SHORE PROTECTION FOR A SURE TOMORROW: EVALUATING COASTAL MANAGEMENT LAWS IN SEVEN SOUTHEASTERN STATES

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I. INTRODUCTION

Shoreline erosion is a natural geological process, but it becomes a problem when anthropocentric activities are adversely impacted. Sea level rise increases shoreline erosion by shifting coastal waters landward, displacing sediment, and increasing flooding, which in turn affects property ownership.[2] Coastal states have enacted shore protection laws based on various policy goals ranging from protecting property to preserving public beach access to conserving coastal ecosystems in response to shoreline erosion. As sea levels rise, the effectiveness of these laws is tested. Policymakers may soon face pressure to reconsider shore protection laws or risk leaving ineffective laws in place, so an analysis of existing laws is increasingly relevant.

Coastal erosion occurs when wind and waves transport sediments from the shore. In fact, sediments are in constant motion on the beach.[3] Beaches are the primary defense against severe weather events, coastal erosion, and sea level rise.[4] Specifically, sand dunes serve as natural barriers against wind and waves by absorbing storm surge energy and offering beach stabilization through the root

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[2] NIKI L. PACE, WETLANDS OR SEAWALLS? ADAPTING SHORELINE REGULATION TO ADDRESS SEA LEVEL RISE AND WETLAND PRESERVATION IN THE GULF OF MEXICO, 26 J. LAND USE & ENVTL. L. 327 (2011); CARL H. HOBBS, THE BEACH BOOK: SCIENCE OF THE SHORE 144-160 (2012); Omar Defeo et al., *Threats to Sandy Beach Ecosystems: A Review*, 81 ESTUARINE, COASTAL & SHELF SCIENCE 1, 1-12. Federal coastal management laws and the public trust doctrine are outside the scope of this research.

[3] The movement of sediments is called littoral drift or longshore drift. GIS software, aerial photographs over time, and other modeling methods can reveal such movement. *See* Chester W. Jackson Jr. et al., *Application of the AMBUR R Package for Spatio-Temporal Analysis of Shoreline Change: Jekyll Island, Georgia, USA*, 41 COMPUTERS & GEOSCIENCES 199 (2012).

[4] Here, the shoreline refers to the location where the water meets the land. The beach is defined as the land covered in sand along the shore.

systems of coastal vegetation on those dunes.[5] In addition, beaches provide many ecosystem services such as biodiversity and recreation. When beaches erode, the consequences can be extensive. For example, habitat loss has contributed to the endangerment of all U.S. sea turtle species and many migratory shorebirds.[6] While beaches offer unique habitats for biodiversity, they also provide value through recreation and tourism.[7] To protect the ecosystem services beaches provide while balancing interests to develop coastal property, state governments have created jurisdictional areas using setback lines where some development may occur with a permit.

This article discusses the setback lines creating shoreline jurisdictional areas in seven states in the Southeast and Mid-Atlantic: Alabama, Florida, Georgia, Maryland, North Carolina, South Carolina, and Virginia. Part II provides a summary of evidence related to both sea level rise and coastal erosion on beaches in the southeastern United States. Part III describes the governing shore protection laws, particularly the jurisdictional area delineating where persons can and cannot build without a permit. The statutes and regulations of these seven southeastern states are reviewed using a framework of fixed, floating, hybrid, or other setback lines.[8] The analysis of each state includes excerpts of exemptions and enforcement provisions to provide a better scope of how the shores are protected. Finally, Part IV presents an adaptive management approach in which state laws would include methods to regularly review setback lines at given intervals and suggests future research avenues. While acknowledging the uniqueness of each state in terms of policy objectives, geography, and other relevant state laws, implementing provisions requiring regular review of setback lines is the best method to protect shores over fixed or floating lines.

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[5] *Shoreline & Waterway Management: Dune Protection and Improvement*, STATE OF DEL., http://www.dnrec.delaware.gov/swc/shoreline/pages/duneprotection.aspx (last visited Aug. 14, 2019).

[6] *See* Jacques-Olivier Laloë et al., *Climate Change and Temperature-Linked Hatchling Mortality at a Globally Important Sea Turtle Nesting Site*, 23 GLOBAL CHANGE BIOLOGY 4922 (2017); *Coastal Bird Conservation*, AUDUBON, http://ny.audubon.org/conservation/coastal-bird-conservation (last visited Aug. 14, 2019).

[7] Eva Kaján & Jarkko Saarinen, *Tourism, Climate Change and Adaptation: A Review*, 16 CURRENT ISSUES IN TOURISM 167 (2013).

[8] Dennis J. Hwang, *Shoreline Setback Regulations and the Takings Analysis*, 13 U. HAW. L. REV. 1 (1991).

II. EVIDENCE OF SEA LEVEL RISE AND EROSION IN THE SOUTHEASTERN UNITED STATES

Sea level rise is one of the most visible effects of climate change.[9] In the southeastern United States, the sea level has risen approximately eight inches in the past 100 years and current projections show that the rate of sea level rise is expected to accelerate in the next 100 years.[10] Chesapeake Bay waters have risen approximately one foot in the past century and are predicted to rise an additional 1.3 to 5.2 feet in the next century.[11] Infrastructure is at risk as more flooding and extreme weather events pressure public services such as transportation and sewer systems.[12] Furthermore, sea level rise contributes to wetland and habitat loss, as well as causing saltwater intrusion that affects energy systems and agricultural production by inundating freshwater used for irrigation.[13]

Sea level rise also imposes an undue burden on under-resourced populations raising environmental justice concerns.[14] The effects of climate change are already pressuring communities to migrate inland.[15] For example, the Biloxi-Chitimacha-Choctaw Indians on the Isle de Jean Charles in Louisiana are among the climate-vulnerable tribal coastal communities pressured to relocate, which presents significant economic, cultural, health, and human rights concerns.[16] This is just a snapshot of environmental and social issues resulting

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[9] *See* DONALD J. WUEBBLES ET AL., UNITED STATES GLOBAL CHANGE RESEARCH PROGRAM, 2018: CLIMATE SCIENCE SPECIAL REPORT: FOURTH NATIONAL CLIMATE ASSESSMENT, VOLUME I [hereinafter NATIONAL CLIMATE ASSESSMENT], https://science2017.globalchange.gov/downloads/CSSR2017_FullReport.pdf (last visited Aug. 14, 2019).

[10] *Id*.

[11] Coastal erosion is especially apparent on the Chesapeake Bay's Tangier Island in Virginia. The island has shrunk an average of eight acres per year since 1850. *Climate Change*, CHESAPEAKE BAY PROGRAM, https://www.chesapeakebay.net/issues/climate_change (last visited Aug. 14, 2019); Simon Worrall, *Tiny U.S. Island is Drowning. Residents Deny the Reason*, NAT'L GEOGRAPHIC, Sept. 7, 2018, https://www.nationalgeographic.com/environment/2018/09/climate-change-rising-seas-tangier-island-chesapeake-book-talk/ (last visited Aug. 14, 2019).

[12] Shana Jones et al., *Roads to Nowhere in Four States: State and Local Governments in the Atlantic Southeast Facing Sea-Level Rise*, 44 COLUMBIA J. OF ENVTL. L. 1 (2019).

[13] NATIONAL CLIMATE ASSESSMENT, *supra* note 9, at 13.

[14] Mathew E. Hauer, *Migration Induced by Sea-Level Rise Could Reshape the US Population Landscape*, 7 NATURE CLIMATE CHANGE 321 (2017).

[15] NATIONAL CLIMATE ASSESSMENT, *supra* note 9, at 322.

[16] Julie Koppel Maldonado et al., *The Impact of Climate Change on Tribal Communities in the U.S.: Displacement, Relocation, and Human Rights*, 120 CLIMATIC CHANGE 601 (2013); Eli Keene, *Resources for Relocation: In Search of a Coherent Federal Policy on Resettling Climate-Vulnerable Communities*, 48 TEX. ENVTL. L.J. 119 (2018).

from sea level rise and erosion, and demonstrates the timely need to evaluate shore protection state laws as tools to defend coastal communities and ecosystems.

