# RICHARD BROOKS ON THE SEASHORE

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I have gratefully taken on the assignment to offer some observations on Richard Brooks' practical accomplishments and theoretical contributions in the field of coastal zone management. Those who have a Vermont-centric view of the world and appreciate Professor Brooks' efforts to protect Vermont's environment might be surprised to learn about his work in protecting coastal areas. Before coming to Vermont, Professor Brooks had a whole other life—living, teaching, and agitating in the coastal zones of Connecticut and Rhode Island. To highlight a few of his accomplishments during this earlier phase of his life, he helped draft Connecticut's key coastal legislation and defeat the first and arguably most important "takings" challenge to Connecticut's coastal protections in the Connecticut Supreme Court.

My contribution to this Festschrift proceeds in three parts. The first part provides a brief summary of Professor Brooks' contributions in the field of coastal zone management, especially in Connecticut. The second part describes and comments upon Professor Brooks' observations, after a lifetime of experience and reflection, on the challenges associated with coastal zone management, in southern New England and in general. The third part comments on one of the key coastal zone management challenges that has emerged since Professor Brooks started working in this field: sea level rise.

Parenthetically, and still by way of introduction, I will comment briefly on the (at least to me) interesting and gratifying links between the life and times of Professor Brooks and myself–wholly apart from our joint membership on the faculty of Vermont Law School and my brief service as the acting director of the Environmental Law Center, which Professor Brooks founded and ably led for many years.

First, we are both graduates of Yale Law School (or the "the Yale Law School," as it is sometimes called), although Professor Brooks graduated approximately 20 years before I did. Beach access is one of the myriad costal management issues Connecticut has faced, and Professor Brooks has

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commented thoughtfully on that issue.[1] While I was at Yale, I wrote a seminar paper on conflicts over beach access in Connecticut. The most memorable part of the experience was that my faculty supervisor was reportedly one of the wealthier members of the Yale faculty and owned a substantial coastal home. I look back with gratitude on his benign indulgence of my youthful ravings about plutocrats barring the hoi polloi from reaching the waters of Long Island Sound. Sadly, as Professor Brooks knows full well, beach access represents fraught class conflict in Connecticut.

Second, Professor Brooks and I share a love of sailing, though I suppose neither of us partakes much anymore now that we both live in a state without an ocean coast and (truth be told) not even a great lake. Late in life, Professor Brooks wrote about navigating his Cape Cod Bullseye in Long Island sound, including one memorable day-long reach along the entire Connecticut shore.[2] I have a similar memory of being at the tiller of a large sloop on a straight shot from Gardiner's Island to Stonington, though happily the boat in question was not my own (which in my experience has always been the best arrangement, given the expense and trouble of owning and maintaining a boat).

Finally, though I do not regard myself as a coastal zone expert, early in my career I did a considerable amount of work in this field that overlapped, to a degree, with Professor Brooks' work. In the 1970s, during a gap year between college and law school, I worked in the coastal office of the New Jersey Department of Environmental Protection in Trenton, New Jersey. Later that year, and for several months the following year, I worked for the federal Office of Coastal Zone Management within the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce, in Washington, D.C. Interestingly for present purposes, in the federal coastal zone office I worked under the supervision of Ms. Kathryn Cousins, the North Atlantic Regional Manager, who oversaw the development of state coastal programs in all the New England coastal states including, of course, Connecticut.

Two lessons stand out for me from my early experience in coastal zone management in Washington, D.C. One was administered by the very accomplished and widely admired director of the federal coastal office who one day urgently solicited ideas from staff on how to spend more money

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1. Richard O. Brooks, *Making 'the Mediterranean of the Western Hemisphere' a Sustainable Community: the Connecticut Coastal Zone Management Act and the Long Island Sound*, 13 VT. J. OF ENVTL L. 453, 470 -72 (2012).

2. *Id.*

quickly. The end of the fiscal year was approaching and the office had not exhausted its supply of funding from Congress. When I naively suggested we might simply return the unused and apparently unneeded money to Congress, the office director sternly lectured me on the imperative for every federal agency to spend every penny allotted by Congress or risk a dreaded cut in appropriations the following year. He was correct, of course, and the lesson was received: Washington, D.C. operates according to special rules.

