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GLOBAL WARMING AND PROPERTY INTERESTS: PRESERVING COASTAL WETLANDS AS SEA LEVELS RISE

Robert L. Fischman*

INTRODUCTION

This article explores an example of the challenge that global warming presents to American property law. It examines how law might keep pace with changing expectations about the stability and permanence of both natural systems and property interests. Over the past decade, coastal area managers and environmentalists have intensified their efforts to slow the draining, filling and development that are primarily responsible for coastal marsh destruction. These efforts are based on a heightened awareness of the value of wetlands ecosystems. However, a new threat to coastal wetlands looms on the hori-

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1. J. KUSLER, OUR NATIONAL WETLAND HERITAGE 6 (1983) [hereinafter J. KUSLER]. See, e.g., Maryland Chesapeake Bay Critical Area Protection Program, Nat. Res. § 8-1801 (prohibiting construction within 1000 feet of a wetland); ME. REV. STAT. ANN. tit. 38, § 480-B (setting strict standards for issuing construction permits along marine beach systems, which include wetlands); Louisiana Wetlands Conservation and Restoration Authority, 2d Spec. Sess., La. Acts 6 (establishing authority to develop and implement plans to conserve, restore, and enhance coastal wetlands).

2. Coastal wetlands comprise less than 5% of the 99 million acres of total wetlands in the contiguous United States. Tiner, Wetlands of the United States: Current Status and Recent Trends, 28-29 (U.S. Fish and Wildlife Service, 1984); U.S. ENVIRONMENTAL PROTECTION AGENCY, AMERICA'S WETLANDS: OUR VITAL LINK BETWEEN LAND AND WATER 12 (1990). Today, less than half of the United States' initial stock of coastal wetlands remains. Tiner at 36-37. A transition zone that is both land and sea, these sheltered waters provide habitat for fish, shellfish and waterfowl, protection from erosion and storm surges, and pollution control. J. KUSLER, supra note 1, at 7. The lure of the ocean draws people to the coast and pressure to build residential housing, resorts and marinas is growing rapidly. Tiner at 36-37. See also T. CULLITON, M. WARREN, T. GOODSPEED, D. REMER, C. BLACKWELL & J. MCDONOUGH,
zon that, ironically, could make futile all of the current protection efforts that limit draining and filling. Coastal wetlands may drown under rising seas.

Atmospheric models predict, and some evidence suggests, that the surge of carbon dioxide and other trace gases released into the atmosphere over the last century will contribute to a warming of the Earth's climate. However, uncertainty exists over how significant the warming will be and over what period of time warming will occur. As the Earth's temperature increases, sea levels will rise due to thermal expansion of water and melting of glacial and polar ice.

Existing coastal wetlands, which are flooded periodically by tides, will be inundated by the sea under the standard global warming scenario. Under natural conditions, as seas rise, some coastal marshes can migrate landward and maintain a constant vegetated edge between fastland and open coastal waters. Figure 1 shows how

III, FIFTY YEARS OF POPULATION CHANGE ALONG THE NATION'S COASTS: 1960-2010 (1990) (predicting a 60% increase in coastal population from 1960 to 2010).


4. See Jones, supra note 3, at 91.

5. See IPCC, supra note 3 (predicting a 10-30 cm rise over the next four decades); MacDonald, Scientific Basis for the Greenhouse Effect, in AGRICULTURAL, FORESTRY, AND GLOBAL CLIMATE CHANGE - A READER 76 (1989) (predicting a rise of at least one meter over the next century).

There is some dispute over the effects of global warming on the ice caps that adds yet another layer of uncertainty on making policy to deal with climate change issues. See the debate over whether the Greenland ice sheet is thickening between Zwally, Growth of Greenland Ice Sheet: Interpretation, 246 SCI. 1589 (Dec. 1989) and Douglas, et al., Greenland Ice Sheet: Is It Growing or Shrinking?, 248 SCI. 288 (April 1990).

6. The process of wetlands migration under natural conditions generally involves both migration to adjacent fastland as well as vertical growth through deposition of sediment and organic material.

It is important to note that sea level rise due to global warming will occur more rapidly than sea level fluctuations in the past. Therefore, coastal wetlands that maintained their areas in the past may not keep pace with current rising waters and will narrow. In some cases, depending on the slope of the shoreline profile, the wetlands may not be able to migrate at all. The description of coastal wetlands response to sea level rise is developed from: GREENHOUSE EFFECT, SEA LEVEL RISE AND COASTAL WETLANDS (J.G. Titus ed. 1988);
FIGURE 1. Evolution of a marsh as sea level rises. Coastal marshes have kept pace with the slow rate of sea level rise that has characterized the last several thousand years. Thus, the area of marsh has expanded over time as new lands were inundated. If, in the future, sea level rises faster than the ability of the marsh to keep pace, the marsh area will contract. Construction of bulkheads to protect economic development may prevent new marsh from forming and result in a total loss of marsh in some areas.

GREENHOUSE EFFECT AND SEA LEVEL RISE: A CHALLENGE FOR THIS GENERATION (M.C. Barth & J.G. Titus eds. 1984); Kearney & Stevenson, Sea Level Rise and Marsh Vertical Accretion Rates in Chesapeake Bay, in COASTAL ZONE '85 (O.T. Magoon, et al. eds. 1985); NATIONAL RESEARCH COUNCIL, RESPONDING TO SEA LEVEL (1987).

7. This figure is taken from Titus, Greenhouse Effect, Sea Level Rise, and Coastal Zone Management, 14 COASTAL ZONE MGMT J. 147, 157 (1986).
coastal wetlands can retreat with a moving shoreline if there is vacant upland. However, in many places along the United States coast, property owners have developed the area needed to support new “migrant” wetlands into uses that require dry land. To protect their investments, landowners may erect bulkheads to keep the rising waters out. As Figure 1 (D) shows, bulkheads create walls that will prevent wetlands from migrating. Restrictions on the development of existing coastal marshes will fail to achieve long-term wetland protection if sea levels rise and landowners upland of the marshes build bulkheads. Policies that discourage or forbid landowners from erecting seawalls will reduce the amount of wetlands loss.6 The central tension between the interests of landowners to maintain the dry character of their upland and the interests of the public to maintain a vegetated margin between sea and land will strain regulatory agencies and the courts.

This central tension can be viewed through the lens developed by Professor Michelman more than two decades ago.9 In Michelman’s analysis, just compensation of landowners focuses on the disruption of the security of property interests.10 A private landowner just upland of an existing marsh may experience some demoralization from dashed expectations about what actions she may take as the tide encroaches on her land. The case for compensation of economic loss from a bulkhead prohibition, however, is weakened if the landowner has early warning to adjust future expectations before they crystallize.

Professor Sax’s treatment of the public trust doctrine complements

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8. The Environmental Protection Agency estimates that even if no bulkheads were built to protect dry upland, a 50 cm rise in sea level would result in a 17-43% loss of coastal wetlands. The same rise would result in a 38-61% loss of wetlands if all dryland were protected by bulkheads. U.S. ENVIRONMENTAL PROTECTION AGENCY, supra note 3 (For a 100 cm rise in sea level, coastal wetland loss is estimated at 26-66% if no bulkheads exist and 50-82% if bulkheads are built.). These estimates of area of wetlands loss are deceptive in that many of the functions served by coastal marshes depend on shoreline length of wetland rather than area. For fisheries in particular, small differences in area lost could result in drastic ecological changes if the differences are accounted for by complete loss of shoreline coverage in some regions. Titus, Greenhouse Effect and Coastal Wetland Policies: How Americans Could Abandon an Area the Size of Massachusetts at Minimum Cost, 15 ENVTL MGMT 39 (Jan./Feb. 1991) (hereinafter Titus). See M.V. REID & M.C. TREXLER, DROWNING THE NATIONAL HERITAGE: CLIMATE CHANGE AND U.S. COASTAL BIOLOGICAL DIVERSITY (1991) (describing the adverse effects of sea level rise on coastal ecology).


10. Id. at 1166-68.
this perspective by focusing on preventing destabilizing disappointment of expectations held in common. These expectations generally include the right to enjoy the coast and the environmental benefits it sustains. Passage must be cleared for the geographic movements of coastal wetlands induced by global warming if the public rights to marsh use are to be maintained.

This article grapples with one of the most vexing results of climate change by examining the law embodied in these public and private perspectives of expectations: (1) just compensation, as required by the fifth amendment and (2) the public trust doctrine. Part I reviews possible policy approaches to address the wetlands migration problem. An effective government response will account for the uncertainty and take advantage of the advance warning of sea level rise. The next two parts consider strategies to restrict private bulkheading that are economically efficient, not costly to the government and raise serious legal concerns. Part II discusses the implications of shoreline changes for the public trust doctrine. The public trust may allow or even impose a duty on governments to act to facilitate wetlands migration. Part III applies takings law and lays out the fifth amendment boundaries for restricting bulkheads without compensation. The application of these two areas of law to the problem of coastal wetlands protection and sea level rise highlights the challenges to traditional property interests that global climate change will bring.

The article concludes by returning to the central tension between concentrated private expectations and diffuse public expectations. Concern over the continuing viability of coastal ecosystems is only one of many policy problems that will press the government, including the courts, to balance fairly competing interests. Global warming will stretch conventional notions of stability and natural change. The climate change debate continues to flourish in scientific journals, but enough is understood to call for an early response from government. Indeed, an early response will help clarify the expectations that are at the heart of property law. In the case of coastal wetland protection, early action will result in more marsh migration at less cost with the least disruption of settled property interests.

I. POLICY OPTIONS FOR PROTECTING “MIGRANT” WETLANDS

The probability of global warming over the next century and the resultant rise in sea levels present policy-makers and coastal managers with a novel problem. Instead of preserving an existing wetland that faces an imminent threat, these decision-makers must now contemplate protecting a potential new wetland from a future threat. The characteristic uncertainty and remoteness in time of events that will affect the viability of coastal wetlands during sea level rise may require unconventional responses.

