.

304. *Id.* at 286.

305. *Id.* at 294 (citations omitted).

306. *Id.* The court essentially ordered legislative remand when it ordered the agency to lobby Congress for more money because Congress would have to pass legislation to adequately protect the park. *See* Wood, *supra* note 62, at 238. Indeed, Congress passed such legislation authorizing DOI to purchase land surrounding the park. *See* Redwood Expansion Act of 1978, 92 Stat. 163 (1978) (codified at 16 U.S.C. §§79(a) et seq. (2012)).

court ordered the state to comply with specific directives by issuing declaratory relief and remanding.

In an atmospheric trust case, *Chernaik v. Kitzhaber*,[307] the Oregon Court of Appeals suggested that it would be willing to consider the idea that the public trust doctrine "imposes specific affirmative obligations on defendants" similar to those requested by the plaintiffs when they sought declaratory judgment.[308] The court explained that "ordering defendants to take the requested actions might not unduly burden the other branches of government or result in the judiciary impermissibly performing duties or making policy determinations that are reserved to those other branches."[309] The court remanded the case, and concluded that the plaintiffs were entitled to a declaration of whether the atmosphere is a trust resource and whether the state has a fiduciary duty to protect it.[310] According to the court, the answer to these questions will determine which specific remedies the court will order.[311]

Even though remedies imposing specific duties on states are difficult for judges to order because they might be scientifically complex and the judge will need to make educated judgments based on the information the parties present, courts are well equipped to take on this role.[312] Indeed, they already have done so in a variety of cases, including public trust cases.[313] To simplify the court's job, a court could order scientific studies as part of its declaratory judgment, which would give the court insight as to which remedy would be appropriate.[314] Given that states routinely authorize activities that degrade the environment, and that global climate change is destroying parts of the planet (particularly the coasts) while states do little or nothing to prevent the damage,[315] the courts have a duty to enforce the public trust.[316] Without adequate judicial enforcement and remedial measures, the public trust doctrine is a right without a remedy, which is no right at all.[317]

V. Conclusion

The public trust doctrine is an accommodation principle, requiring the state to preserve trust resources for present and future generations while accommodating private property rights.[318] Typically, when states balance private property rights against the public right to use and preserve coastal resources, the private property interest wins most times because of the immense pressure placed on states by private landowners to allow landowners to develop on and protect their property.[319] Given that most scientists agree that seas have been rising and will continue to rise as a result of climate change, states must reverse this trend of favoring private uses over public uses to ensure that coastal wetlands and beaches will continue to function as public trust resources. Failure to allow coastal wetlands and beaches to migrate inland will impose enormous ecological and economic costs on society.

States along the Atlantic Coast have designated only about 9% of land within one meter above the ordinary high watermark for conservation purposes. This 9% of coastal wetlands and beaches will migrate unimpeded as seas rise. The majority of what is left is either already developed (42%) or will likely be developed in the foreseeable future (15%). Thus, about 34% of coastal wetlands and beaches, if left as is, would likely migrate inland as seas rise. However, the future of this land is far from clear. Given that coastal populations continue to rise, which increases pressure to develop, this one-third of Atlantic coastal land could be developed and armored in the foreseeable future.

The Atlantic states' balancing of interests must take into account the number of people who would be affected by either a retreat or a defend policy.[320] With regard to the 42% that is already developed (at least for the land that is already heavily developed and populated), the balance most likely weighs in favor of allowing development to continue and allowing property owners to armor the shoreline to protect life and property from flooding.