The other lesson related to the deep and continuous tension between the federal government and the states in the implementation of federal environmental programs. The federal Coastal Zone Management Act (CZMA), adopted in 1972, authorized generous funding (at least in its early years) to states to support the development and implementation of state coastal programs.[3] Congress sought, in effect, to use its bully pulpit and the lever of federal funds to encourage states to perform coastal management that followed federal guidelines and achieved federal goals. The coastal states, for their part, welcomed the federal money, but they did not necessarily share the same environmental goals that Congress expressed in the CZMA. And to the extent they did share the same goals, or perhaps had even more ambitious goals, the states sometimes wished to accomplish these goals in their own ways. The result, from my observation, was ongoing conflict between federal coastal officials responsible for doling out federal funds to accomplish federal goals and state officials intent on extracting as much money as possible from the federal government without necessarily doing the federal government's bidding. During this early phase of my career, I got to see that conflict from both sides in the arena of coastal zone management.

## I. Richard Brooks' Coastal Zone Career

From 1962, following his graduation from Yale Law School, until 1978, when he joined the Vermont Law School faculty, Professor Brooks represented private as well as public clients in Connecticut.[4] During this period he also taught planning and law at the University of Rhode Island and Connecticut College. Professor Brooks worked during this period on a variety of land use and environmental problems, including the novel idea of new town developments. But a primary focus of his work during this era was coastal zone management.

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3. *See* Coastal Zone Management Act 1972, 16 U.S.C. §§ 1451-1456 (2017).
4. Brooks, *supra* note 2, at 454.

In particular, he worked, to use his own description, "with a small band of environmental attorneys to consult with Art Rocque, then Director of the Connecticut Coastal program, to draft state legislation for Connecticut's coastal management program." [5] The result of this effort was the Connecticut Coastal Management Act of 1979. [6] This legislation, like similar pieces of legislation enacted in other coastal states during the same period, was adopted in response to Congress's adoption of the federal Coastal Zone Management Act of 1972. I do not have a recollection, based on my own personal experience, of the federal office's relationship with the Connecticut coastal program; my personal dealings were primarily with officials in Rhode Island and Maine. But I am confident that the same kind of federal-state frictions described above also arose with respect to Connecticut.

My guess is that the Director of the Connecticut Coastal Program convened the group, of which Professor Brooks was a part, to draft new state coastal legislation because the federal office informed him that it would be advisable for the state to enact new legislation to secure long-term federal funding for the implantation of a state coastal management program. The accuracy of this guess is supported by the fact that the federal coastal program did not approve the Connecticut coastal program until 1980. This was fairly late in the process relative to other New England states, but just one year following enactment of the Connecticut Coastal Management Act. [7]

Just as the Connecticut coastal legislation was apparently the product of a negotiation between the federal and state coastal offices, it also represented the product of a negotiation between the state coastal office and local communities that already had been vested with considerable land use regulatory authority and state agencies with pre-existing legal authority over the coast. As Professor Brooks explained in his 2012 retrospective about the development of the Connecticut program, "[t]he strategy for securing passage of the law [in the Connecticut legislature] was to defer to local regulation as well as the existing activities of state agencies." [8] In a nutshell, the Act created a two-tiered coastal zone. [9] The first was a more stringently protected tier, the "coastal boundary," generally extending inland 1,000 feet from the shore. [10] The second tier, the "coastal area,"

5. *Id.*
6. CONN. GEN STAT. ANN. § 22a-94 (2010).
7. *See* NAT'L OCEANIC AND ATMOSPHERIC ADMIN., OFF. OF COASTAL ZONE MGMT., *Coastal Zone Management Programs*, https://coast.noaa.gov/czm/mystate/ (last visited Nov. 17, 2018).
8. Brooks, *supra* note 2.
9. NAT'L OCEANIC AND ATMOSPHERIC ADMIN., *supra* note 8.
10. *Id.*

included all of the state's 36 coastal municipalities.[11] The Act articulated various new policies calling for the protection and wise use of the coastal zone. But in terms of implementation, the Act hardly worked a legal revolution. The Act relied heavily on local government implementation of traditional planning, zoning, and subdivision requirements to achieve the policy goals of the state act.[12] The Act also required that existing state plans and procedures be modified and coordinated to achieve the goals of the state coastal law.[13]

In sum, as an example of cooperative federalism, the Connecticut coastal program illustrates how carefully proponents of new environmental protections sometimes must thread the needle to accomplish their goals.[14] The program shows how difficult it can be to create a state initiative that is new and bold enough to meet with federal approval, but that is sufficiently deferential to existing state and local laws and institutions so as to avoid foundering on the shoals of state politics.