In an article describing the policy problem, the Environmental Protection Agency’s James Titus characterizes three approaches to facilitate coastal wetland migration: (1) prevent development; (2) do nothing now; or (3) condition development on an agreement not to protect the property from rising seas. The first category consists of policies to prevent development in areas likely to be inundated. This can be accomplished through the purchase of property rights or regulation.

In some parts of the United States, relative sea level rise due to subsidence, reduction of sedimentation, or erosion makes the problem of coastal wetland migration considerably more certain and immediate. For example, Louisiana, which has one third of all the coastal wetlands in the lower 48 states, is losing its coastal marshes at a rate of 25,000 acres per year. The loss is due to a variety of factors, including subsidence from extraction of oil, gas and groundwater; tectonic subsidence; and channelization and dredging of the Mississippi River by the Army Corps of Engineers. See, e.g., Caron, When Law Makes Climate Change Worse: Rethinking the Law of Baselines in Light of a Rising Sea Level, 17 ECOLOGY L.Q. 741 (1990); Lang, Is the Ozone Depletion Regime a Model for an Emerging Regime on Global Warming?, 9 UCLA J. ENVTL L. & POL’Y 161 (1991); Menefee, “Half Seas Over”: The Impact of Sea Level Rise on International Law & Policy, 9 UCLA J. ENVTL L. & POL’Y 175 (1991); Stone, The Global Warming Crisis, If There Is One, and the Law, 5 AM. U.J. INT’L L. & POL’Y 497 (1990); Zasuke & Cameron, Global Warming and Climate Change — An Overview of the International Legal Process, 5 AM. U.J. INT’L L. & POL’Y 249 (1990).

In addition to the thoughtful articles by Sax and Titus, supra note 8, domestic policy responses to sea level rise are discussed in: Ausubel, A Second Look at the Impacts of Climate Change, 79 AM. SCIENTIST 210 (1991); NATIONAL ACADEMY OF SCIENCES, POLICY IMPLICATIONS OF GREENHOUSE WARMING (1991); M.V. REID & M.C. TREXLER, supra note 8.

for the owner to protect his investment by constructing a bulkhead as the sea level rises. A regulatory scheme that forbids development, however, may be both financially and politically costly to governments. The financial costs may be shifted to the government if the courts require compensation for the lost value of the property. If the government is not required to compensate affected landowners, the political costs to officials of decisions that reduce the value of constituents' property are likely to be high. This is particularly true in the case of coastal wetlands protection where the burdens are borne by a small group of citizens and the benefits are diffused throughout society.

Moreover, developed residential use of fastland before inundation would do little harm to subsequent migration. Prohibiting current economic use of uplands results in a loss of whatever value would be created by development, with little benefit to future wetlands. Another weakness of the development ban strategy is that it does nothing to allow wetlands migration in areas with existing upland development.

Governments often do nothing until a crisis motivates action. The second category of responses allows development on private property without intervention now, but requires abandonment when wetlands begin to encroach. However, the "do nothing now" strategy merely postpones the difficult political and financial decisions surrounding coastal wetlands viability. The longer governments wait, the more development will occur and the greater stake landowners will have in protecting property with bulkheads. The "do nothing now" approach is, in essence, a gamble against the odds that the Earth's climate will warm.

The third strategy, to allow development on the condition that property will not be protected from rising seas, is the most reasonable from an economic perspective. Titus proposes two methods for

17. Most residential development, if abandoned when inundated, would decay and not impede the migration of wetlands. At some level of intensity, however, durable structures and the pollution associated with development might create problems for migration. Titus, supra note 8, at 55.

18. See id. at 57.

19. Approximately one seventh of the east and gulf coasts are developed. Titus, et al., Greenhouse Effect and Sea Level Rise: Potential Loss of Land and the Cost of Holding Back the Sea, 19 COASTAL MGMT. 171, 186 (1991). The author has found no estimate of the proportion of this developed area that lies directly above coastal wetlands.

20. See Titus, supra note 8, at 44.

21. See id. at 50-51.
implementing this approach: (1) ban bulkheads or (2) purchase future interests. Prohibiting bulkheads would allow fastland property owners to develop their property to whatever degree they wished, subject to the condition that any such development will not block wetland migration. Government action today to prohibit bulkheads in the future has a low political and financial cost because there is not an imminent threat of inundation and because future interests are discounted. However, regulatory prohibition of bulkheads that is politically acceptable today may falter in the future as flooding occurs and landowners lobby to protect their property from an imminent threat. Therefore, government may wish to take advantage of discounted future property interests by purchasing them instead of imposing a regulatory prohibition, because the acquired interests may be more durable as the threat of flooding becomes more imminent.

The legal issues associated with the types of responses to sea level rise vary greatly in their complexity. The responses that in-

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22. See id. at 44-45.

23. In this article, the term "bulkhead" refers to any structure blocking wetlands migration regardless of whether the structure serves some other purpose.

24. See Sax, The Fate, supra note 15 for a discussion of prohibitions. When Hurricane Hugo slammed into South Carolina in October 1989, it transformed a future threat of coastal storm damage into an immediate one. The hurricane halted implementation of the 1988 Beachfront Management Act, S.C. CODE ANN. § 48-39-270, which prohibited new construction or replacement of destroyed buildings in a "dead zone" twenty feet back from the primary dune. The law would have prevented rebuilding on approximately 20 of the 150 properties damaged by the hurricane and was already hobbled by about 45 takings challenges to the application of the construction prohibitions seaward of the primary dune. The state legislature amended the law in June, 1990 to eliminate the "dead zone" prohibitions and allow for variances under certain circumstances. The 1990 amendments also implemented a version of the third response strategy by prohibiting new bulkhead construction, bulkhead strengthening, and bulkhead rebuilding. S.C. CODE ANN. § 48-39-290(B)(2). See Esposito v. South Carolina Coastal Council, 939 F.2d 165 (4th Cir. 1991) (rejecting temporary takings challenge to the 1988 law).

Maine regulations implementing its coastal construction permit system attempt to accommodate sea level changes by prohibiting construction that may reasonably be expected to experience damage from shoreline changes within 100 years. ME. REV. STAT. ANN. tit. 38, § 480-B; Code of Maine Rules, Ch. 355, § 3(A)(2). Furthermore, "if the shoreline recedes such that the coastal wetland ... extends to any part of the structure, including support posts, for a period of six months or more," then the structure must be relocated. Id. § 3(B)(1)(b). Because the Maine coast has so little marsh area, there are few affected landowners.

See infra notes 49-57 and accompanying text for a description of the legislative response in Mississippi to overturn the results of an expansive judicial interpretation of public ownership of tidelands.

25. Of the seven options that Titus lays out, one (number 5, rely on elements/economics) involves no increased regulation or acquisition of property. Titus, supra note
corporate compensation to property owners face no legal hurdles. The power of eminent domain, which rests both in the federal and state governments, allows condemnation of private property for a public purpose. Wetlands protection is a legitimate public purpose.26 Governments can negotiate a voluntary sale or compel sales through condemnation procedures.

If, however, the government opts to prohibit development of bulkheads through legislation or regulation, then the primary legal question is whether it is required to compensate affected property owners. Even though political considerations may warrant that coastal landowners be compensated for losses they suffer while facilitating wetland migration, the question is still important because if the government is not legally required to make that compensation, its negotiating position will be stronger. The stronger the government's right to act without compensation, the more likely private landowners are to cooperate, and the lower their reservation prices will be. The public trust doctrine, along with the law of nuisance, defines the existing public rights that limit certain uses of private property. If bulkheads or development are incompatible with the exercise of these public rights, then no compensation is required for regulatory restrictions. Takings law sets the limits of governments' ability to interfere with private property for public purposes without just compensation.27

8 at 44. The only possible legal issue involved in this *laissez-faire* option is the fiduciary duty of the public trust doctrine discussed *infra* notes 75-82 and accompanying text. Three options (number 2, buy coastal land now; number 4, buy property when seas rise; and number 7, leases) involve either voluntary negotiation or forced sale. *See id.* The principal legal concern with these options is the relevant authority's power of eminent domain. *See infra* note 26 and accompanying text. The lease option can be implemented by governments through purchase (or condemnation) of the fee simple absolute property and then lease-back of property for a term of years. *See Titus,* *supra* note 8 at 45. Titus' alternative option of "converting" fee simple absolute ownership to a leasehold would certainly result in a taking unless compensation were provided. The remaining two options (number 1, prohibit development and number 6, prohibit bulkheads) raise the question of whether these restrictions can be implemented without compensation to property owners. *See id.* at 44-45. Parts II and III of this article focus on this issue.


27. U.S. CONST. amend. V (No person shall "be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation."); U.S. CONST. amend. XIV, § 1 (No state shall "deprive any person of life, liberty, or property, without due process of law.").
The following two parts of this article will focus on these legal issues that surround restrictions on bulkhead construction. An analysis of bulkhead prohibitions serves as a vehicle to explore how property law will respond to climate change. It also describes the specific legal problems that arise in implementing policies to protect coastal wetlands as sea levels rise. This article applies the law to bulkhead prohibition for four reasons: (1) it is a realistic example of the kind of controversy that will arise from climate change which will press the boundaries of conventional property law; (2) it is a farsighted approach that alters expectations of property owners well before inundation and the need for a bulkhead is imminent; (3) it is an efficient and politically feasible response to the problem of potential wetland loss due to sea level rise; and (4) of all the possible responses to the threat of coastal wetland loss, it sits most squarely in the gray area between permissible and impermissible regulation without compensation, and therefore is a sensitive indicator of how far the law will allow governments and agencies to go.