III. SHORE PROTECTION LAWS IN SEVEN SOUTHEASTERN STATES

Three broad types of beach management strategies to combat erosion exist: beach nourishment, coastal armoring, and retreat.[17] Beach nourishment is a "soft armoring" technique in which sand is added to the shore to mitigate erosion. Despite avoiding the shortcomings of coastal "hard" armoring options, beach nourishment is expensive and disturbs wildlife habitats like turtle nesting locations.[18] Further, adding sand to a dynamic, eroding beach is only a temporary solution, so beach nourishment eventually becomes beach renourishment.[19] Coastal armoring techniques, like seawalls, also impact habitats for wildlife and vegetation.[20] Coastal armoring is expensive, and the construction of hard structures increases the rate of erosion on the beach as the slope offshore steepens.[21] The third type of management tool is retreat. Retreat prevents development from encroaching onto beaches mitigating habitat loss and protecting property from storm damage.[22] Shore protection laws apply to all three types of coastal management, but the permitting process for certain activities examined in this article fits best within the retreat category.

Shore protection laws establish setback lines to form jurisdictional areas. The purpose of jurisdictional areas is to stabilize shorelines between the land and the sea by permitting only certain activities and preventing development too close

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[17] *Coastal Armoring*, UNIVERSITY OF CALIFORNIA, SANTA BARBARA: EXPLORE BEACHES, http://explorebeaches.msi.ucsb.edu/beach-health/coastal-armoring (last visited Aug. 14, 2019).
[18] *Beach Nourishment*, UNIVERSITY OF CALIFORNIA, SANTA BARBARA: EXPLORE BEACHES, http://explorebeaches.msi.ucsb.edu/beach-health/beach-nourishment (last visited Aug. 14, 2019); Boris Worm et al., *Impacts of Biodiversity Loss on Ocean Ecosystem Services*, 314 SCIENCE 787 (2006); Megan Mullin et al., *Paying to Save the Beach: Effects of Local Finance Decisions on Coastal Management,* 152 CLIMATIC CHANGE 275 (2018).
[19] Charles H. Peterson & Melanie J. Bishop, *Assessing the Environmental Impacts of Beach Nourishment*, 55 BIOSCIENCE 887 (2005).
[20] A.T. Williams et al., *The Management of Coastal Erosion*, 156 OCEAN & COASTAL MGMT. 4 (2018).
[21] *Coastal Armoring*, *supra* note 17.
[22] Frank E. Marshall & K. Banks, *Shoreline Habitat: Beaches*, *in* INTEGRATED CONCEPTUAL ECOSYSTEM MODEL DEVELOPMENT FOR THE SOUTHEAST FLORIDA COASTAL MARINE ECOSYSTEM 94 (W.K. Nuttle & P.J. Fletcher eds., 2013), https://repository.library.noaa.gov/view/noaa/9408 (last visited Aug. 14, 2019).

to the ocean.[23] Setback lines are used to identify where development seaward of certain physical beach features is prohibited – an area often referred to as the "no-build area" – and where development landward of those features may occur with an approved permit. In this way, jurisdictional lines reduce costs associated with rebuilding after major weather events or flooding by preventing development in the most vulnerable coastal areas. Therefore, shore protection laws are particularly relevant to protect the government from bearing substantial costs resulting from environmental damage.[24] In fact, most southeastern states identify the cost of restoring damaged shorelines as a primary justification for enacting coastal management laws.[25]

All of the states reviewed use "fixed," "floating," "hybrid," or "other" setback lines to establish the jurisdictional areas for coastal development.[26] Fixed setback lines identify a length from certain features (i.e., elevation contours, shore protection structures, mean high or low water marks) while floating setback lines vary by measuring and applying coastal erosion rates. North Carolina, South Carolina, and Virginia apply coastal erosion rates while Alabama and Maryland use specific lengths from certain features to identify jurisdictional areas. Florida applies both fixed and floating setback lines depending on the location. Georgia originally applied a unique formula, but the Georgia General Assembly changed the jurisdictional area to a fixed setback line in May 2019.[27]

Fixed setback lines are bright-line rules, so they are easier to identify and enforce as they are more consistent across the state. Most laws establishing fixed setback lines, however, do not have a procedure to update the lines as the geographic features anchoring those lines change. The lack of a formal procedure to review the setback lines prevents states from applying the best available science to sea level rise. Floating setback lines are more difficult to identify and enforce because unlike state plane coordinates or a similar method to establish a statewide line, the line applies a formula using erosion rates which vary by location. More specific information is needed for specific locations. Thus, states with legal provisions to adjust floating setback lines follow the adaptive management approach more closely and probably offer better shore protection.

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[23] Legal provisions regarding coastal erosion control structures, such as living shorelines and shoreline armoring permits, are outside the scope of this research.
[24] Sathya Gopalakrishnan et al., *Economics of Coastal Erosion and Adaptation to Sea Level Rise*, 8 ANN. REV. OF RESOURCE ECON. 119 (2016).
[25] GA. CODE ANN. § 12-5-230 and § 12-5-231.
[26] Hwang, *supra* note 8.
[27] GA. CODE ANN. § 12-5-232.

A. Fixed Setback Lines: Certain Jurisdictional Areas for an Uncertain Future

Alabama and Maryland use fixed setback lines to distinguish the no-build zone from the area that may allow certain permitted activities.[28] These lines are consistent across the state, but the laws lack a formal procedure to update the jurisdictional area based on emerging data. In Alabama, the line covers the two coastal counties: Mobile and Baldwin. In Maryland, Ocean City is the only ocean-fronting location.

i. Alabama

Alabama's Department of Environmental Management establishes a fixed setback line through the Alabama Coastal Area Management Program (ACAMP) within the coastal area to protect coastal area resources.[29] The inland boundary of the coastal area is the continuous contour line ten feet above mean sea level from the Mississippi-Alabama state line extending eastward through Baldwin and Mobile Counties to the Alabama-Florida state line.[30] The coastal area outward boundary is the limit of the United States territorial sea.[31] Within the coastal area, construction and substantial improvements are prohibited on land between the mean high tide line and the coastal construction control line.[32]

The construction control line (CCL) is Alabama's statewide, fixed minimum setback which uses state plane coordinates for identification.[33] No statutory provisions exist to update the CCL. In one part of the coastal area, the coordinates are based on local monuments.[34] In another part, the CCL is forty feet landward of the most inland crestline except in business, touring, and lodging

[28] Georgia's Shore Protection Committee or an authorized local unit of government determines the fixed shorefront jurisdictional line using information gathered from site inspections, photographs, and similar techniques to best protect the sand-sharing system. The Coastal Resources Division Staff for the Shore Protection Committee marks the jurisdictional line with survey flags or tape creating the no-build area. *Id.* § 12-5-235.
[29] ALA. CODE §§ 9-7-12, 9-7-15.
[30] *Id.* § 9-7-10; ALA. ADMIN. CODE r. 335-8-1-.02(k).
[31] ALA. CODE § 9-7-10.
[32] ALA. ADMIN. CODE r 335-8-2-.08(1). Substantial improvement refers to any improvement increasing the structure size and is otherwise subject to local building ordinances that is equal to or more than 50% of the structure's fair market value. *Id.* r 335-8-1-.02(jjj)(2).
[33] *Id.* r 335-8-1-.02(p).
[34] *Id.*

(BTL) and business central resort (BCR) zones.[35] In the BTL and BCR zones, the CCL is five feet landward of the most inland crestline.[36]

Permits are required for proposed activities landward of the coastal CCL that would result in a significant impact on coastal resources.[37] Proposed activities must coincide with the program's list of permissible uses.[38] Permissible uses include agriculture, emergency activities, normal maintenance, minor activities, and research and conservation efforts.[39] Specifically, permits are required for the removal or alteration of primary dune systems, beach sands or vegetation, construction, or any substantial improvement landward of the CCL within the coastal area.[40] A permit is also required for the construction of single family dwellings and duplexes, as well as commercial and residential developments larger than five acres adjacent to coastal waters, intercepted by the CCL, or on wetlands, unless the project otherwise requires a federal permit.[41]