Another example of Professor Brooks' coastal work was his representation of four citizen intervenors in a hearing before the Atomic Energy Safety and Licensing Board. This work was in connection with an application by Connecticut Light & Power to construct an additional unit of the Millstone Nuclear Power Plant in Waterford, Connecticut, on Long Island Sound.[15] Two of the intervenors lived and owned homes in proximity to the plant, while the other two intervenors swam and fished near the plant with other members of the public.

The intervenors raised a series of objections to issuance of the proposed license, including inadequate notice, defects in the record, and failure by the Atomic Energy Commission staff to conduct an adequate environmental analysis under the newly-enacted National Environmental Policy Act.[16] In December 1969, the board issued a construction permit for the project and rejected the intervenors' objections.[17] Professor Brooks came away disappointed but educated by the process. "Most apparent in the Millstone case," he wrote, "was the vigorous attempt by the AEC and the applicant

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11. *Id.*

12. CONN. DEP'T OF ENERGY & ENVTL. PROT., *Overview of the Connecticut Coastal Management Program,* https://www.ct.gov/deep/cwp/view.asp?a=2705&q=323536&deepNav_GID=1622 (last updated Oct. 17, 2018).

13. *Id.*

14. *Id.*

15. *See* Richard O. Brooks, *Millstone Two and the Rainbow: Planning Law and Environmental Protection*, 4 CONN. L. REV. 54 (1971) (describing Professor Brooks' participation in the regulatory proceedings in detail).

16. *Id.* at 57.

17. *Id.* at 58 - 59.

power company to exclude considerations of the environment which would slow the speed of power plant development."[18] While he acknowledged that opponents of nuclear plants are granted a formal opportunity to intervene in the regulatory proceedings, and in that sense can have their say, he thought "the relative inequality of resources of local conservation groups vis-à-vis power companies casts serious doubts on the impact of intervention."[19]

On a more positive note, in 1975, Professor Brooks achieved a major victory on behalf of coastal management in the Connecticut Supreme Court in *Brecciaroli v. Connecticut Commissioner of Environmental Protection*.[20] The Court rejected a takings challenge based on denial of a permit seeking permission to fill over five acres of tidal wetlands in the Town of Guilford.[21] Professor Brooks, along with the late Angus McBeth,[22] one of the founders of the Natural Resources Defense Council (NRDC), filed an amicus brief on behalf of the NRDC in support of the commissioner of environmental protection. The individual plaintiff owned a 20.6-acre parcel of land abutting the East River, 17.5 acres of which had been designated as tidal wetlands.[23] The owner wished to develop the property as a 6-lot industrial subdivision.[24] To further that plan he sought regulatory approval to place four feet of fill on 5.3 acres of the designated wetlands.[25] The Department of Environmental Protection rejected the application, and the landowner filed suit challenging the decision on various grounds, including that it amounted to an unconstitutional taking without just compensation.[26]

The trial court rejected the takings claim, and the Connecticut Supreme Court affirmed on appeal.[27] The Court first acknowledged that its precedents established that a regulatory restriction amounts to a taking when it results in a "practical confiscation" of land.[28] But the plaintiff could not invoke that rule because the permit denial left the owner the opportunity to develop the unregulated upland portion of the property, nor could he

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18. *Id.* at 80.
19. *Id.* at 81.
20. *Brecciaroli v. Conn. Comm'r of Envtl. Prot*., 362 A.2d 948 (Conn. 1975).
21. *Id.* at 953.
22. *See* Bart Barnes, *Angus C. Macbeth, lawyer who helped shape environmental rules, dies at 74*, THE WASHINGTON POST (Jan. 28, 2017), https://www.washingtonpost.com/local/obituaries/angus-c-macbeth-lawyer-who-helped-shape-environmental-rules-dies-at-74/2017/01/28/d02c1942-e4bc-11e6-a547-5fb9411d332c_story.html?utm_term=.ccf73dd07a33.
23. *Breccaierolli*, 362 A.2d at 948.
24. *Id.* at 949 - 50.
25. *Id.* at 950.
26. *Id.*
27. *Id.*
28. *Id.* at 951.