II. THE PUBLIC TRUST DOCTRINE

The public trust concerns the extent of the generally inalienable common rights of the public to use or enjoy certain natural resources. All property owners control land subject to the public trust. Because coastal wetlands are valuable natural resources in which the public has an inherent substantial interest, a government may be able to act within its trust responsibilities to address sea level rise. The public trust authority of government, though, is much narrower than its police power to protect the health and welfare of its citizens.

The law recognizes the coastline as a uniquely important location and grants the government special rights and responsibilities in coastal areas to act in the public interest. Navigation, commerce, and fisheries are traditional areas of public interest; however, conservation and aesthetics are gaining increasing recognition as elements of the public trust. Yet, there is no single public trust theory; different trusts operate for different resources and different sovereigns (state and federal). State and federal public trust doctrines are relevant to considering responses to sea level rise because the coast is an area where private

28. See discussion of South Carolina and Maine law, supra note 24.
29. Important wetland functions include flood control; habitat for fishing, hunting, and recreation; and sediment, erosion, and pollution control. J. Kusler, supra note 1, at 1-7.
lands traditionally have been subject to public rights. The protection of these public rights may even impose an affirmative duty on governments.

A. Federal Public Trust: The Navigational Servitude

The commerce clause of the U.S. Constitution impresses a servitude on all navigable waters.\(^{30}\) To ensure unimpeded commerce, navigation, and fishing, the federal government can improve both inland and coastal waters by building dams, jetties, diversions and other structures.\(^{31}\) A federal action that alters access to waters subject to the navigational servitude does not require compensation even if the alteration completely deprives a littoral owner of all access to the waters. This is because the owner's title never encompassed a perpetual right to access navigational waters.\(^{32}\) Even when the government condemns fastlands for a water-related project, compensation to the owner does not include the value of those lands, such as for a port, attributable to their location near the water.\(^{33}\)

The commerce clause, besides defining the scope of the federal navigational servitude, also defines Congressional regulatory authority over navigable waters. This regulatory authority is broader than the navigational servitude\(^{34}\) and its exercise by Congress may sometimes require compensation under the fifth amendment.\(^{35}\) For instance, in \textit{Kaiser Aetna v. United States},\(^{36}\) the Court ruled that a non-navigable private fish pond, when dredged and connected to the ocean to create

\(^{30}\) U.S. CONST. art. I, § 8, cl. 3; \textit{See Gilman v. Philadelphia}, 70 U.S. (3 Wall.) 96, 99 (1866) (holding that "[t]he power to regulate commerce comprehends the control . . . of all navigable waters.")


\(^{33}\) \textit{United States v. Rands}, 389 U.S. 121 (1967) (holding that the value of a riparian owner's rights of access to navigable waters is not compensable under the fifth amendment).

\(^{34}\) In fact, Congress' authority to regulate interstate commerce is much broader than the federal navigational servitude. Not only can Congress regulate waters that are non-navigable, but it can also regulate virtually any class of economic activities that cumulatively affect interstate commerce. \textit{See Wickard v. Filburn}, 317 U.S. 111 (1942) (upholding regulation of a farmer's production of wheat for his family's consumption); \textit{United States v. Darby}, 312 U.S. 100 (1941) (upholding exclusion of certain goods manufactured by factories violating labor standards from interstate commerce).

\(^{35}\) \textit{See infra} notes 83-137 and accompanying text for an analysis of when the compensation requirement is triggered.

a marina, was subject to the U.S. Army Corps of Engineers’ regulatory authority. However, the pond was not subject to the federal navigational servitude, which would have required free public access to the marina without compensation to the owner.\(^{37}\)

The federal government could use the navigational servitude to prohibit a littoral landowner from erecting a bulkhead in navigable waters below the high tide line. No compensation would be required. The federal government could also use its broader commerce clause regulatory authority to ban fastland bulkheads; however, it would be required to compensate the landowner if the regulation resulted in a taking. As seas rise, there is no doubt about the federal government’s ability to ensure that coastal wetlands be allowed to migrate. The difficult question is whether the federal government could exercise its public trust authority to prohibit bulkheads just above the current high tide line without being subject to takings limitations.\(^{38}\) Would courts hold that the navigational servitude migrates inland as the seas rise?

Courts could decide the issue either way but most likely will favor owners of fastland. *Kaiser Aetna* and its companion case, *Vaughn v. Vermilion Corp.*,\(^{39}\) indicate that the U.S. Supreme Court will focus on past use of areas that become subject to the ebb and flow of the tides as a result of private construction. In both cases, a landowner altered property that was not navigable to make it navigable for private use. In both cases the court held that such improvements, which neither divert nor destroy pre-existing waterways, do not result in the extension of the federal navigational servitude to cover the new navigable waters.\(^{40}\)

These cases support the principle that property not previously subject to the navigational servitude will remain free of the servitude even if artificial construction exposes the property to the ebb and flow of the tides. Since construction of a bulkhead will prevent land from becoming subject to the ebb and flow of the rising tides, the land will remain free from the servitude. It is hard to see how a court that does not recognize the migration of the federal navigational servitude to an area that becomes navigable-in-fact would extend the

\(^{37}\) *Id.* at 178-80.

\(^{38}\) A landowner who delays building a bulkhead and finds her property partly under water during high tide may lose the right to exclude the sea from that area. *See supra* notes 10-11 and accompanying text. The following discussion concerns the situation where a landowner builds a bulkhead before the property is inundated.

\(^{39}\) 444 U.S. 206 (1979)

\(^{40}\) *Id.* at 208-09; *Kaiser Aetna*, 444 U.S. at 180.
public trust to an area that is kept dry by a seawall.

On the other hand, *Kaiser Aetna* and *Vaughn* can be read to support the public policy of promoting enhancement of navigational waters. If the court had found that the navigational servitude had moved in these cases, property owners would be discouraged from expanding navigable waters because they could not capture the benefits. In a sea level rise scenario, it is the prevention of construction that will improve navigational waters. In *Kaiser Aetna* and *Vaughn*, inaction would not have resulted in an expansion of navigable waters. The Court did not wish to penalize enterprising landowners who expand navigable waters through construction. Where inaction will result in rising sea levels enhancing navigational waters, however, the court may find that the servitude moves regardless of construction activities. In a sense, this interpretation of the reach of the navigational servitude is tied to the “natural” reach of navigable waters in the absence of construction. Under this theory, a landowner should not be able to frustrate the reach of the navigational servitude by erecting a bulkhead. As I discuss in the next section, however, climate change will challenge legal theories based on naturalness. The *Vaughn* opinion left open the question of whether diversion or destruction of a pre-existing natural waterway in the course of construction would result in extending the servitude to the new navigable area created at the “expense” of part of the public servitude. If harm to navigable waters extends the servitude, then bulkheading that results in the destruction of navigable waters (including wetlands) may be subject to the public trust.

### B. State Public Trust

As inheritors of the sovereign rights of the Crown, the thirteen original states acquired ownership of all lands subject to the ebb and flow of the tide. The “equal footing” doctrine gives all other states the same rights as the original thirteen. Therefore, upon statehood, each state received title to lands subject to the ebb and flow up to the normal high tide mark.

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41. 444 U.S. at 209-10 (remanding to the fact-finding court the question of whether existing navigable waters were destroyed or diverted). The parties settled before the question was decided.
States may own submerged tidelands regardless of their navigability.\(^4\) However, "individual states have the authority to define the limits of the lands held in public trust and to recognize private rights in such lands as they see fit."\(^5\) Nonetheless, all submerged tidelands, whether publicly or privately owned, are subject to certain public easements.\(^6\) Whereas the federal public trust is primarily concerned with navigational issues, the state public trust is more expansive and is concerned with a wide variety of interests including fishing, environmental quality, and recreation.\(^7\) Therefore, state doctrines are more helpful in protecting the public interest in wetlands preservation than is the federal doctrine. State public trust is not a single doctrine, but fifty bodies of law created by each state.\(^8\)

Mississippi's public trust in submerged lands, confirmed by the U.S. Supreme Court in *Phillips Petroleum Co. v. Mississippi*,\(^9\) pres-

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44. Phillips Petroleum Co. v. Mississippi, 484 U.S. 469 (1988) (holding that the state public trust applies to all submerged lands subject to the ebb and flow of the tide).

45. Id at 475.

46. See, e.g., Bell v. Town of Wells, 557 A.2d 168, 169-73 (Me. 1989) (holding that intertidal landowners hold title in fee subject to certain public easements); People v. California Fish Co., 166 Cal. 576, 593-94, 138 P. 79, 88 (1913) (stating that private ownership is subject to a paramount right to use by the public). Maine's severe restrictions on coastal development had been upheld in Hall v. Board of Envtl. Protection, 528 A.2d 453 (Me. 1987).

47. See *Phillips Petroleum Co.*, 484 U.S. at 476 (stating that "several of our prior decisions have recognized that the States have interests in lands beneath tidal waters which have nothing to do with navigation."). See, e.g., *Marks v. Whitney*, 6 Cal. 3d 251, 491 P.2d 374, 98 Cal. Rptr. 790, (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. *Id.* at 259-60, 491 P.2d at 380, 98 Cal. Rptr. at 796.