Variances may be granted through an application process when property would be taken without compensation or is unduly restrictive. To get a variance, there must not be a feasible alternative and negative impacts must be minimized.[42] The variance can include additional conditions to limit the project's impacts on the coastal area. In 1994, Alabama's enforcement provision was repealed.[43]

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[35] ALA. ADMIN. CODE r. 335-8-1-.02(p). The crestline is the line connecting the peaks of the dunes in the primary dune system. *Id.* r. 335-8-1-.02(q).
[36] *Id.* r. 335-8-1-.02(p).
[37] *Id.* r. 335-8-2-.01. A significant impact is the result of any activity with more than a negligible adverse effect on the coastal area. *Id.* r. 335-8-1-.02(bbb).
[38] ALA. CODE §§ 9-7-13, 9-7-20; ALA. ADMIN. CODE r. 335-8-1-.05.
[39] ALA. CODE § 9-7-13(a)(8). Activities must also comply with air and water quality standards and consider potential negative impacts on designated historical, architectural, or archaeological sites, critical habitats, and public access to recreational resources. ALA. ADMIN. CODE r. 335-8-2-.01. Some temporary activities, like using beach umbrellas and volleyball equipment, that occur seaward of the CCL are not subject to the ACAMP permits if all materials are removed from the area prior to inclement weather. *Id.* r. 335-8-2-0.8(8).
[40] ALA. ADMIN. CODE r. 335-8-2-.08.
[41] *Id.* r. 335-8-2-.11. Structures containing more than two dwelling units must submit an Environmental Impact and Natural Hazards Study. *Id.* r. 335-8-2-.08(3)(d).
[42] *Id.* r. 335-8-1-.13.
[43] *Id.* r. 335-8-1-.32.

ii. Maryland

Most of Maryland's coastal management laws pertain to the Chesapeake Bay, which is not ocean-fronting.[44] Maryland's Department of Natural Resources (MDNR) follows the Beach Erosion Control and Replenishment Act to identify the Beach Erosion Control District and protect the beach and dunal systems.[45] The Beach Erosion Control District protects Ocean City, Maryland from coastal erosion and sea level rise as Ocean City is the only municipality facing the Atlantic Ocean on the state's barrier island. Maintaining the beach and dunal systems, controlling sediment movement, and protecting against storms may reduce restoration costs.[46]

The Beach Erosion Control District is the area of land between the boundary line of Maryland and Delaware, the Atlantic Ocean, the Ocean City inlet to the south, and the State-Ocean City building limit line to the west.[47] The local district establishes the setback line ("State-Ocean City Building Limit Line") that covers the jurisdictional area seaward to the ocean.[48] The boundary of the State-Ocean City Building Limit Line is identified by control points, which are surveying points similar to Alabama's state plane coordinates identifying the CCL.[49] The State-Ocean City Building Limit Line generally coincides with Ocean City's building limit line, as well as with the crest of the littoral system.

Prohibited actions within the Beach Erosion Control District are land clearing, construction activity, and the construction of permanent structures.[50] The MDNR or the Worcester County Natural Resources Division of the Department of Environmental Programs ("Natural Resources Division") approves permits for acceptable activities in the Beach Erosion Control District.[51] The environmental impact, navigational impact, recreational potential, and commercial benefit are

[44] Georgia Sea Grant is currently researching coastal wetland protections laws in these seven states. Legal provisions governing the protection of the Chesapeake Bay against coastal erosion and sea level rise will be analyzed in that upcoming publication.
[45] MD. CODE. ANN., NAT. RES. §§ 8-1101-8-1102.
[46] *Id.* § 8-1101.
[47] Specifically, the Beach Erosion Control District is Ocean City and Assateague Island. *Id.* § 8-1105.1.
[48] *Id.*
[49] MD. CODE REGS. 08.09.02.02.
[50] MD. CODE. ANN., NAT. RES. § 8-1102; MD. CODE REGS. 08.09.01.02.
[51] *Shoreline Construction*, WORCESTER COUNTY, MARYLAND, http://www.co.worcester.md.us/departments/env/natural/shore (last visited Aug. 15, 2019).

considered in the permit review process.[52] Public comment is also taken into account, as well as the effect on surrounding property values by any development.[53] Both the MDNR and the Natural Resources Division have authority to enforce permits, but no specific statutory or regulatory enforcement provisions exist in the Act.[54]

iii. Georgia

Georgia's Shore Protection Act of 1979 was designed to protect the state's coastal sand dunes, beaches, sandbars, and shoals, together known as the sand-sharing system.[55] The system serves as the interdependent buffer that defends barrier islands from ecosystem damage due to severe weather events and erosion. The sand-sharing system is important for the promotion of recreation, public health and safety, and the economy. Reconstruction and rehabilitation of the sand-sharing system is "costly, if not impossible," so the Shore Protection Act seeks to conserve the buffer for "present and future use."[56] The jurisdictional area, termed the dynamic dune field, covers land from the setback line to the ordinary low water mark.[57] In May 2019, Georgia changed its setback line.[58]

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[52] *Id.*
[53] *Id*.
[54] *See* MD. CODE REGS. 08.09.01.03.
[55] GA. CODE ANN. §§ 12-5-230-12-5-231.
[56] *Id.*
[57] *Id,*; Rolleston v. State, 266 S.E.2d 189, 191-192 (1980). Perhaps not surprisingly Georgia's jurisdictional line was challenged soon after its enactment for being unconstitutionally vague. In 1980, the Shore Assistance Committee denied a property owner's permit application to build a bulkhead for erosion control on Sea Island, yet approved permits for a revetment by a nearby property owning corporation. The property owner appealed and argued that the Act was unconstitutionally vague. The Supreme Court of Georgia held that the resulting zig zag jurisdictional line "tree line" was rationally related to the Shore Protection Act, the Shore Protection Act was clear and unambiguous, and denying a property owner's permit while granting others was not arbitrary, discriminatory, or unconstitutional. The court acknowledged that the "tree line" indicates a stable area but is a moving line; in some instances, trees marking the line have fallen implying a newly unstable area. The line then moves landward to the next qualifying tree. On the same note, a permit is required for the clearing of vegetation or landscaping, so the "tree line" is not subject to manipulation. This case was the first interpretation of the Shore Protection Act, and established the law's constitutionality and the Department's jurisdiction to approve or deny permits. The property owner also argued that federal law preempted beach regulation to the high water mark, but since the argument was raised on appeal, the Supreme Court of Georgia did not rule on the merits.
[58] GA. CODE ANN. § 12-5-232(8).

From 1979 to early 2019, Georgia's setback line was unique because it connected live, native trees twenty feet in height or greater to any structure existing on July 1, 1979 as long as the distance between the two types of features was a reasonable distance no more than 250 feet.[59] No other state in this study area draws its setback line in this way. As Figure 1 indicates below, this created a zig-zag line as the upper, landward boundary of the dynamic dune field. This approach was unique because, while the jurisdictional line could move if a tree or structure is removed, the line ultimately was not designed to do so – and, for example, when a feature such as a tree fell, the line moved to the next qualifying tree.[60] The line stayed relatively fixed and allowed for movement based on dynamic information such as erosion rates. Even so, the resulting zig-zag jurisdictional line was difficult for managers in Georgia to enforce. Further, the jurisdictional line was problematic because it included areas that did not necessarily require protection (e.g., parking lots) while excluding areas that were within the sand-sharing system.

[59] *Id.* A real estate appraiser may determine that an existing structure, shoreline engineering activity, or other alteration at the landward boundary of the dynamic dune field has been more than 80% destroyed by weather events or erosion, the landward boundary will be as if the structure did not exist on July 1, 1979. *Id.*
[60] *Rolleston*, 266 S.E.2d at 191.