apply to fill a smaller portion of the wetlands.[29] The Court also said that its precedent recognized that, depending on the facts and circumstances, a regulation that falls short of a confiscation can still result in a taking.[30] But the Court said there was no taking under this alternative test, especially given that the Department denied the application to prevent the "public harm" that would flow from destroying ecologically valuable wetlands.[31] The decision was a clear and decisive victory that was undoubtedly crucial to the future effectiveness of the Connecticut coastal program, especially for protecting the state's relatively limited but very valuable salt marshes.

The *Brecciaroli* decision, issued in 1975, predates most of the important steps in the evolution of the modern takings doctrine in the U.S. Supreme Court. In particular, it predates the Supreme Court's landmark 1978 decision in *Penn Central Transportation Co. v. City of New York*,[32] in which the Court rejected a takings challenge to the city's designation of Grand Central Terminal as an historic landmark, and in the process articulated the multi-factor framework the courts use to analyze most regulatory takings claims today.[33] It also predates the Supreme Court's 1993 decision in *Lucas v. South Carolina Coastal Council*,[34] in which the Court ruled in favor of a takings claimant challenging a state restriction on beachfront development, applying a new per se rule that a regulation that denies the owner all economically viable use generally will be regarded as a taking.[35] However, the *Brecciaroli* decision presciently anticipated both of those decisions by embracing a two-tier approach to the takings analysis: applying a rule of virtual automatic liability to "confiscatory" regulations, while applying a more nuanced, facts-and-circumstances analysis to other regulations with less severe adverse economic impacts.[36]

The decision also was prescient insofar as the Connecticut Court implicitly applied a "parcel as a whole" approach in assessing the economic impact of the permit denial. Rather than focus on the economic impact of denial of permission to fill 5.3 acres of wetlands, the Court assessed the regulatory burden in the context of the entirety of the claimant's 20-plus

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29. *Id.* at 952.
30. *Id.*
31. *Id.*
32. *Penn Cent. Transp. Co. v. City of New York,* 438 U.S. 104, 125 (1978).
33. *Id*. at 125 ("In engaging in these essentially ad hoc, factual inquiries, the Court's decisions have identified several factors that have particular significance. The economic impact of the regulation on the claimant and, particularly, the extent to which the regulation has interfered with distinct investment-backed expectations are, of course, relevant considerations. So, too, is the character of the governmental action.").
34. *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003 (1992).
35. *Id.* at 1015.
36. *Brecciaroli,* 362 A.2d at 948-53.

acre parcel consisting of both uplands and wetlands.[37] This "parcel as a whole" approach was later explicitly embraced by the U.S. Supreme Court in the *Penn Central* case,[38] and recently reaffirmed by the Supreme Court in *Murr v. State of Wisconsin*, involving a takings challenge to zoning restrictions protecting a wild and scenic river corridor.[39]

## II. Richard Brooks' Reflections on Coastal Zone Management

In 2012, with the encouragement of his long-time colleague and former Dean of Vermont Law School Kinvin Wroth, Professor Brooks published a highly personal reminiscence about his involvement in the Connecticut coastal program in the Vermont Journal of Environmental Law. I will use Professor Brooks' observations and reflections in this article as the starting place for my own observations about Professor Brooks' contributions.

The central theme of Professor Brooks' 2012 article is that coastal zone management, as defined by current law and policy, "is best understood not as an effort to protect a natural coastal ecosystem, but rather as the development of a sustainable coastal community in which the natural ecosystem and coastal ways of life are maintained in a continuing balance."[40] This observation strikes me as both wise and useful. The coastal zone is an ecologically complex, biologically productive, and delicate portion of the landscape perched on a narrow knife edge between the ocean and the dry land. It includes many specific natural features – such as salt marshes, tidal flats, and barrier beaches – that are as worthy of aggressive preservation efforts as any other part of our nation's landscape.