48. Generally, though, state public trust lands extend from the mean high tide line (otherwise known as the mean high water mark) seaward to the three mile territorial limit. This public trust land includes tidelands (otherwise known as foreshore) from mean high tide to mean low tide and submerged lands seaward of the low tide. Existing coastal wetlands generally occur in tidelands. See Comment, *Public Access to Private Beaches: A Tidal Necessity*, 6 UCLA J. ENVTL. L. & POL’Y 69 (1986). In states such as Massachusetts, where colonial grants included littoral property to the extreme low water mark with a public easement for fishing, fowling, and navigation, the State does not own intertidal flats but may act to preserve the easement. Conners & Krumholz, *Legal Status of Tidal Flats in Massachusetts*, in *INTERTIDAL FLATS: THEIR VALUE AND LEGAL STATUS* 35 (1990). See generally D. SLADE, *PUTTING THE PUBLIC TRUST DOCTRINE TO WORK* (1990) (surveying state public trust cases).

ents a useful illustration of the doctrine because the state is located on the Gulf of Mexico with extensive wetlands, and has a representative common law system (as contrasted with Louisiana’s anomalous civil law-influenced system). In Mississippi, the public has an interest in public bathing, swimming, recreation, fishing, environmental protection, and mineral development along the shore. \(^{50}\) Despite the fact that Phillips Petroleum Co. had been paying property taxes on submerged lands for which it had recorded title, the U.S. Supreme Court held that the submerged lands (and their valuable mineral rights) belonged to the state of Mississippi, which had never granted Phillips Petroleum rights the company was claiming. \(^{51}\) Public trust interests do not lapse merely because a state has not previously asserted them.

The Mississippi Supreme Court, in *Cinque Bambini Partnership v. State*, \(^{52}\) held that state public trust lands may be augmented by natural inland expansion of the tidal influence.

If over decades, . . . the tides rise — that is, the mean high water mark rises (and there is reason to believe this has happened and may continue to happen) — the inward reach of the tidal influence expands . . . . \(^{53}\) [T]he new tidelands so affected accrete to the trust.

On the other hand, artificially created water courses, inlets, marinas, and other non-natural alterations to private land do not cause ownership to pass to the state public trust even though they become subject to the ebb and flow of the tides. \(^{54}\) This finding was not appealed to the U.S. Supreme Court with the other issues in *Phillips Petroleum*.

In response to the *Cinque Bambini* and *Phillips Petroleum* rulings, the Mississippi legislature enacted a statute to fix permanently the boundaries between public and private lands. \(^{55}\) The act requires

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\(^{51}\) *Phillips Petroleum Co.*, 484 U.S. at 484.

\(^{52}\) 491 So. 2d 508 (Miss. 1986), aff’d sub nom. Phillips Petroleum Co. v. Mississippi, 484 U.S. 469 (1988).

\(^{53}\) *Id.* at 519-20.

\(^{54}\) *Id.* at 520.

the Secretary of State to prepare a map to mark trust land boundaries that will not move with rising sea levels. The Secretary of State has challenged the constitutionality of the act based on a public trust theory in litigation that is now pending before the Mississippi Supreme Court.

Regardless of the outcome of the Mississippi litigation, there is no existing state law doctrine that addresses a public interest in lands that lie below sea level but are not subject to the ebb and flow of the tides due to bulkhead protection. Nonetheless, Phillips Petroleum provides a clue as to how a Mississippi program to protect migrating wetlands might fare in the courts. The Phillips Petroleum Court stressed the importance of "honoring reasonable expectations in property interests." In that case, Mississippi's long-standing claim of ownership of tidal lands made it unreasonable for Phillips Petroleum to assume that it held title. The Cinque Bambini opinion should put coastal owners on notice of the state's future interest in lands that will become tidal. Mississippi may honor this expectation by prohibiting bulkheads. The unprecedented scale of sea level rise due to global warming necessarily unsettles both public and private expectations. Policy-makers should begin to institute programs to prohibit bulkheads sooner rather than later so that new expectations have a chance to settle before seas rise so high as to threaten imminently upland property.

To the extent that sea level rise caused by the global warming is not a natural event, the state may not be entitled even to newly submerged land according to Cinque Bambini's artificially created waters exception. After all, global warming is a kind of nuisance caused by human activities that generate "greenhouse gases." But unlike the artificial changes in navigable waters in Vaughn, where a responsible party is identifiable, the diffuse anthropogenic causes of global warming make allocation of responsibility for sea level rise difficult. Actually, the rate of sea level rise is a behavior more analogous to natural

56. Id. § 29-15-7 (Supp. 1989).
58. Phillips Petroleum Co., 484 U.S. at 482.
59. Cinque Bambini Partnership, 491 So. 2d at 520.
changes along the coast, such as subsidence, than to artificial changes, such as the construction of a marina or canal. Since sea level rise will occur over the course of decades, it may be regarded by courts as akin to natural change because of the gradual way the alteration to the shoreline occurs. The decisive factor in sorting out the legal response to sea level rise may be the longstanding principle that boundaries between land and water are inherently transient. An owner near a body of water has always been on notice that property boundaries may change due to erosion, accretion, and reliction. Only sudden, avulsive changes in watercourses leave property boundaries unaffected. In explaining this rule, at least one court has noted that the underlying rationale is the pace of change. 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.

C. The Expanding State Public Trust

Since the 1970s, many courts and commentators have argued that the public trust doctrines should reach beyond the federal navigational servitude and state ownership of submerged lands to protect public rights to certain natural resources incapable of or inappropriate for private ownership. Some courts view the public trust as a dynamic

60. See Rychlak, supra note 57.
61. See id. at 105-07.

The most widely cited court decision implementing the broader notions of the public trust is National Audubon Soc'y v. Superior Court of Alpine County, 33 Cal. 3d 419, 658 P.2d 709, 189 Cal. Rptr. 346 (1983), cert. denied, 464 U.S. 977 (1983) (incorporating public trust considerations into the existing state system of water rights by balancing reasonable, beneficial uses of water with competing public interests such as environmental protection). The California Court noted that the purpose of the public trust evolves in tandem with changes in public uses and values. See National Audubon Soc'y v. Dep't of Water, 858 F.2d 1409 (9th Cir. 1988), for the latest case in the ongoing Mono Lake controversy.
doctrine to "be molded and extended to meet changing conditions and needs of the public it was created to benefit." To the extent that the public has a reasonable expectation to enjoy the benefits of coastal wetlands, the trust can ensure that those wetlands do not disappear under the rising seas.

As the modern public trust doctrines evolve along with the problems posed by global warming, the reach of public rights may extend to activities such as bulkheading that previously were unrestricted. Such an evolution is consistent with an emerging trend. Whereas the traditional public trust extended only up to the high water line and was concerned solely with navigation, commerce, and fishing, recent cases have expanded the trust to include dry sand areas of public beaches for recreation.65 For example, in Matthews v. Bay Head Improvement Ass'n,66 the New Jersey Supreme Court confirmed that the public's right to use tidelands includes a variety of recreational activities and found that the use of the dry sand beach above the high water mark extending to the vegetation line was necessary to the exercise of the public right.67 This ancillary right includes not only the use of the dry sand beach for access to the tideland, but also "the right to sunbathe and generally enjoy recreational activities."68


67. Matthews, 95 N.J. at 312, 471 A.2d at 358 n. 1.
68. Id. at 323, 471 A.2d at 364.
court declared that this right of use exists on private as well as public lands.\(^6\) The New Jersey Supreme Court’s willingness to recognize public rights on private property to allow public enjoyment of existing trust lands illustrates the flexibility of the doctrine. This flexibility holds promise for imposing public trust restrictions on fastlands located upland of existing coastal wetlands. The opinion reflects a practical attitude toward ensuring that the public trust be useable. 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. The \textit{Matthews} case demonstrates the willingness of a court to impose obligations on fastlands so that traditional public trust areas can serve their public purposes.

Wisconsin, in its celebrated opinion of \textit{Just v. Marinette County},\(^7\) recognized that “\textit{[t]he changing of wetlands and swamps to the damage of the general public by upsetting the natural environment... is not a reasonable use of that land which is protected from police power regulation.}”\(^8\) In \textit{Just}, a landowner was prevented from filling his property because it might diminish the ability of the wetlands to serve as a buffer for pollution. In applying the public trust, the court stressed the close interrelationship between wetlands and the integrity of navigable waters. The purpose of the ordinance upheld in \textit{Just} was to “\textit{protect navigable waters and the public rights therein from the degradation and deterioration which results from uncontrolled use and development of shorelands.}”\(^9\) The same rationale may be applied to a regulation restricting bulkheading.

California has a similar ecological interest in its public trust doctrine for tidelands. In \textit{Marks v. Whitney},\(^10\) an action to quiet title to settle a boundary line dispute, the California Supreme Court held that the littoral owner holds property subject to a public easement for navigation, commerce, and preservation. “[O]ne of the most important

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\(^{6}\) \textit{Id.} at 325, 471 A.2d at 365. The defendant in \textit{Matthews} was a non-profit corporation that acted as a quasi-public association. The court’s language regarding purely private dry sand beaches is dictum.

\(^{7}\) \textit{Id.} at 325, 471 A.2d at 365.

\(^{8}\) \textit{Id.} at 326, 471 A.2d at 366.

\(^{9}\) \textit{Id.} at 10; 201 N.W.2d at 765; see also \textit{M & I Marshall & Ilsley Bank v. Town of Somers}, 141 Wis. 2d 271, 414 N.W.2d 824, 828 (1987) (reaffirming the vitality of \textit{Just} and stressing the public harm/public benefit test).

\(^{10}\) \textit{Id.} at 17-18, 201 N.W.2d at 768.
public uses of the tidelands . . . is the preservation of those lands in their natural state, so that they may serve as ecological units . . . . 74 Explicit judicial recognition of this particular use of the public trust suggests that a ban on bulkheads, if justified to preserve marsh ecology, may be acceptable in states like California and Wisconsin.

It is important to recognize that there is a difference between prohibiting development of a tract of land because of its existing value as a wetland and prohibiting the erection of a sea wall because of a tract of land’s potential to evolve into a wetland. An owner is on notice of the current natural character of her land, but not necessarily of its importance as a future wetland if the sea level rises. This underscores the importance of a bulkhead prohibition that is implemented as soon as possible to allow ample time for reconciliation of expectations with the risks of global warming.