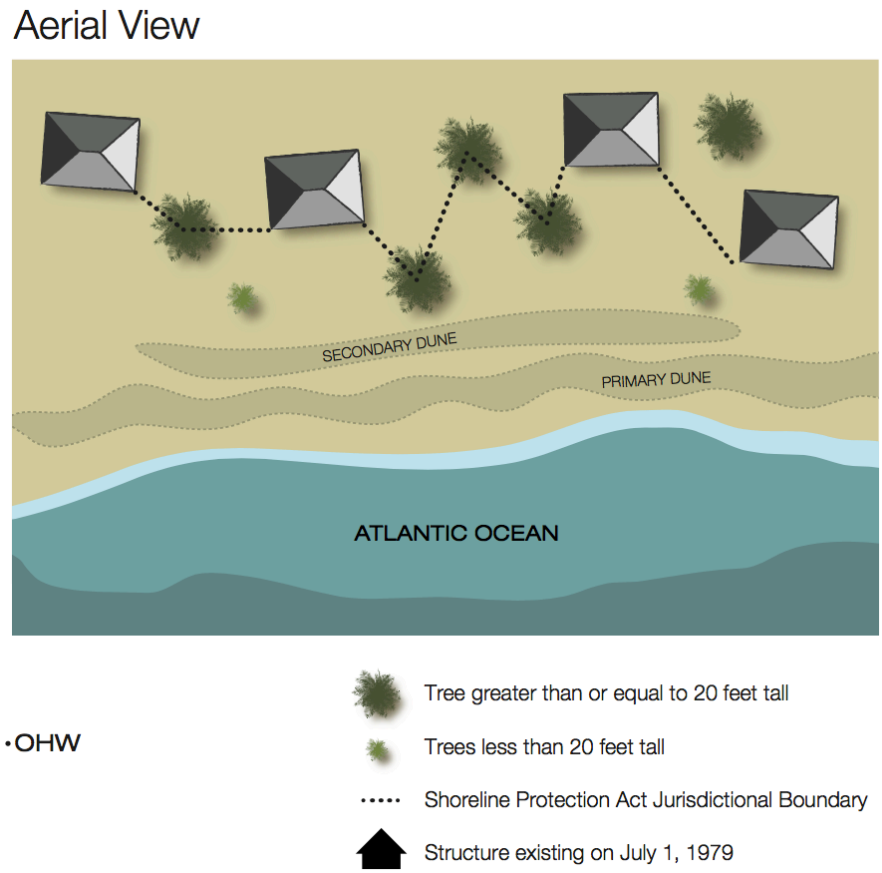

Figure 1. Carl Vinson Institute of Government, 2015.

In May 2019, Georgia enacted a new fixed setback line making the jurisdictional dynamic dune field area more predictable and enforceable.[61] Rather than connecting live native trees taller than twenty feet to a pre-1979 structure, the landward line is now the first occurrence of either the seaward most portion of a pre-1979 structure or twenty-five feet landward of the landward toe of the most landward sand dune. Alternatively, the setback line is now twenty-five feet landward of the crest of a serviceable stabilization activity. If a sand dune or a serviceable stabilization activity are absent, the line must be twenty-five feet landward of the ordinary high water mark.[62] State-owned property follows a

[61] GA. CODE ANN. § 12-5-232.
[62] *Id.* A serviceable shoreline stabilization activity involves an artificial method of changing the topography or vegetation of components within the sand-sharing system, such as beach renourishment, that requires only minimal maintenance.

different fixed line; the line must be 100 feet landward of the ordinary high water mark.[63]

While the Shore Protection Act's policy objective remains to protect the sand-sharing system, not all construction or development is prohibited. Rather, the following three categories of activities are allowed if a permit is granted: any construction of a structure such as a building; shoreline engineering projects;[64] or alterations of the natural topography[65] or vegetation of land within the jurisdictional area.[66] Because the Shore Protection Act grandfathered activities prior to July 1, 1979, permits are not required for structures, shoreline engineering activity, or land alteration that existed on or before July 1, 1979 unless any modification, addition, or extension of the activity would have a negative impact on the sand-sharing system.[67] However, permits for reconstruction are required if grandfathered structures, shoreline engineering activity, or land alterations have been damaged by more than 80% of the fair market value from wind, water, or erosion.[68] These reconstruction permits may become increasingly necessary as sea level rise stresses the shoreline.[69]

Projects that will affect the jurisdictional dynamic dune field area may be permitted if a series of requirements are met: the proposed activity occupies the landward part of the parcel and is landward of the sand dunes if feasible; more

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[63] *Id.*

[64] Permits for shoreline engineering activity or land alteration on beaches, sand dunes, or submerged lands are issuable if activities are temporary and the area affected will be restored upon project completion to promote the functions of the sand-sharing system. If shoreline stabilization is necessary and no reasonable or feasible alternative exists, "low-sloping porous rock structures or other techniques which maximize the dissipation of wave energy and minimize shoreline erosion" shall be used. *Id.* § 12-5-239(c)(3).

[65] Permits for construction of a pier, boardwalk, or crosswalk on beaches, eroding sand dune areas, or submerged lands will be granted if the natural vegetation and topography are restored after the project and the activity will maintain the sand-sharing system functions. *Id.* § 12-5-239(c)(2).

[66] *See id.* § 12-5-239(c)(2)(A).

[67] In addition, the potential permittee may be eligible for letters of permission to exempt some activity from requiring a permit. The Department of Natural Resources must provide public notice describing the activity and location at least 15 days before the activity begins. However, public notice is not required for activity that is necessary for public safety or the delivery of public services. In addition, the Shore Protection Committee or authorized local unit of government can implement immediate action in the event of an emergency to protect the public interest. *Id.* § 12-5-237(b).

[68] *Id.*

[69] The Shore Protection Committee reviews permit applications. Committee members maintain the authority to issue orders, grant, suspend, revoke, modify, extend, condition, or deny permits. The committee may also renew permits if certain conditions are met. *Id.* § 12-5-235.

than 30% of the parcel will be retain its natural vegetation and topography; the proposed project follows applicable hurricane-resistant standards; activities are minimized and temporary; the natural vegetation and topography are restored using best available technology upon project completion; and the proposed project will uphold the functions of the sand-sharing system.[70]

Public interest considerations based on reasonableness are a key standard to granting a permit.[71] First, the permitted project must not cause unreasonable harm to the sand-sharing system. The reasonableness standard balances the interests of the proposed activity against the protection of the shore. Second, the project must not unreasonably interfere with sea turtle or shorebird conservation. Finally, the project must not unreasonably interfere with recreational use and enjoyment of public properties.[72] Once a permit is granted, the project may continue without an additional permit if the activity does not further alter the natural topography or vegetation of the site or increase the size or scope of the project, and remains in serviceable condition."[73]

The Department of Natural Resources Shore Protection Committee has the authority to enforce permits for lack of conformance, violations, or non-compliance with other local, state, or federal laws.[74] Enforcement is authorized when individuals violate the conditions of their permit or alter the dynamic dune field or submerged lands without an approved permit. Violations, encompassing both acting without a permit and violating permit conditions, are considered a public nuisance and may result in a temporary restraining order, permanent or temporary injunction, or other order.[75] The appropriate corrective action is to return the sand dunes, beaches, and submerged lands to their condition prior to the violation.[76]

Similarly, individuals who alter the dynamic dune field or submerged lands without a valid permit are liable in damages to the "state and any political subdivision of the state" for "any and all actual and projected costs and expenses

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[70] *Id.* § 12-5-239(c); GA. COMP. R. & REGS. 391-2-2-.02.
[71] One Hundred Miles v. Shore Prot. Comm., No. 1630908-60, 2016 WL 8711743, at 22-24 (Ga. Bd. Nat. Res. Aug. 26, 2016) (holding that a permit for construction of a rock groin, beach nourishment, and dune construction was appropriate on Sea Island in Glynn County).
[72] *Id.*
[73] GA. CODE ANN. § 12-5-237(a).
[74] The Shore Protection Committee can determine compliance using photos, topographic data, on-site inspections, academic literature, and other data. *Id.*; *see also Id.* §§ 12-5-235 and 12-5-239.
[75] *Id.* § 12-5-245.
[76] *Id.* § 12-5-247.