The balance is closer when weighing the competing interests in the 15% of coastal land that will likely be developed in the future. The public interest might outweigh the private interest because the lands have not yet been developed, although the government might be liable

307. 328 P.3d 799 (Or. Ct. App. 2014).
308. *Id.* at 808.
309. *Id.* However, the court did not reach this issue because the parties had not yet litigated that question. *Id.* The court reversed and remanded stating that the "plaintiffs are entitled to judicial declaration of whether . . . the atmosphere is a trust resource." *Id. But see* Alec L. v. Jackson, 863 F. Supp. 2d 11, 16-17, 42 ELR 20115 (D.D.C. 2012) (concluding that scientific determinations of whether the atmosphere has too much carbon dioxide such that the state violated its fiduciary duty to protect the atmosphere are better left to the other branches of government).
310. *Id.* (remanding to the trial court to make these determinations in the first instance).
311. *Id.*
312. *See* Wood, *supra* note 62, at 255 ("[C]ourts remain both well situated and fully obligated to prevent environmental agencies from mismanaging public trust assets.").
313. *See supra* Part IV.B.2.; *see also* Coleman v. Schwarzenegger, 922 F. Supp. 2d 882, 962 (N.D. Cal. 2009) (concluding that the average of the plaintiff and defendants' estimates of the prison capacity would "provide the relief from overcrowding necessary for the state to correct the constitutional violations" and "order[ing] defendants to reduce the prisoner population to 137.5% of the adult institutions' total design capacity").
314. One could argue that the court should simply order the scientific study and let the state determine which remedy is most appropriate based on the study's results. However, given that many states have ignored the public's interests in trust resources during its decisionmaking process, merely ordering the state to perform a scientific study will not necessarily cause the state to take action based on the study. The court should provide guidance to the state as to what the law requires.
315. *See supra* Part III.B.
316. *See* Wood, *supra* note 62, at 255.
317. *See* Adam Patrick Murray, *Alaska's Atmospheric Public Trust: A Right Without a Remedy?*, EcoPerspectives Blog, Vt. J. Envtl. L., http://vjel.vermontlaw.edu/alaskas-atmospheric-public-trust-right-without-remedy/ (last visited Dec. 2, 2014).
318. *See* Blumm, *supra* note 24, at 666 (explaining that the public trust doctrine is an accommodation principle, which means that states must engage in a "balancing of public and private rights in fulfilling the trust responsibility").
319. As explained in Part IV.B.1., the Corps approves most permits to fill wetlands and states, much of the shoreline is already filled, and states' laws regulating coastal development and shoreline armoring are limited and inadequate to protect coastal resources.
320. *See* Titus, *supra* note 72, at 1389 ("Regardless of what old cases and statutes say, would a court really resurrect an ancient common law doctrine in order to allow the government to evict people from their homes?").

for takings claims for those landowners whose reasonable investment-backed expectations had time to crystalize. In this case, a state could either prohibit all development and shoreline armoring[321] or implement a rolling easement allowing development now, but prohibiting shoreline armoring, then requiring property owners to retreat as the land is inundated or eroded away.[322] Finally, the balance weighs in favor of public rights regarding the 34% of land with no current plans for development. States could implement a total ban on development and shoreline armoring in those areas and most likely would not be subject to takings claims.[323]

Coastal states must act to make these policy decisions sooner rather than later,[324] because states have a fiduciary duty to preserve trust resources for the benefit of present and future generations.[325] Failure to do so will cause trust resources to be destroyed, a loss for which the state could be held liable.

321. This type of regulation is probably most feasible in cases where the state owns the land, landowners have not yet developed the land, or restrictions are already in place prohibiting development—because without adequate notice, the state could be liable for taking without just compensation. *See supra* Part III.C.

322. This type of regulation is less likely to be a taking than a prohibition on development, but could still be subject to takings claims if the state gave landowners reason to believe that they had a right to develop.

323. *See* Titus et al., Envtl. Res. Letters, *supra* note 48, at 6.

324. *See id.* ("Ensuring that some of these lands are abandoned to a rising sea so that ecosystems can adjust would face economic, political, and legal challenges; but defending the entire coast seems even more difficult in the long run.").

325. Waiting too long will cause more destruction of coastal wetlands and beaches because more people will move to the coasts, buy property, expect to develop on that property, and expect that they will have the right to armor the shoreline to protect their investments. *See* Fischman, *supra* note 56, at 595. ("The sooner a bulkhead ban is enacted, the less the cost to the landowner and the greater the time available for adjustment of investment-backed expectations. A bulkhead ban passing constitutional muster today might fail if it were enacted at a later time when sea level rise is imminent.").