D. Enforcing the Public Trust

This discussion of the public trust has focused on finding authority for willing state and federal governments to claim a public interest in protecting migrating coastal wetlands. However, the public trust sometimes is applied to compel a government to take or refrain from an action. 75 If the public trust is applicable to wetlands migration, then there is precedent for a fiduciary duty of the government to act to prevent interference with the process.

The classic case of this fiduciary aspect of the trust is Illinois Central R.R. v. Illinois. 76 In that case, the state of Illinois revoked a grant it had made of a major section of the Chicago waterfront to the railroad company. The U.S. Supreme Court held the original grant invalid, stating that Illinois was powerless to alienate a natural resource as important as Chicago’s harbor. 77 This principle may be

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74. Id. at 259, 491 P. 2d at 380, 98 Cal. Rptr. at 796.

75. The trust may also be applied to compel a landowner to abate an action that causes damage to public rights along the coast. Comment, supra note 63 (citing J. Gould, A TREATISE ON THE LAW OF WATERS § 27 (1900)).

76. 146 U.S. 387 (1892).

77. The Illinois legislature has run afoul of the public trust doctrine repeatedly for attempting to convey land under Lake Michigan. See Lake Michigan Fed’n v. United States Army Corps of Engineers, 742 F. Supp 441 (N.D. Ill. 1990) (holding that the legislature had improperly conveyed 18.5 acres of lakebed to Loyola University for park and athletic facilities); People ex. rel. Scott v. Chicago Park Dist., 66 Ill. 2d 65, 360 N.E. 2d 773 (1976) (holding that the legislature may not convey 194.6 acres of lakebed to U.S. Steel Corp.).
relevant to wetlands migration. If a state fails to restrict bulkheads, it may be abdicating its fiduciary responsibility to protect tidal lands.

The migrating wetlands situation in which government fails to act is different from *Illinois Central*, however, because there was an identifiable action by the Illinois legislature to which conflict of interest or failure of duty could be attached. Still, courts have compelled government authorities to act affirmatively on behalf of a public trust resource. As with the line of New Jersey cases expanding the public trust to include some interests on dry sand beaches, these fiduciary cases represent the leading edge of public trust law. As trends, they give greater impetus to state and federal governments to create regulatory systems that can keep pace with new threats to public resources.

In a series of cases involving water diversion for the City of Los Angeles, the California Supreme Court held that the public trust "is an affirmation of the duty of the state to protect the people's common heritage of . . . marshlands and tidelands, surrendering that right of protection only in rare cases when the abandonment of that right is consistent with the purposes of the trust." The Court held that the city might have to reduce existing appropriative water rights to protect public trust values in Mono Lake. The city planned to increase future diversions even though past use of Mono Lake tributaries had reduced water levels to an extent that threatened habitat.

Another series of opinions, relating to U.S. Department of the Interior management of Redwood National Park, found that the department's inaction violated its fiduciary responsibilities to protect the park. The Court required the department to fulfill its trust by lobbying Congress for an expansion of park boundaries, and ordered the department to report back to the court on proposals made for more park protection, more management authority, more money to purchase land and more negotiation of cooperative agreements with neighboring timber companies (whose practices were causing erosion and sedimentation).

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78. National Audubon Soc'y v. Superior Court, 33 Cal. 3d 419, 658 P.2d 709, 724, 189 Cal. Rptr. 346, 360-01 (1983), *cert. denied*, 464 U.S. 977 (1983). Other states have recognized the exception to the rule against alienation of the public trust in the event the transfer is for a public purpose. See, e.g., City of Milwaukee v. State, 193 Wis. 423, 214 N.W. 820 (1927) (upholding Milwaukee's grant to a steel company to develop a public harbor).

More recently, a different federal court suggested that the U.S. Department of Agriculture staff failed to act "with the degree of responsibility rightfully expected of them" when they did not assert federal reserved wilderness water rights in state stream adjudications. The court concluded that it lacked the discretion to require that the Department assert federally reserved wilderness water rights. However, the court ordered the Department staff to write "a memorandum explaining their analysis, final decision, and plan to comply with their statutory obligations regarding protection and preservation of wilderness water resources." Although the Tenth Circuit vacated the lower court's judgment on ripeness and reviewability grounds, the opinions that address the merits of the public trust issue reflect the potential for citizen enforcement. Just as a landowner has recourse in the courts for frustration of certain private expectations, so does the public for its trust interests. However, if the hurdles of ripeness and reviewability prevent citizens from compelling agencies to act to protect coastal wetlands until flooding is imminent, the public will have lost a crucial opportunity to confirm its interest before private interests crystallize and the equities shift.

III. THE TAKINGS ISSUE

In his famous 1922 opinion, Justice Holmes found that a Pennsylvania law restricting underground coal owners from mining some of their property was invalid without compensation to the owners for loss of their rights. He stated: "if [a] regulation goes too far, it will be recognized as a taking." Although subsequent cases give us


81. Block, 622 F. Supp. at 865. This conclusion is in line with earlier cases involving nonassertion of federal reserved water rights. See Sierra Club v. Andrus, 487 F. Supp. 443 (D.D.C. 1980), aff'd. sub. nom. Sierra Club v. Watt, 659 F.2d 203 (D.C. Cir. 1981) (holding that Interior's failure to assert federal reserved water rights had a rational basis because none of the relevant energy developers had acquired vested water rights and the ultimate relief sought was being obtained through other administrative means).

82. Sierra Club v. Block, 622 F. Supp at 865 (agreeing that a two-page plan submitted in response to the Court's order exhibited no real analysis and ordering preparation of a new one); Sierra Club v. Lyng, 661 F. Supp. 1490 (D. Colo. 1987), vacated on other grounds, Sierra Club v. Yeutter, 911 F.2d 1405 (10th Cir. 1990).


84. Id. at 415 (finding that application of a state statute that substantially furthered an important public policy constituted a taking because it so frustrated investment-backed expectations). Cf. Keystone Bituminous Coal Ass'n v. DeBenedictis, 480 U.S. 470 (1987).
more guidance, Holmes' general statement accurately captures the _ad hoc_ law of takings—there is no precise formula for determining whether a regulation, such as a bulkhead or development restriction, will lead to the taking of private property by its application. Courts seldom invalidate a regulation as unconstitutional on its face.

States, which have sovereign power to regulate land use for the health, safety and welfare of their citizens, confer regulatory authority on local governments to control land use. Many state governments reserve authority to regulate land use directly in areas of special concern, such as coasts. Both state regulations and local ordinances based on enabling authority granted from the state must respect fifth amendment protections of property. However, it is important to note that a landowner can challenge a local regulation as not being within the scope of powers granted to the local jurisdiction by state law. This issue is a matter of state law and does not arise in cases where the state directly regulates land use, such as actions by a state coastal zone management authority.

This analysis begins with a review of the constitutional law of takings and applies the doctrine to regulatory authority to prohibit construction of bulkheads. Next, it addresses the special case of conditioning building permits on agreements not to build bulkheads. The public trust doctrine protects public expectations by providing authority, and perhaps a duty, for government to act, whereas takings law protects the expectations of property owners by restricting the power of governments to regulate without compensation.

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86. A regulation also will be invalid if it deprives a landowner of property without due process of law. Because the due process protection in the fifth amendment embodies similar safeguards as the just compensation requirement, courts generally fail to distinguish between the two grounds when overturning regulations. Want, _The Taking Defense to Wetlands Regulation_, 14 ENVTL. L. REP. 10169 (1984). Therefore, the takings issue as defined in this paper includes substantive due process concerns that tend to focus on the rational relationship between the regulation in question and a legitimate government interest (e.g., a state's interest in health, safety and welfare of its citizens).

87. See, e.g., Hodel v. Virginia Surface Mining and Reclamation Ass'n, 452 U.S. 264 (1981) (emphasizing that takings analysis must be conducted with respect to specific property and the values affected by the particular circumstances of the application of the law). See also United States v. Riverside Bayview Homes, 474 U.S. 121 (1985).

88. The fourteenth amendment extends the application of the fifth amendment to the states. U.S. CONST. amend XIV, § 1.
A. Takings Law and Anti-Bulkhead Regulation

It is impossible to convert into formula the narrative language of U.S. Supreme Court opinions describing the limits of the fifth amendment just compensation requirement. Generally, however, the Court's analysis tends to focus on three considerations:

1. the extent to which the regulation advances a legitimate state interest;
2. the extent to which the regulation denies all reasonable economic uses of the property; and
3. the extent to which the regulation is a physical invasion or outright seizure of a property interest. 90

The following sections address each of these possible triggers for a taking.

1. Legitimate State Interest

The requirement that a regulation advance a legitimate state interest technically precedes the takings analysis. However, for practical purposes, it is part and parcel of the Court's analysis of a takings claim. 91 The consideration involves identifying a legitimate interest and then showing the nexus between the regulation and the interest. 91 If either a legitimate interest is lacking or the relationship between the state interest and the regulatory burden imposed on private property is too attenuated in a given case, a taking (or substantive due process violation) will result.

Although some state courts have found that preservation of land in a natural state is a valid state interest, 92 most courts look for interests that are more explicitly tied to human concerns. To the extent that coastal wetlands migration is important for fish spawning, for

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90. See id. at 127 (stating that "a use restriction on real property may constitute a 'taking' if not reasonably necessary to the effectuation of a substantial public purpose"); See also Agins v. Tiberon, 447 U.S. 255, 260 (1980) (a law is "a taking if the ordinance does not substantially advance legitimate state interests").
92. See Carter v. South Carolina Coastal Council, 314 S.E.2d 327 (S.C. 1984) (upholding restrictions on filling wetlands); Just v. Marinette County, 56 Wis. 2d 7, 24, 201 N.W.2d 761, 771 (1972) (upholding an ordinance prohibiting a landowner from filling a wetland and stating that "[t]he ordinance . . . preserves nature from the despoilage and harm resulting from the unrestricted activities of humans.").
instance, a regulation advancing this interest is more likely to be upheld if it is based on maintaining fisheries (for humans) rather than merely protecting fish. Protection of non-economic resources such as wildlife or aesthetics arouses more judicial scrutiny. Any legislative (or even administrative) finding that migration of coastal wetlands is in the interest of human health, safety or welfare will help boost a regulation over the legitimate state interest hurdle. Such a finding can also be important to help demonstrate the nexus between the regulatory burden and the public interest advanced.