and injuries occasioned by such alteration."[77] Specifically, the damages shall cover the actual and projected cost of restoring the sand-sharing system and replacing the vegetation destroyed by the alteration of the dynamic dune field or submerged lands.[78] Provisions of Georgia's Shore Protection Act can be enforced by a temporary restraining order, injunction, requiring restoration of the affected lands to their prior condition, or restitution for damages. A maximum fine of $10,000 may also be issued for each violation.[79]

A. Floating Setback Lines: Using Erosion Rates to Create Jurisdictional Areas

State laws establishing floating setback lines provide procedures to update setback lines based on the best available scientific data. These laws more closely align with adaptive management techniques, especially in applying an iterative approach for science-based decision-making. North Carolina, South Carolina, Virginia, and Florida apply floating regulations. In these states, setback lines are reevaluated on established intervals.[80]

i. North Carolina

North Carolina's Department of Environmental Quality Coastal Resources Commission (Commission) regulates jurisdictional boundaries, or "development lines," for shore protection within North Carolina's coastal area through the North Carolina Coastal Area Management Act of 1974 (CAMA). Specifically, CAMA's policy objective is to preserve coastal resources. North Carolina's coastal area includes the counties along the Atlantic Ocean and coastal sound.[81] Under CAMA, the Commission has the authority to mandate erosion change rates to determine the oceanfront construction setback line and setback lines in Areas of Environmental Concern (AECs).[82]

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[77] *Id.* § 12-5-247(c).
[78] *Id.*
[79] *Id.* § 12-5-247(b).
[80] South Carolina, for example, has recently reviewed proposals for new setback lines. The OCRM expects new coordinates will be released in early 2019. *State Beachfront Jurisdictional Lines*, S.C. DEP'T OF HEALTH AND ENVTL. CONTROL, https://www.scdhec.gov/environment/your-water-coast/ocean-coastal-management-ocrm/beach-management/state-beachfront (last visited Aug. 15, 2019).
[81] N.C. GEN. STAT. ANN. § 113A-103(2-3).
[82] *Id.* §§ 113A-100, 113A-104, and 113A-107.1; 15A N.C. ADMIN. CODE 7H.0305(10) and 7J.0102.

The oceanfront construction setback line is measured by a setback factor based on shoreline changes or by the size of structure. The minimum setback factor is two, even when the shoreline is accreting. The setback factor is used for the long-term average erosion rate. The Commission reviews the long-term average erosion rate about every five years.[83] The review process uses the end-point method, which involves comparing aerial photographs of the current shoreline with the earliest aerial photograph. The process takes about a year to complete. Once the new long-term average erosion rate is determined, the Commission approves the setback line after allowing public comment.[84]

In AECs, development is limited. For example, lots created after 1979 must meet the following requirements: apply the appropriate erosion rate setback factor; occur as landward as possible without violating zoning requirements; not extend seaward of the landward-most adjacent building; and be less than 2,000 square feet. Within AECs, there are Ocean Hazard Areas. These areas receive additional protection due to their greater vulnerability to erosion. Ocean Hazard Areas are determined by "geologic, vegetative, and soil conditions [that] indicate a substantial possibility of excessive erosion or flood damage" and include beaches, frontal dunes, and inlet lands.[85] Inlet Hazard Areas, the Ocean Erodible Area, and unvegetated beach area are subsets of Ocean Hazard Areas within the AECs.[86] North Carolina has established both no-build areas and setback procedures for structures based on size in Ocean Hazard Areas. Construction is prohibited seaward of the ocean hazard setback distance and may not be established below the mean high water line.[87]

Setbacks for permissible development are either landward of the crest of the primary dune or based on the Ocean Hazard Setback, whichever is most

[83] "Long-term" is about 50 years. *What You Should Know About Erosion Oceanfront Development*, N.C. ENVTL. QUALITY, https://deq.nc.gov/about/divisions/coastal-management/coastal-management-oceanfront-shorelines/what-you-should-know-about-erosion-oceanfront-development (last visited on Aug. 15, 2019).
[84] *Id.*
[85] Frontal dunes are dunes with the first mound of sand located landward of the ocean beach that has stable and natural vegetation present. 15A N.C. ADMIN. CODE 7H.0301 and 7H.0305 (2019).
[86] 15A N.C. ADMIN. CODE 7H.0304. Since these zones, especially Inlet Hazard Areas, are more vulnerable to erosion, the density of permanent structures cannot exceed "more than one commercial or residential unit per 15,000 square feet of land area on lots subdivided or created after July 23, 1981," and "only residential structures of four units or less or non-residential structures of less than 5,000 square feet total floor area" may be constructed. *Id.* 7H.0310.
[87] 15A N.C. ADMIN. CODE 7H.0306.

landward.[88] If there is not a primary dune, the setback is landward of the frontal dune. Ocean Hazard Setbacks, listed in Table 1, are based on size of the structure or the annual shoreline erosion rate, whichever is greater and measured from the first line of static vegetation.[89] The setback distance increases as the size of the structure increases, as opposed to the size of the development.[90]

Structure Size (ft^2)	Minimum Setback (ft)	Annual Shoreline Erosion Rate (ft)
Less than 5,000	60	30
5,000-9,999	120	60
10,000-19,999	130	65
20,000-39,999	140	70
40,000-59,999	150	75
60,000-79,999	160	80
80,000-99,999	170	85
100,000 or more	180	90

Table 1. Data gathered from 15A N.C. ADMIN. CODE 7H.0306 (2019).

A permit is required for any proposed development.[91] Development on structures existing on or before June 1, 1979 must comply with certain location criteria and design standards.[92] Reconstruction may occur in an Ocean Hazard Area if developers comply with CAMA regulations, building codes, the National

[88] Primary dunes are the "first mounds of sand located landward of the ocean beaches with an elevation equal to mean flood level… plus six feet" that "extend landward to the lowest elevation in the depression behind that same mound of sand (commonly referred to as the 'dune trough')." *Id.* 7H.0305(3).
[89] *Id.* 7H.0305(6) and 7H.0306.
[90] Busik v. N.C. Coastal Res. Comm'n, 753 S.E.2d 326 (N.C. Ct. App. 2013).
[91] Development is: "[A]ny activity…involving, requiring, or consisting of the construction or enlargement of a structure; excavation; dredging; filling; dumping; removal of clay, silt, sand, gravel or minerals; bulkheading; driving of pilings; clearing or alteration of land as an adjunct to construction; alteration or removal of sand dunes; alteration of the shore, bank, or bottom of the Atlantic Ocean or any sound, bay, river, creek, stream, lake or canal." N.C. GEN. STAT. ANN. § 113A-103(5). Development does not include public utility activities, roadwork, agricultural or forestry, activities, maintenance or repairs to damaged property, projects grandfathered under the statute, or construction that does not require dredging, filling, or the alteration of a sand dune or beach. *Id.* Camping, accessways to beaches, pools, elevated decks less than 500 square feet, gazebos, uninhabited sheds, temporary amusement stands, sand fences, and some parking may be constructed seaward of the setback lines if they remain landward of the vegetation line and comply with other conditions. 15A N.C. ADMIN. CODE 7H.0309.
[92] 15A N.C. ADMIN. CODE 7H.0104 and 7H.0309(b-c).