But, as Professor Brooks' observation highlights, the coastal zone is already heavily developed and subject to intense development pressure. For many reasons, population density along the shore far exceeds the

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37. *Id*. at 952-53.

38. *Penn Cent. Transp.*, 438 U.S. at 129 ("Taking" jurisprudence does not divide a single parcel into discrete segments and attempt to determine whether rights in a particular segment have been entirely abrogated. In deciding whether a particular governmental action has affected a taking, this Court focuses rather both on the character of the action and on the nature and extent of the interference with rights in the parcel as a whole—here, the city tax block designated as the "landmark site.").

39. *Murr v. Wisconsin,* 137 S. Ct. 1933, 1949 (2017) (One potential argument that might have been made in the Breccaierolli case, but which the Court's opinion does not discuss, is that the department was not liable for a taking because the tidelands at issue were below the mean high-water line and therefore subject to the public trust doctrine. Under this argument, the Connecticut Supreme Court might have concluded that the public trust doctrine represents a "background principle' of state property law precluding the claimant from asserting a property entitlement to fill the tidelands to begin with, foreclosing a finding of takings liability on any theory); *see, e.g., Esplanade Properties, LLC v. City of Seattle,* 307 F.3d 978 (9th Cir. 2002) (rejecting a takings claim based on a regulatory restriction on tideland development based on the Washington public trust doctrine).

40. Brooks, *supra* note 2.

population density in the interior of the country. According to U.S. Census projections, population growth in the coastal zone is expected to increase at a faster rate than in the nation as a whole.[41] For understandable reasons, people like to live, work, and play in the coastal zone. In addition, many intensive land uses are necessarily, or at least preferentially, located in coastal zones, such as port facilities, energy plants, and sewage treatment plants.

Preservation of certain natural features of the coast represents a matter of national policy priority (nothing is finer in nature than a healthy expanse of spartina patens). But coastal zone management as a whole involves a complex balancing of human needs and ecological imperatives, or to use Professor Brooks' terms, "sustainable development" and "environmental protection." Several conclusions follow from this observation. One is that coastal management is characterized by "continuous tension," to use Professor Brooks' phrase, between pro-preservation and pro-development policies up and down the coast and over time. Another is that effective coastal zone management, if it is going to succeed in preserving any key natural features of the coast, calls for a strict segregation of land uses. At least some fragile portions of the coast must be effectively preserved while development that is inevitably destructive of natural features can also be accommodated.

Another point Professor Brooks made in his 2012 article is that the coastal zone defies application of a "unified system of environmental management."[42] Part of the challenge flows from our complex federal system. The federal government leads in providing policy direction and financial support. The states lead in developing the coastal programs. And, in many cases, local governments (such as in Connecticut) take a lead role in actual program implementation. Institutionalized conflict is the inevitable result, as I suggested above. Another difficulty is that many activities occurring outside the coastal zone affect the coastal zone's health but are not subject to coastal program regulation. For example, the operation of dairy farms in Tunbridge, Vermont, feeds pollutants into the Connecticut River and ultimately Long Island Sound, but these polluting activities are obviously not subject to regulation by Connecticut authorities.[43] Finally, while a coastal program involves focused regulatory scrutiny of certain

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41. NAT'L OCEANIC AND ATMOSPHERIC ADMIN., NATIONAL COASTAL POPULATION REPORT: POPULATION TRENDS FROM 1970 TO 2020 3 (Mar. 2013).

42. Brooks, *supra* note 2.

43. Nora Doyle-Burr, *Small Vermont Farmers Wrestle With New Water Quality Rules*, VALLEY NEWS (July 24, 2016), https://www.vnews.com/Farmers-Say-Proposed-New-Water-Rules-Could-Be-Burdensome-3171900.

activities within the coastal zone, cross-cutting regulatory programs address many issues affecting the coast, including water quality, energy facility siting, or waste disposal. With all this complexity, it is hard to define the coastal zone, identify the activities affecting the coast, or determine the impacts of these activities on the environmental health of the coastal zone—much less achieve the ultimate objective, which is to control these adverse impacts.