Still, the legitimate interests that may be served by regulation are broad and comfortably encompass the purposes of prohibiting bulkheads. The U.S. Supreme Court has upheld regulations designed to preserve open space, avoid premature development, prevent pollution and congestion; protect wetlands; maintain aesthetics; and re-claim disturbed land. If, however, a court suspects that the underlying purpose of an otherwise legitimate regulation is to reduce the value of property to make future public acquisition less costly, then it may view the application of the regulation as a taking. Bulkhead prohibitions cannot be imposed in order to make purchase of flowage easements or other property interests less costly.

2. Economic Impact

Regulations may have significant adverse effects on the market value of property, but as long as they do not remove all reasonable economic uses of land, they may not constitute a taking. Sometimes the courts will view the economic consideration as having two facets: the direct impact on the landowner, and the extent of interference with investment-backed expectation. However, the distinctions be-

93. Public expense for maintenance of fisheries may be avoided by maintaining wetlands. See Moskow v. Commissioner of Dep't of Envtl. Mgmt., 384 Mass. 530, 427 N.E. 2d 750 (1981) (holding that a restrictive order issued pursuant to the Inland Wetlands Act was not a taking because the Act is reasonably related to the goals of flood and pollution control and the interference was not too extensive).

94. Agins v. City of Tiburon, 447 U.S. 255 (1980) (upholding a zoning ordinance limiting the number of buildings a plaintiff could construct on his property and deferring to legislative findings).


tween the two blur because the direct impact often coincides with frustration of expectation. In examining the value left in property after regulation, courts adjudicating taking disputes often weigh the importance of the public benefits created by the regulation. Moreover, even if a prohibition of a land use results in a complete loss of economic value, courts will not find a taking if allowing the use would cause a public nuisance. The economic impact hurdle comes closest to the classic balancing test of public benefit versus private cost. It is a pragmatic standard to be applied to the particular facts of a case. As a balancing test, the economic impact analysis offers the flexibility necessary to respond to the new clashes in expectations that climate change will instigate.

In Pennsylvania Central Transportation Co. v. City of New York, the U.S. Supreme Court upheld a New York City Landmarks Preservation Commission’s ruling that multistory office space could not be built above the designated landmark of Grand Central Terminal. The Court held that for the purposes of takings analysis, a single parcel should not be divided into discrete segments to determine whether rights in a particular segment have been entirely abrogated. In deciding whether a particular governmental action has effected a taking, this Court focuses rather both on the character of the action [discussed in the next section] and on the nature and extent of the interference with rights in the parcel as a whole.

(in which the Court relied on three distinct factors of “particular significance” to determine that imposition of withdrawal liability does not constitute a taking: economic impact, interference with investment-backed expectations, and character of the action.

100. This is true in the Pennsylvania Central case discussed below. There the Court found that the regulation did not interfere with Grand Central Terminal’s present uses or prevent Penn Central from realizing a “reasonable return” on its investment. 438 U.S. at 136. See also Florida Rock Indus. v. United States, 21 Cl. Ct. 161, 168 (1990) (“In focusing on the extent to which the government’s action has denied plaintiff the economic viability of its property the court may combine the first two of these factors (economic impact and investment-backed expectations.”). Expectations, however reasonable, may not be subject to the fifth amendment if not investment-backed.

101. See Radin, The Liberal Conception of Property: Cross Currents in the Jurisprudence of Takings, 88 Colum. L. Rev. 1667, 1680-84 (1988) (contrasting standards with rules). But see Michelman, supra note 9, at 1233 (arguing that the diminution in value test is not so much a sliding-scale standard but rather a rule that measures “whether or not the measure in question can easily be seen to have practically deprived the claimant of some distinctly perceived, sharply crystallized, investment-backed expectation.”).


Thus, even if one portion of an interest in property is forfeited, the continued viability of other rights in the property bundle will prevent a taking.104 Although Grand Central Terminal's owner was denied the ability to exploit fully the economic value of the property, it was still left with a viable economic use of the property.105 In other cases, severe restrictions on land use have been upheld where the only residual economic uses were agriculture, recreation or camping.106 The smaller the portion of the land affected, the less likely the regulation is to be ruled a taking, even if it is quite restrictive.107 A bulkhead ban applied to a small plot of land that will be inundated completely is much more vulnerable to a takings claim than one applied to a large plot, a portion of which will remain dry even in the absence of a bulkhead.

In Pennsylvania Central, city law permitted the terminal owner to transfer air development rights to nearby blocks. The Supreme Court indicated that this option helped preserve the economic value of the property.108 An anti-bulkhead policy will rest on firmer legal

104. This will generally not be true if a court finds a physical invasion, discussed in the following section. See Nollan v. California Coastal Comm'n, 483 U.S. 825, 831 (1987) (holding that a public easement across a portion of the owner's property constitutes a compensable taking because it can be characterized as a "permanent physical occupation" of the property); Loretto v. Teleprompter Manhattan CATV Corp., 458 U.S. 419, 434 (1982) (holding that constitutional protection of property does not depend on the size of the area affected if it is physically occupied).


107. A regulation that affects a tiny portion of the property, however, may still be a taking under one of the other two considerations. See supra note 38.

108. See Pennsylvania Cent. Transp. Co., 438 U.S. at 136. Nonetheless, the Supreme Court has upheld regulations that result in a severe loss in value with no transferable development right compensation. See Euclid v. Amber Realty Co., 272 U.S. 365 (1926) (upholding a regulation causing 75% diminution in value of property); Hadacheck v. Sebastian, 239 U.S.
ground if regulatory authorities can offer fastland owners transferable rights to offset the economic burden of a bulkhead ban. A transferable right might allow more intense development somewhere beyond the highest expected future high tide line in exchange for an agreement not to construct a bulkhead. Alternatively, landowners along the shore may be permitted to build at a higher density level on any property that cannot be protected by a bulkhead. The danger with this incentive, of course, is that higher density development may increase the pressure on the government to retreat from its prohibitive policy in the future, as more valuable structures are threatened with abandonment. The effectiveness of transferable rights is, of course, limited to situations where there is a target area with demand for more intense development than is permitted by existing zoning.

When courts characterize a regulation as abating a public nuisance, rather than forcing a private landowner to provide a public good, economic impact is substantially less important. A far greater diminution in value is likely to be upheld if the regulation is found to prevent a harm. The Wisconsin Supreme Court, in Just v. Marinette County, framed its wetland preservation language in terms of preventing harm ("despoliation") to public rights by limiting the use of private property. A recent interpretation of Just confirmed that "the key to analyzing a claim that property has been taken . . . is the determination of whether the ordinance prohibits a public harm or provides a public benefit." That Just is often cited as a case

394 (1915) (upholding a regulation causing 87.5% diminution in value); See also Keystone Bituminous Coal Ass’n v. DeBenedictis, 480 U.S. 470 (1987).


110. See Keystone Bituminous Coal Ass’n, 480 U.S. at 492, n. 22 (holding that abatement of public nuisance to promote safety is not a taking even if it destroys the value of property); Mugler v. Kansas, 123 U.S. 623 (1887) (finding that a state prohibition on sale of alcohol to protect public health and safety that ruined plaintiff’s business is not a taking). See also Orion Corp. v. State, 109 Wash. 2d 621, 661, 747 P.2d 1062, 1083 (1987) (citing Keystone and Mugler).

111. Just, 56 Wis. 2d at 16-17, 201 N.W.2d at 768 (stating that “[w]hat makes this case different from most condemnation or police power zoning cases is the interrelationship of the wetlands, the swamps and the natural environment of shorelands to the purity of the water and to such natural resources as navigation, fishing, and scenic beauty.”). See also Miller v. Schoene, 276 U.S. 272 (1928) (upholding an order by a state entomologist, acting pursuant to a state statute, requiring landowners to cut down their cedar trees, which produced a disease fatal to nearby apple trees); Hadacheck v. Sebastian, 239 U.S. 394 (1915) (upholding a local decision to ban a brickyard because of the nuisance it created to surrounding residences that were erected while the brickyard was operating).

affirming the public trust doctrine highlights the close link between the doctrine and the economic impact prong of takings analysis. If a government regulation prevents an activity by a landowner that would frustrate the public from exercising its rights, then the prohibited activity should be characterized as a nuisance. Abatement of this kind of nuisance will not be a taking because of economic impact even if the property is rendered essentially worthless.

A well crafted bulkhead restriction will focus on the harm to public interests that results from activities that cause marsh loss. In *Lucas v. South Carolina Coastal Council,* the South Carolina Supreme Court recently found that no taking occurred in implementing bulkhead and coastal construction restrictions because they were designed to prevent public harm. The Court relied on extensive legislative findings that the coastal ecological and geomorphological systems of the state were threatened by development that interfered with natural processes. Citing *Keystone* and *Mugler,* the Court held that because restrictions were designed to prevent serious injury to the community, no compensation was owed a property owner who is prohibited from constructing any permanent structure (except a small deck or walkway). The Court suggested that no amount of economic impact would give rise to a taking where the government acts to abate a public nuisance.