Flood Insurance Program, and local reconstruction plans.[93] Some projects may be permitted under the Commission's general permit program.[94] Permits must include the condition that structures will be removed or relocated if it becomes imminently threatened by shoreline changes.[95]

Variances may be granted when "unnecessary hardships would result from strict application of the rules, standards, or orders," such as a hardship to comply with a setback requirement.[96] The hardship must not be a result of the landowners' actions.[97] Setback lines in Ocean Hazard Areas may be waived for structures built on lots that existed before June 1, 1979 if development occurs at least sixty feet from the vegetation line, is not in front of or on a frontal dune, meets size and design standards, and satisfies all other relevant regulations. This waiver does not apply to Inlet Hazard Areas or unvegetated beach areas.[98]

Beach fill projects that will be in effect for at least thirty years with sediment or storm protection greater than 300,000 cubic yards may also be eligible for exceptions if the community identifies the appropriate sediment and source of project funding. These exceptions are available only to structures less than 2,500 square feet and not seaward of the most landward adjacent structure.[99] Single family residences within AECs are also exempt from CAMA permits if they are forty feet landward of the normal high-water mark and do not disturb land within that buffer.[100] Finally, all federal agency development activities are exempt.[101]

The Commission and Local Permit Officers monitor compliance with major, minor, and general CAMA permits using various methods, such as aerial flights. If a person is violating a permit or beginning development without an approved permit, the Commission staff has the authority to provide a Notice of Violation, stop the development, and determine the penalty. The corrective action is usually restoring the site to its condition prior to the violation. Civil penalties

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[93] *Id.* 7M.0503.
[94] N.C. GEN. STAT. ANN. § 113A-118.1.
[95] 15A N.C. ADMIN. CODE 7H.0306(k). CAMA permits are not required for small ditches, activities in Jockey's Ridge, sand-fencing installation, projects requiring NPDES or air quality permits, and structural accessways over frontal dunes in AECs. 15A N.C. ADMIN. CODE 7K.0200.
[96] N.C. GEN. STAT. ANN. § 113A-120.1(a).
[97] *Id.*; Riggings Homeowners, Inc. v. Coastal Res. Comm'n, 747 S.E.2d 301 (N.C. Ct. App. 2013).
[98] 15A N.C. ADMIN. CODE 7H.0309.
[99] *Id.* 7H.0306.
[100] *Id.* 7K.0208.
[101] *Id.* 7K.0402.

may not exceed $10,000 for major and $1,000 for minor development violations. Costs may also result from Coastal Management monitoring activities to ensure compliance.[102] Furthermore, injunctive relief or a Class 2 misdemeanor may be an appropriate action for a violation.

ii. Virginia

Virginia's Coastal Primary Sand Dunes Act and Barrier Island Policy establish the jurisdictional boundaries and permitting process for shore protection on beaches, coastal primary sand dunes, and barrier islands.[103] The policy objective of this Act is to protect the ecosystem and its functions. Virginia's coastal zone extends across approximately 5,000 miles of shoreline and 29% of the state's land area. Further, more than 60% of Virginia's population resides in the coastal zone.

On Virginia's beaches, the no-build area extends from the low water line to the marked change in material composition or physiographic form, line of woody vegetation, or nearest impermeable manmade structure.[104] On coastal primary sand dunes, the no-build area is between the mean high water mark and where the landward dune grade falls below 10%.[105] On barrier islands, the setback is twenty times the local 100-year long-term annual shoreline erosion rate from the dune crest.[106] If the local mean high water mark comes within ten times the average erosion rate, a new plan to revise the setback line must be submitted to

[102] *Id.* 7J.0409; N.C. GEN. STAT. ANN. § 113A-126.
[103] VA. CODE. ANN. § 28.2-1401.
[104] The beach begins at the low water line and extends landward to the "marked change in material composition or physiographic form, the line of woody vegetation, or the nearest impermeable manmade structure." *Id.* § 28.2-1400.
[105] The coastal primary sand dune is a "mound of unconsolidated sandy soil which is contiguous to mean high water, whose landward and lateral limits are marked by a change in grade from ten percent or greater to less than ten percent" with certain species: "American beach grass (Ammophila breviligulata); beach heather (Hudsonia tomentosa); dune bean (Strophostyles spp.); dusty miller (Artemisia stelleriana); saltmeadow hay (Spartina patens); seabeach sandwort (Honckenya peploides); sea oats (Uniola paniculata); sea rocket (Cakile edentula); seaside goldenrod (Solidago sempervirens); Japanese sedge or Asiatic sand sedge (Carex kobomugi); Virginia pine (Pinus virginiana); broom sedge (Andropogon virginicus); and short dune grass (Panicum amarum)." VA. CODE. ANN. § 28.2-1400.
[106] 4 VA. ADMIN. CODE 20-440-10(C)(1)(c)(4). The dune crest is "the highest elevation of the coastal primary sand dune on the lot." 4 VA. ADMIN. CODE 20-440-10(A)(1). The local 100-year long-term recession rate is the "average shoreline recession over fixed one-mile intervals averaged over the period between surveys of 100 years or more." *Id.*

the state.[107] The Virginia Institute of Marine Science (VIMS) provides the Virginia Marine Resources Commission (VMRC) or local wetlands board with data pertaining to erosion rates.

No permanent structures, except some vehicular access ramps, are permitted seaward of the crest of any coastal primary sand dune.[108] This prevents roads and trails from being built on or across any coastal primary sand dune or in any wetland.[109] Construction or permanent alteration is not allowed on beaches or coastal primary sand dunes when such development would impair ecological functions, destroy vegetation, or physically modify the beach or coastal primary sand dunes.[110] In addition, structures that have been condemned by health or local building officials due to damage from natural events may not be reconstructed. Such structures must be relocated or removed within two years.[111]

The VMRC or a certified local wetlands board reviews permit applications. Permits are granted if both the public and private benefit outweigh the detriment, and the proposed development is consistent with the standards listed in VA. CODE. ANN. § 28.2-1401 and VA. CODE. ANN. § 28.2-1408.[112] Specifically, coastal development may only occur when there will not be a significant negative impact on the ecosystem or when the development aligns with the public interest.[113] The permit application must include a site survey showing one-foot contours relative to local mean high water to the first wetlands vegetation and identification of the dune crest, among other features.

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[107] *Id.* 20-440-10(E)(1)(c).
[108] *Id.* 20-440-10(C)(2)(b).
[109] *Id.* 20-440-10(C)(3) (2018).
[110] VA. CODE. ANN. § 28.2-1408.
[111] Written authorization from the Commission is required for relocation. 4 VA. ADMIN. CODE 20-440-10(B)(2).
[112] VA. CODE. ANN. § 28.2-1403; 4 VA. ADMIN. CODE 20-440-10(B)(1)(a).
[113] Development is limited to low density single-family use on each platted parcel. Virginia considers the density of the structure and percentage of shoreline frontage those structures occupy. Therefore, less than 25% of the lot must result in adverse impacts and there must be an adequate area that is not sand dunes or wetlands. The minimum frontage for a single-family vacation cottage is 100 feet and the minimum side yard is thirty feet. The setback from the dune crest and septic for all structures is twenty times the local 100-year long-term annual shoreline recession rate. On 100-foot lots, the first floor may be a maximum of 900 square feet. On 200-foot lots, the first floor may not exceed 1800 square feet. This area includes porches, decks, and other appurtenances. The dwellings may not exceed twenty-five feet in height and must be constructed on elevated open pilings greater than or equal to ten feet above grade. Enclosures below the first floor are prohibited. VA. CODE. ANN. § 28.2-1408.