Scientific complexities compound the difficulties facing coastal managers. This is what Professor Brooks has dubbed "a serious lack of knowledge of ecosystemic relationship and the change in those relationships over time."[44] Professor Brooks laments that, in the context of the Connecticut coastal protection effort, "[t]here was no scientifically-guided [Long Island] Sound program." He contends that "proper assessments and monitoring were not undertaken." [45] But he also recognizes that the intractable nature of scientific inquiry has to be taken into account:

> Fisheries management cannot predict the relative impacts of water quality, habitat conditions, and other factors on the fish population. The impacts of many energy activities upon fish population and the sediment conditions are difficult to assess. The relative contributions of point sources and non-point sources to overall pollution of the Sound are difficult to quantify.[46]

In my view, Professor Brooks comes closest to hitting the nail on the head when he recognizes that institutional and programmatic failures are ultimately less important than the inherent difficulties of doing good science, which can effectively guide regulators and policy makers.

I had firsthand experience in the federal coastal zone office, faced with the challenge of evaluating the environmental consequences of governmental efforts to manage and protect the coastal zone. As the office approached reviewing initial applications for approval of state coastal programs, the question arose of how to assess the environmental impacts of program approvals in accordance with the National Environmental Policy Act (NEPA). To develop a strategy for performing the necessary NEPA analysis, I proposed the simple-minded, but I think sensible, idea that we assess how state permitting actions would change once a federally approved coastal program was in place. After all, if federal funding and review of

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44. Brooks, *supra* note 2, at 454.
45. *Id.*
46. *Id.*

state coastal planning efforts did not produce some improvement in the performance of state permitting programs, what was the purpose for the federal program? But for state officials more interested in securing federal funding than in changing their policy directions, the idea that federal program approval was designed to produce changes in state permitting results was problematic. Anyway, my reward for coming up with this bright idea was to camp out for several weeks each in Providence, Rhode Island and Augusta, Maine. And for those weeks, I reviewed state permitting files to identify which permitting actions might be "improved" once a federally sanctioned program was in place. I was, to say the least, an unpopular visitor and in each state an unfortunate assistant attorney general had to accompany me during every minute of my visit. In the end, the federal office was satisfied this technique met the requirements of NEPA. As far as I know, no one challenged this conclusion and the Maine and Rhode Island coastal programs were approved. Whether the performance of these programs actually improved as a result of federal financing and oversight, I haven't a clue.

## III. The Coastal Zone in the Era of Sea Level Rise

Richard Brooks' coastal zone career largely predates the emergence of the most urgent coastal zone management issue today – ongoing and projected sea level rise due to climate change. While we have recognized the mechanism of global warming for over a century,[47] only in the last several decades have we recognized global warming in general and sea level rise in particular as critical public policy challenges. The first World Climate Conference, which ultimately led to the establishment of the Intergovernmental Panel on Climate Change, was held in 1979. Domestically, the U.S. Council of Environmental Quality, led by Vermont Law School's own Gus Speth, issued the first high-level official warning about climate change and its potential environmental consequences in a 1980 report to the president.[48] Even if our public policy responses have not been commensurate with the magnitude of the threat posed by climate change, the subsequent growth in our understanding of the threat, and about sea level rise in particular, has been breathtaking..

According to the latest information from the U.S. Global Change Research Program, "global average sea level has risen by about 7-8

47. Svante Arrhenius, *On the Influence of Carbonic Acid in the Air upon Temperature on the Ground*, 41 PHIL. MAG. & J. OF SCI. 237, 237-39 (1896).

48. U.S. COUNCIL FOR ENV'T QUALITY, THE GLOBAL 2000 REPORT TO THE PRESIDENT--ENTERING THE TWENTY-FIRST CENTURY 12 (1980.)

inches since 1900, with almost half (about 3 inches) of that rise occurring since 1993."[49] Looking to the future, the program's recent Climate Science Special Report predicts that "Global average sea levels are expected to continue to rise by at least several inches in the next 15 years and by 1-4 feet by 2100."[50] Ominously, taking into account new information about ice sheets melting in Greenland and Antarctica, the report says, "A rise of as much as 8 feet by 2100 cannot be ruled out."[51] If, eventually, all of the ice covering Antarctica, Greenland, and mountain glaciers around the world were to melt, sea level would rise by several hundred feet.[52]