Commentators often question the distinction between the abatement of a nuisance and the provision of a public good. Without a "benchmark of 'neutral' conduct which enables us to say where refusal to confer benefits . . . slips into readiness to inflict harms," it is impossible to classify a bulkhead prohibition in either category. From the perspective of private property interests, a bulkhead ban enables the public to benefit from a new coastal wetland by compromising the landowner's ability to maintain the character of the plot of land. From the perspective of public interests, bulkheading prevents

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114. Id. at 900.
115. Id. at 896-97.
116. Id. at 901.
117. Id. at 899-900. See also McNulty v. Town of Indialantic, 727 F. Supp. 604 (M.D. Fla. 1989); Presbytery v. King County, 787 P.2d 907 (Wash.), cert. denied, 111 S. Ct. 284 (1990) (both relying on *Keystone* to hold that, irrespective of the magnitude of the economic loss to the landowner, construction restrictions on wetlands or coasts that prevent public harm do not effect a taking).
118. See Michelman, supra note 9, at 1199, 1201; Sax, supra note 98, at 48-50.
119. Michelman, supra note 9, at 1197.
continued use of the coastal wetlands and the larger areas they maintain with plants, fish, and water quality.

If the idea of preserving the natural character of land ever provided a stable benchmark, it will surely be cast adrift as sea levels rise. A court that views bulkheading as maintaining the nature of the fastland against sea level rise produced by anthropogenic greenhouse gases is likely to regard bulkheading as a strong right held by the landowner. On the other hand, a court that views bulkheading as resistance to the natural phenomenon of marsh migration, for which landowners have had ample notice, is likely to regard the construction as depriving the public of its right to the benefits of coastal wetlands which it has always enjoyed.

Yet, courts do draw the harm/benefit distinction. Such widely cited cases as Miller v. Schoene, Hadacheck v. Sebastian, and Keystone Bituminous Coal Ass’n manifest Michelman’s rule that no compensation is owed a landowner when prohibited activities would have “either (a) interrupted someone else’s enjoyment of an economic good, as should have been apparent; or (b) were of a sort which society had adequately made known should not become the object of expectations of continuing enjoyment.” Failure to provide a benefit becomes a nuisance when society has given the property owner ample warning of the benefits it expects. Certainly, Penn Central had no duty to build Grand Central Terminal in the first place; however, as the building became admired as a landmark, the company lost the right to alter it significantly. A court that upholds a regulation preventing alteration of a resource constructed by the owner (a historic landmark) can reasonably uphold a regulation preventing alteration of an ecological resource (e.g., a coastal wetland), even though the owner was unaware of the need to maintain the resource initially (when the terminal was built or the upland developed).

Governments that take action now to protect remaining marshes indicate their intentions now to ensure that these ecosystems survive sea level rise, and strengthen expectations to sustain the marine and estuarine uses that depend on marshes. To the extent that a bulkhead ban is the most narrowly drawn of the government’s options to pro-

120. See, e.g., Just, 56 Wis. 2d at 17, 201 N.W.2d at 768 (upholding zoning designed to “prevent harm to public rights by limiting the use of private property to its natural uses”).
121. See supra notes 110-11.
122. Michelman, supra note 9, at 1241.
123. Public rights to use the coast are well established. See supra notes 63-82 and accompanying text.
tect coastal wetlands (as opposed to a development ban that prohibits more than is necessary to allow future marsh migration), it may be more likely seen as abating a nuisance by responding directly to a new threat and not providing any new public benefits. A bulkhead restriction justified on nuisance grounds may secure greater credibility from a court if it is part of a larger program to remove any incentives existing marsh owners have to alter the ecosystem. The economic cost of a bulkhead ban today will not be borne by the landowner for decades, until the sea level rises sufficiently to threaten property. The discounted value of the cost is likely to be small today. 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.

3. Character of Government Action

Where government regulation is of such a character as to physically invade or permanently occupy property, courts will find a taking even if the economic loss is small. When a regulation creates a new easement for public use, it is a taking. In *Kaiser Aetna v. United States*, the Court ruled that the Army Corps of Engineers could not prohibit, without compensation, a lagoon owner from excluding the public. The Court stressed the fundamental nature of the right to exclude others from private property and its violation by the imposition of the federal navigational servitude on a privately constructed

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124. A bulkhead ban enacted today may also provide the government with an advantage if the statute of limitations for filing a takings claim is triggered by the enactment. By the time inundation occurs, landowners may be precluded from asserting a taking that actually occurred decades ago. See Shostak & Barrett, *Valid Existing Rights on SMCRA*, 5 J. MIN. L. & Pol'y 585, 618-19 (1989-90) (discussing the trigger for statute of limitations for taking claims under the Surface Mining Control and Reclamation Act).

125. See *Pennsylvania Cent. Transp. Co. v. City of New York*, 438 U.S. 104, 124 (1978) (holding that “[a] ‘taking’ may more readily be found when the interference with property can be characterized as a physical invasion by the government . . . .’”); *Loretto v. Teleprompter Manhattan CATV Corp.*, 458 U.S. 419, 426 (1982) (holding that “when the physical intrusion reaches the extreme form of a permanent physical occupation, a taking has occurred”). See also *Hodel v. Irving*, 481 U.S. 704 (1987) (holding that an application of federal law requiring any small undivided fractional interest in Indian land to escheat to the tribe, rather than descend by intestacy or devise, resulted in a taking of decedents’ property rights in violation of the fifth amendment).

lagoon.\textsuperscript{127} Public use of airspace for plane flights has been held to constitute a taking of an air easement.\textsuperscript{128} In finding an easement taking, the Court stressed the unanticipated nuisance of the intrusion by low-flying aircraft.\textsuperscript{129}

The Court has also found a physical invasion even when the government action implied no easement for public access. In \textit{Loretto v. Teleprompter Manhattan CATV Corp.},\textsuperscript{130} the Court found a taking where a New York statute required apartment owners to allow cable companies to install small electronic facilities on their premises for a fee established by a commission. The character of the government action was determinative.\textsuperscript{131} The Court held that when the character is a permanent physical occupation, there is a taking without regard to whether the action furthers a legitimate state interest or has only minimal economic impact on the owner.\textsuperscript{132} The \textit{Loretto} Court did not consider, however, the case where a government action is a permanent physical occupation but its purpose is to abate a public nuisance. The cases discussed in the previous section of this article, such as \textit{Miller v. Schoene},\textsuperscript{133} suggest that the state interest in preventing nuisance allows physical destruction without compensation.

Once a court finds that a regulation effects a physical invasion, it is very likely that the regulation will be found to cause a taking unless it abates a public nuisance. A regulation that is found to exact a flowage easement for the sea over private property is more likely to be considered a taking than one that is found merely to restrict a seawall construction activity.\textsuperscript{134} The takings view would focus on the permanent physical encroachment of water on the owners' property as a result of regulation. 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

\begin{footnotes}
\textsuperscript{127} See \textit{supra} notes 34-42 and accompanying text.
\textsuperscript{128} See Griggs v. Allegheny County, 369 U.S. 84 (1962).
\textsuperscript{129} \textit{Id.}; United States v. Causby, 328 U.S. 256 (1945).
\textsuperscript{130} 458 U.S. 419 (1982).
\textsuperscript{131} \textit{Id.} at 434.
\textsuperscript{132} \textit{Id.} at 434-35.
\textsuperscript{133} See \textit{supra} notes 110-11 and accompanying text.
\textsuperscript{134} See United States v. Cress, 243 U.S. 316 (1917) (holding that a landowner whose property was partially flooded because of a dam constructed by the federal government to improve navigation is entitled to compensation in exchange for relinquishing a flowage easement); Pumpelly v. Green Bay & Miss. Canal Co., 80 U.S. (13 Wall.) 166 (1872) (holding that the construction of a dam that flooded property effected a taking).
\end{footnotes}
rather as preventing a property owner from diverting a naturally-formed body of water off of her property.

The physical invasion rule yields results that are at odds with instinctive notions of fairness. A nominal harm will be compensable if it is the result of physical presence despite the fact that a greater harm will go uncompensated if it involves a mere use limitation with no physical occupation. One basis for explaining the rule is that private expectations about property use focus on a right to exclude people or objects; therefore, frustration of that expectation is more serious than other forms of regulation. The tension between public and private expectations in this context will be manifest in the conflict over whether the right to exclude includes the right to prevent changes in the nature of land that would replace one ecosystem with another in which the public has an interest.

B. Permit Conditions

If a government can ban seawalls outright, it certainly can condition permits on agreements not to construct bulkheads. However, the political and legal hurdles are likely to be lower for conditioning new building along the coast, where most development already is regulated. Therefore, a coastal area that is not now highly developed may wish to pursue this path of less resistance. Building permits for new structures are issued by local authorities who may check to see that the proposed structure meets zoning requirements. In many jurisdictions, special subdivision/land development ordinances regulate major development activities and often require permit applicants to meet standards relating to environmental protection.

135. Michelman, supra note 9, at 1226-29 (showing that the rule is also at odds with the utilitarian justifications for takings law); Sax, supra note 98, at 46-48.

136. See Michelman, supra note 9, at 1226-29. See also Underkuffler, On Property: An Essay, 100 YALE L.J. 127 (1990) (describing the paradoxical results of legal formalism in takings law).

137. See Radin, supra note 101, at 1680-84 (proposing that the basis for bright line rules is a fear of uncontrollable, arbitrary decisions by judges).

138. See Nollan v. California Coastal Comm'n, 483 U.S. 825, 831 (1987) (indicating that although a permit conditioned on an easement might be valid given a substantial relationship to a state interest, an easement required by a blanket regulation would result in a taking: "Had California simply required the Nollans to make an easement across their beachfront available to the public on a permanent basis in order to increase public access to the beach, rather than conditioning their permit to rebuild their house on their agreeing to do so, we have no doubt there would have been a taking."). Nonetheless, blanket regulation of land uses that seem more severe than a bulkhead prohibition have been upheld by the Supreme Court. See supra notes 108, 110.
veloped land in coastal zones often requires a permit from a state coastal zone management agency. Any of these existing regulatory frameworks may be used to implement bulkhead restrictions.