Permits are not required for construction or maintenance of walkways or observation platforms that do not affect the coastal primary sand dunes, sand replenishment activities, sand fence installation, addition of vegetation to stabilize dunes, normal maintenance of erosion control devices abutting dunes and roads, outdoor recreational activities that do not alter the coastal primary sand dune structure, conservation and research activities, or emergencies.[114] However, shore hardening structures are not allowed and artificial barriers, such as sand fencing, are discouraged.[115]

A permit for development may not be required if the restrictions would create an unduly hardship and the development would not result in significant detriment to barrier islands, natural resources, or adjacent property.[116] In addition, the Coastal Primary Sand Dunes and Beaches Act provides exemptions for some development permits through a General Permit for Sand Management and Placement Profiles.[117] Landowners within the Sandbridge Beach Subdivision, the area between Dam Neck Naval Base, Sandpiper Road, and Little Island Park, that are deemed to be in clear, imminent danger may construct and maintain protective structures with the approval of the Virginia Beach Wetlands Board. The City of Norfolk may also adopt a General Permit for Sand Management and Placement Profiles.[118]

To enforce permit provisions or unpermitted actions, the Commission has the authority to investigate activity altering dunes or beaches.[119] Local Wetlands Boards may also investigate projects within their respective jurisdictions.[120] If an activity is deemed a violation upon on-site inspections of the permitted property, the commissioner or board chairman must give notice to the permittee to comply within a certain period.[121] An order shall be issued if the permittee does not comply with the notice of the violation.[122] If the corrective action is completed, the order must be lifted. The appropriate corrective action is usually to return the site to its condition prior to the violation.[123] The order may come in the form of

[114] *Id.* § 28.2-1403.
[115] 4 VA. ADMIN. CODE 20-440-10(C)(8).
[116] *Id.* 20-440-10(C)(1)(c)(9).
[117] VA. CODE. ANN. § 28.2-1408.2.
[118] *Id.* § 28.2-1408.2(B)(2).
[119] *Id.* § 28.2-1416.
[120] *Id*.
[121] *Id.* § 28.2-1417(B).
[122] *Id.* § 28.2-1417(C).
[123] *Id.* §§ 28.2-1417(D) and 28.2-1419; 4 VA. ADMIN. CODE 20-440-10.

"injunction, mandamus, or other appropriate remedy."[124] If a person "knowingly, intentionally, or negligently violates any order, rule, or regulation of the Commission" or Local Wetlands Board, they are guilty of a Class 1 misdemeanor.[125] Fines must not exceed $25,000 for each violation. Each day of a continued violation after the conviction is a separate offense.[126]

iii. South Carolina

The South Carolina Department of Health and Environmental Control's Office of Ocean and Coastal Resource Management (OCRM) regulates beachfront development under the South Carolina Coastal Zone Management Act (SCCZMA) and the 1988 Beachfront Management Act (BMA). South Carolina emphasized a policy of retreat with safety, environmental protection, and tourism as primary objectives until 2018.[127] Now, the current policy emphasizes preservation rather than retreat.[128]

The OCRM uses two lines to regulate development in the coastal zone: the baseline and the setback line.[129] The coastal zone protects critical areas, which include coastal waters, tidelands, beach/dune systems, and beaches.[130] The beach/dune system encompasses "all land from the mean high water mark of the Atlantic Ocean landward to the forty-year setback line."[131] The setback line extends forty times the average annual erosion rate landward of the baseline. This rate is determined by the OCRM using the best available historical and scientific data.[132] The minimum setback is twenty feet landward of the baseline.[133] The setback line is revised every eight to ten years.

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[124] 4 VA. ADMIN. CODE 20-440-10.
[125] VA. CODE. ANN. § 28.2-1418.
[126] *Id*.
[127] S.C. CODE ANN. § 48-39-250; S.C. CODE ANN. REGS. 30-1.
[128] *Id*.
[129] S.C. CODE ANN. § 48-39-290(A).
[130] *Id.* § 48-39-10; S.C. CODE ANN. REGS. 30-1(D)(15).
[131] S.C. CODE ANN. REGS. 30-1(D)(5).
[132] S.C. CODE ANN. § 48-39-280.
[133] S.C. CODE ANN. REGS. 30-1(D)(2).

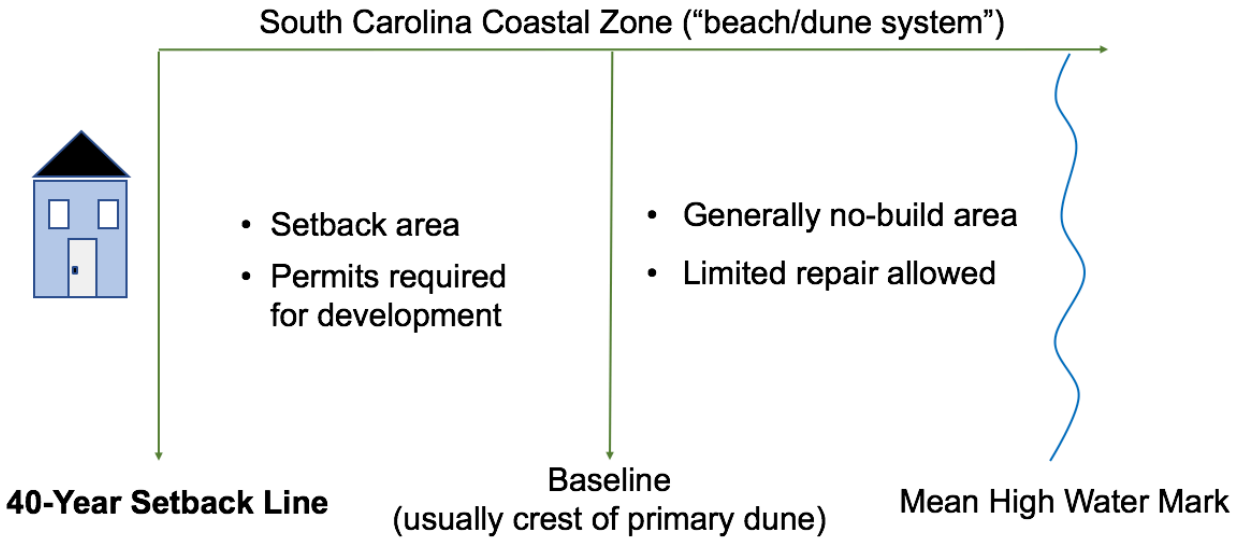

Figure 2. Simplified depiction of South Carolina's two jurisdictional lines.

The baselines vary by location: standard erosion zones or inlet erosion zones. Standard erosion zones are:

> segment[s] of shoreline which [are] subject to essentially the same set of coastal processes, [have] a fairly constant range of profiles and sediment characteristics, and [are] not influenced directly by tidal inlets or associated inlet shoals.[134]

In a standard erosion zone, the baseline is established at the crest of the primary oceanfront sand dune or where the shoreline has been artificially altered to that point as determined by beach profile computations.[135] Inlet erosion zones are "segment[s] of shoreline along or adjacent to tidal inlets which is influenced directly by the inlet and its associated shoals."[136] Inlet erosion zones are stabilized by "jetties, terminal groins, or other structures."[137] In an unstabilized inlet zone, the baseline is the most landward point of erosion during the past forty years, unless data indicates that the shoreline is unlikely to return to its former position. In a stabilized inlet zone, the baseline is the actual location of the crest of the primary oceanfront sand dune" of the particular erosion zone.[138]

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[134] S.C. CODE ANN. § 48-39-270(6).
[135] *Id.* § 48-39-280(A)(1).
[136] *Id.* § 48-39-270(7).
[137] *Id.* § 48-39-280(A)(2).
[138] *Id.* § 48-39-280(A)(3).

Destruction of beach or dune vegetation is not allowed seaward of the setback line. If there is no feasible alternative, planting new vegetation where possible becomes a condition of the permit to mitigate harm.[139] Construction and improvements are not allowed on the area seaward of the escarpment or the first line of stable natural vegetation, whichever is most seaward. In addition, activities on primary oceanfront sand dunes and erosion control devices seaward of the setback line are prohibited.[140]

Normal maintenance of habitable structures, emergencies, sandbags, sandscraping, renourishment, lawful discharge of treated effluent, walkways over dunes, U.S. Army Corps of Engineers activities, or otherwise lawful activities do not require a permit under the Act.[141] Golf courses, pools landward of erosion control devices, wooden walkways, wooden decks, normal landscaping, fishing piers are also allowed seaward of the baseline.[142]

Proposed construction of new habitable structures seaward of the setback line in critical areas must be as far landward as practicable, less than 5,000 square feet of heated space if habitable, not include an erosion control device as an integral part of the habitable structure, or be constructed on the primary oceanfront sand dune, seaward of the baseline, or on active beach.[143] Permits are required for the construction of parking lots, driveways, emergency vehicle accessways, utilities, drainage structures, sand fences, revegetation, and erosion control structures.[144]