The original version of the federal Coastal Zone Management Act said nothing about sea level rise.[53] However, the last set of comprehensive amendments to the federal act, the Coastal Zone Act Reauthorization Amendments of 1990, embrace the issue of climate change.[54] The amendments include the following forceful finding:

> Global warming results from the accumulation of man-made gases, released into the atmosphere from such activities as the burning of fossil fuels, deforestation, and the production of chlorofluorocarbons, which trap solar heat in the atmosphere and raise temperatures worldwide. Global warming could result in significant global sea level rise by 2050 resulting from ocean expansion, the melting of snow and ice, and the gradual melting of the polar ice cap. Sea level rise will result in the loss of natural resources such as beaches, dunes, estuaries, and wetlands, and will contribute to the salinization of drinking water supplies. Sea level rise will also result in damage to properties, infrastructure, and public works. There is a growing need to plan for sea level rise.[55]

The 1990 amendments also added to the Coastal Act's declaration of policy statements that state programs developed under the Act should

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49. U.S. Climate Science Special Report, *Executive Summary: Highlights of the Findings of the U.S. Global Change Research Program Climate Science Special Report*, https://science2017.globalchange.gov/ (last visited Nov. 10, 2018).

50. *Id*.

51. *Id*.

52. NAT'L SNOW AND ICE DATA CTR., *Facts About Glaciers*, https://nsidc.org/cryosphere/glaciers/quickfacts.html (last visited Nov. 10, 2018).

53. *See* 16 U.S.C. § 1451 (1976).

54. Coastal Zone Act Reauthorization Amendments of 1990, Pub. L. No. 101-508, 104 Stat. 1388–299.

55. *Id.* at 1388–300. The 1990 amendments also amended the findings supporting the coastal act itself, to state: "because global warming may result in a substantial sea level rise with serious adverse effects in the coastal zone, coastal states must anticipate and plan for such occurrence." 16 U.S.C. § 1451 (l).

provide for "the management of coastal development to minimize the loss of life and property caused by improper development in ... areas likely to be affected by or vulnerable to sea level rise," and "the study and development … in any case in which the Secretary considers it appropriate, of plans for addressing the adverse effects upon the coastal zone of land subsidence and of sea level rise."[56] The amendments also authorized the federal coastal office to make special "enhancement" grants to the states to address the effects of sea level rise.[57] Numerous states have taken advantage of this program, at least up to the advent of the current administration.[58]

While my current knowledge of coastal planning efforts is only fragmentary, my understanding is that coastal managers are deferring the major work of addressing the threat of sea level rise into the future. It is doubtful that this head-in-the-sand approach can continue for very long. One important challenge is devising an effective, efficient, and equitable process for helping communities implement organized retreat from the eroding shore. According to one report, based on projections developed by Zillow, rising seas will likely submerge nearly 1,000,000 Florida properties worth more than $400 billion .[59] Another issue is how to manage the use and development of lands behind coastal defense structures, to the extent that states and local communities can successfully defend against the rising seas, even if only temporarily.[60] Yet another urgent question is whether the nation should place a moratorium on the expenditure of untold millions of dollars for acquiring for conservation coastal lands slated to soon be overcome by rising seas. If Professor Brooks has the time, in his self-described "old age," to help address these issues, we could use the benefit of his wisdom and experience.[61]

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56. 16 U.S.C. 1452(2)(K) (2017).
57. 16 U.S.C. 1456(b) (1992).
58. U.S. GOV'T ACCOUNTABILITY OFF., CLIMATE CHANGE: INFORMATION ON NOAA'S SUPPORT FOR STATES' MARINE COASTAL ECOSYSTEM RESILIENCE EFFORTS 9-13 (Sept. 2016).
59. Christopher Flavelle, *The Nightmare Scenario for Florida's Coastal Homeowners*, BLOOMBERG, https://www.bloomberg.com/news/features/2017-04-19/the-nightmare-scenario-for-florida-s-coastal-homeowners (last updated Apr. 19, 2017, 5:33 PM).
60. John D. Echeverria, *Managing Lands Behind Shore Protection Structures in the Era of Climate Change*, 28 J. LAND USE & ENVT. L. 71, 77 (2012).
62. Brooks, *supra* note 2.