In *Nollan v. California Coastal Comm’n*, the U.S. Supreme Court ruled invalid as an uncompensated taking a state coastal zone management agency’s attempt to condition a building permit. The dispute arose when the California Coastal Commission (CCC) conditioned a permit to replace a bungalow with a larger house on the dedication of an easement to allow public access along the portion of the dry sand beach owned by the permittee. The easement did not involve access to the beach from the street. The CCC argued that it imposed the condition to mitigate the adverse impact of a new, larger house that would block public view of the beach, “psychologically” inhibit the public’s recognition of its right of access, and increase private use of the shorefront. The Court found that the permit condition completely failed to further the legitimate state interest in public health, safety and welfare. Although the majority opinion stated that a permit condition must bear a substantial relationship to a valid public purpose, its actual holding that there was not even a rational relationship carries more precedential weight in defining the test.

The Court acknowledged that the Nollans had no unfettered right to build whatever they wished on the property and that the CCC had a right to deny the permit if denial would further some legitimate

139. See Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464 (1984) [hereinafter CZMA] (creating a voluntary program to encourage states to exercise their own authority to establish and implement coastal management plans (hereinafter CMPs)). The CZMA is not a grant of regulatory authority over private property to states. States with CMPs approved by the federal government receive financial assistance and can prohibit (subject to the veto of the U.S. Secretary of Commerce) federal activities not consistent with the CMP. This provision gives states with CMPs leverage to affect activities requiring federal permits, such as dredge and fill operations. CZMA encourages states to plan how development should occur in a coastal zone where land use has a direct impact on coastal waters. *Id.*
141. *Id.*
142. *Id.* at 828.
143. *Id.* at 841-42.
144. The requirement of a “substantial relationship” is often associated with strict scrutiny, which is a test of close analysis that serves to preserve substantive values of equality and liberty. When strict scrutiny is the standard of review, a regulation is usually struck down. *See L. Tribe, American Constitutional Law 1000-01* (1988). The standard due process and equal protection test for constitutionality requires only a finding of a “rational relationship.” *See Sax, Property Rights in the U.S. Supreme Court: A Status Report, 7 UCLA J. ENVTL. L. & POL’Y* 139, 140 (1988).
A crucial aspect of the Nollan case is that the CCC had authority to deny the permit entirely. However, a condition on the permit that is unrelated to preservation of the public right (of access, use, and view of the shore) that would be harmed by an unconditional permit is invalid. The CCC probably could have conditioned the permit on the provision of a public view or access to the beach.

A coastal management agency seeking to protect wetlands could condition a permit for development or construction on a prohibition of bulkheads. Because the relationship between the presence of a bulkhead and the inability of wetlands to migrate inland is substantial, let alone rational, such a condition would meet the Nollan nexus test. Moreover, it is the development itself that would motivate a property owner to build a bulkhead in the first place.

The chief advantage of a policy to prohibit bulkheads on future development (as opposed to all property) is that it can be implemented using an existing regulatory system to condition permits. Also, it explicitly ties investments in property improvements to the expectation that they must give way to migrating wetlands. However, these advantages come at a cost. Permits authorize a specific activity and do not preclude the same or subsequent owner of the property from returning to the permitting authority at a later date. Unless the permit condition runs with the land as a covenant, the fastland remains vulnerable to subsequent permits that allow bulkheads. However, the more tightly the permit condition runs with the land or effects a permanent prohibition, the more likely it will be seen by a court as a permanent physical occupation. It is important to recall, though, that even a regulatory ban on all bulkheads is vulnerable to amendment should political pressure persuade the government authority to allow construction. Acquisition of the property interest by a relatively insulated party (such as a nongovernmental conservancy) provides the...

145. Nollan, 483 U.S. at 836. See also Hall v. Board of Envtl. Protection, 528 A.2d 453, 456 (Me. 1987) (upholding the denial of a permit to re-build a house lost to coastal erosion). The permit denial did not make the property substantially valueless because the family had been occupying a motor home on the lot during the summer. See id. at 455-56.

146. In fact, without the power to deny the permit, the agency may have no authority to condition the permit. The Nollan opinion offered no guidance for determining whether an agency has the power to deny a permit in a particular case. It is likely that the three factors discussed in the previous section would determine the issue. In this respect, the special case of permit conditioning folds into the general regulatory takings analysis.

147. This assumes, of course, that wetlands migration is a legitimate public purpose. See supra note 26 and accompanying text.
most durable wetlands protection if the financial resources are current-
ly available.\textsuperscript{148}

CONCLUSION

Under the traditional view of the public trust, states that assert public ownership of intertidal lands may gain control of new wetlands if landowners let their property fall under the influence of the tide. This much is clear. The more difficult question is whether seawalls serve as shields from the reach of the public trust. The flexibility of the public trust doctrine and the application of takings law will determine whether coastal jurisdictions can implement bulkhead prohibitions without compensating landowners. States' public trust doctrines offer greater promise than the federal navigational servitude to address the public expectations to continue to enjoy the natural benefits of coastal wetlands.

Professor Sax describes the primary justification of the modern public trust doctrine that protects a wide variety of public resources as "preventing the destabilizing disappointment of expectations held in common but without formal recognition such as title."\textsuperscript{149} Few courts have explicitly recognized such a broad public right over private property. Even those jurisdictions that have recognized broad public rights, such as New Jersey, California, and Wisconsin, give little indication that they would extend the right to restrict landowners who wish to protect the existing character of their property. However, if the public trust lives up to its potential as described by Sax, it may be an effective tool in the future as changing circumstances demand an explicit recognition of the public values served by threatened natural systems.\textsuperscript{150} The most effective strategy today for encouraging evolution in the doctrine is to put private landowners on notice of the importance that the public places on coastal wetlands\textsuperscript{151} and of the role that today's fastlands will play in the future viability of marsh ecosystems.

The same tension created by the conflict between public and

\textsuperscript{148} See Sax, The Fate, supra note 15.
\textsuperscript{149} Sax, Liberating, supra note 11, at 188.
\textsuperscript{151} A serious commitment to planning, regulation, and acquisition to protect existing marshes will bolster a government's case that private actions that doom wetlands are contrary to a significant public interest.
private expectations will surface in fifth amendment challenges to bulkhead restrictions. If the regulation is a normal exercise of police power (or commerce clause authority, in the case of federal regulation), not given special status by vindicating a public trust interest, then it must surmount the takings hurdles or offer compensation. The best touchstone for deciding whether outright prohibition of seawalls on fastlands would be a taking is still Justice Holmes' standard of a regulation that goes "too far." Whether a regulation goes "too far" depends on the circumstances of the particular case. For instance, a regulation that results in the taking of a small parcel, completely vulnerable to inundation, may not result in a taking when applied to a property large enough to retain fastland uses. A bulkhead prohibition will most likely be upheld if it:

- advances human health, safety, or welfare (including business) interests;
- is based on a legislative finding that explicitly ties the regulation to the health, safety and welfare interests;
- treats interference with a migrating wetland as a nuisance; and
- leaves a landowner with some viable economic use of her land (a regulation might offer examples of some permissible types of uses).

Policy-makers and coastal managers should use case law as a guide for implementing strategies that balance public and private expectations. However convoluted the legal fictions involved in applying takings and public trust doctrines, they are all designed to help answer the basic question: whose expectations most deserve to be maintained? A synthesis of the views of Professors Sax and Michelman help probe the answer to this question at the core of property interests and their adaptability to a warmer world. Sax would maintain that the concentrated interests of the private landowner in keeping property dry should be given no more weight by courts than the cumulative, diffuse interests of the public in continuing its use of the resources dependent on marshes. The role of the legislature is to facilitate a resolution to the conflict of interests. Courts should require compensation of landowners only when the regulation prohibits an activity that would have no adverse spillover effects on other people's use of other resources. If there are spillover effects, as surely is

152. See J. Bentham, The Theory of Legislation 68 (N.M. Tripathi Private Ltd. & Oceana Publications, Inc. 1975) ("Property is nothing but a basis of expectation . . . .").
153. Sax, Takings, supra note 11, at 163-64.
the case where property owners build bulkheads that squeeze out coastal wetlands, then courts should not second guess the balance between interests struck by the legislature.

Michelman would not require compensation for a regulation preventing a private activity that, "when the owner first began to orient his decisions towards" the activity, was evidently in conflict with crystallized expectations of others.\(^{154}\) Early warning of public expectations to maintain coastal wetlands, well in advance of inundation, makes the public interests evident and provides a nucleus for their crystallization. Policy-makers can take advantage of the current state of atmospheric and oceanographic knowledge to act before private landowners settle in their expectations to build bulkheads in the future. The tension between public and private interests will play out in a race, not a tug-of-war. The interests that first crystallize into settled expectations will pre-empt subsequently formed expectations from claiming superior legal recognition. Environmentalists and others concerned with coastal wetlands protection should be on notice that now is the time to consider adaptive strategies not only for economic efficiency reasons, but also for legal purposes.

The problem of coastal wetlands migration is just one of many new challenges that climate change presents. Solving problems relating to the modification of agriculture, protection of endemic species, and supply of fresh water, will raise many of the same legal issues.\(^{155}\) An early, effective, and equitable response will not just save some of our dwindling coastal wetlands; it will set the tone for public reaction to the many other uncertainties and environmental perturbations presented by global climate change.

\(^{154}\) Michelman, supra note 9, at 1242.

\(^{155}\) Analogous legal questions will arise from other consequences of global climate change, such as: who will bear the costs of maintaining corridors for plants and animals to migrate as climatic zones shift? and under what conditions can farmers seed clouds to maintain historic levels of rainfall? See Solomon & Freedberg, supra note 3, at 104-09 (summarizing the problems presented by global warming to policy-makers).