A special permit may be granted for construction or improvement of a structure if the property owner would have no reasonable use for the property otherwise or a public benefit can be demonstrated. Most special permits are only granted in extraordinary circumstances for single-family dwellings smaller than similar structures in the neighborhood (less than 5,000 square feet) that are no

[139] S.C. CODE ANN. § 48-39-310.
[140] *Id.* t § 48-39-290.
[141] S.C. CODE ANN. § 48-39-130; S.C. CODE ANN. REGS. 30-5.
[142] S.C. CODE ANN. § 48-39-290; S.C. CODE ANN. REGS. 30-15.
[143] S.C. CODE ANN. § 48-39-290(B); S.C. CODE ANN. REGS. 30-13. Active beach is "the area seaward of the escarpment or of the first line of stable natural vegetation, whichever occurs first, measured from the ocean landward." S.C. CODE ANN. § 48-39-270(13).
[144] S.C. CODE ANN. REGS. 30-15.

further seaward than the adjacent houses unless this would preclude a house from being constructed.[145]

The OCRM may revoke or suspend permits for lack of compliance with notice.[146] Violations of the SCCZMA and BMA can result in civil or misdemeanor criminal penalties.[147] Specifically, persons violating either act could face a cease and desist order, temporary restraining order, misdemeanor charge, a maximum of six months in prison, a $5,000 fine, or any combination of these. In addition, "mitigation or supplemental restoration/enhancement activities" to restore the site may be the appropriate penalty. For minor violations, a fine between $50 and $200 may be issued.[148]

In April 2018, South Carolina shifted away from its policy of retreat.[149] From December 2017 to May 3, 2018, the policy of retreat required that any proposed jurisdictional line be landward of the existing line, even if accretion occurred. The recent change benefitted property owners but received pushback because it requires more expensive beach renourishment programs, placing a higher burden on taxpayers. Now, the baseline will not move seaward, but does not have to shift landward.

iv. Florida

Florida's Department of Environmental Protection (FDEP) regulates shorefront activity and beach preservation across the beach-dune system under the 1965 Dennis L. Jones Beach and Shore Preservation Act.[150] The beach and dune system is:

> that portion of the coastal system where there has been or there is expected to be, over time and as a matter of natural occurrence, cyclical and dynamic emergence, destruction, and reemergence of beaches and dunes.[151]

[145] S.C. CODE ANN. § 48-39-290(D).
[146] S.C. CODE ANN. REGS. 30-8.
[147] S.C. CODE ANN. § 48-39-170.
[148] *Id.*
[149] S.C. CODE ANN. § 48-39-250.
[150] FLA. STAT. ANN. § 161.011.
[151] FLA. ADMIN. CODE ANN. r. 62B-33.002(7).

Florida emphasizes the preservation of beach access and thus discourages the use of hard erosion controls.[152] In 1970, the Florida Legislature established the fifty-foot setback line. In 1985, the Florida Legislature established the thirty-year erosion projection for the coastal CCL in effect today.[153]

The no-build area extends from the seasonal high water line to either thirty times the erosion rate or the coastal CCL, whichever is more seaward. In addition, there are four possible jurisdictional lines ranging from 200 feet on Florida's east coast to 1,000 feet on Florida's west coast.[154] The possible jurisdictional lines are: (1) an erosion control line; (2) a fixed setback of fifty feet from the erosion control line or the mean high water line, whichever is more landward; (3) a floating coastal CCL based on predicted impacts of the 100-year storm surge; and (4) a floating setback determined by the local rate of erosion.[155] In areas that are stable or improving, the minimum setback distance is thirty feet. The erosion control line is the landward extent of the submerged bottoms and shore of the Atlantic Ocean, the Gulf of Mexico, and the bays, lagoons, and other tidal reaches belonging to the state of Florida.[156]

Florida uses coastal CCLs as jurisdictional boundaries for shorefront no-build areas. Control lines differ from setbacks as development seaward of the coastal CCL is limited, but not prohibited.[157] The coastal CCL is set by counties and represents the landward limit of the beach dune system subject to the 100-year storm surge, storm waves, or other predictable weather conditions.[158] The FDEP can shift the coastal CCL further landward than the 100-year storm surge impact zone if the line does not "extend beyond the landward toe of the coastal

[152] FLA. STAT. ANN. § 161.085; Hwang, *supra* note 8.
[153] FLA. STAT. ANN. § 161.053(12)(b). The 30-year erosion projection of long-term shoreline recession is found using historical maps and photographs, reference monuments, or a "minus one-foot per year" shoreline change rate in areas that are either stable or accreting. FLA. ADMIN. CODE ANN. r. 62B-33.024. The 30-year erosion projection cannot extent landward of the coastal construction control line. Repairs or rebuilding that adds to the existing structure seaward of the 30-year erosion projection are prohibited. Notably, this provision includes helpful diagrams to determine the setback line. *Id.*
[154] FLA. STAT. ANN. § 161.053.
[155] For example, the Florida Keys have a fixed setback line of fifty feet from the mean high water line or from erosion control lines, whichever is more landward. Hwang, *supra* note 8.
[156] FLA. STAT. ANN. § 161.151(3).
[157] *Id.* § 161.052.
[158] *Id.* § 161.053(1)(a).

barrier dune structure that intercepts the 100-year storm surge."[159] If there is not an established construction control line in the county, the jurisdictional line is set fifty feet from the erosion control lines or from the mean high water line, whichever is more landward.[160]

On coastal barrier islands, the coastal building zone extends from the seasonal high water line to 5,000 feet landward from the coastal CCL or the entire island, whichever is less.[161] If there is not an established coastal CCL on the island, the zone is the area seaward of the most landward velocity zone as determined by the Federal Emergency Management Agency.[162] The coastal building zone may not be less than 2,500 feet landward of the coastal CCL in any case.

Permits for development are required for activities on state-owned lands seaward of the mean high water line or the fifty-foot setback line of any tidal waters.[163] The development may not inhibit public use of the beach seaward of the mean high water line except during construction, unless the interference is necessary to protect the beach or an endangered upland structure.[164] Permits are not granted for coastal inlet jetty construction or its maintenance if a "significant adverse impact" on the beach would result.[165] Florida's Beach and Shore Preservation Act also requires joint permits for some coastal activities.[166] The coastal activities requiring a joint coastal permit are those occurring on natural sandy beaches or seaward of the high water line, extending into Florida's

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[159] *Id*. The "100-year storm" is a "shore-incident hurricane or any other storm with accompanying wind, wave, or storm surge intensity having a one percent chance of being equaled or exceeded in any given year." FLA. ADMIN. CODE ANN. r. 62B-33.002(46).
[160] FLA. STAT. ANN. § 161.052.
[161] *Id.* § 161.55.
[162] *Id.* § 161.54(1).
[163] FLA. STAT. ANN. § 161.041(1). Permits for single-family dwellings may be granted if the parcel was platted before 2014, the owner does not own another parcel immediately adjacent to and landward of the proposed parcel, the proposed dwelling is landward of the frontal dune, and would be located as far landward as practicable without being located seaward of the frontal dune. FLA. ADMIN. CODE ANN. r. 62B-33.005 and r. 62B-34.070. The frontal dune is the "first natural or manmade mound or bluff of sand which is located landward of the beach and which has sufficient vegetation, height, continuity, and configuration to offer protective value." FLA. STAT. ANN. § 161.053(5)(a)(1).
[164] *Id.* § 161.041(1)(a).
[165] *Id.* § 161.041(1)(b).
[166] A joint permit is a combination of the coastal construction permit, an environmental resource permit, and state lands authorization. *Id.* § 161.041(9).

submerged lands, or affecting the sand distribution on the beach.[167] Federal activities on federally owned property do not require state permits.[168]

If those lines are not applicable to the proposed construction site, the general permit line is determined using one of these standards: twenty-five feet landward of the primary dune feature; fifty feet landward of the top of the bluff with a height greater than fifteen feet; at least 100 feet landward of the vegetation line where there is not coastal armoring, a primary dune, or a bluff taller than fifteen feet; or where construction takes place, at least 250 feet landward of the erosion control line or of the mean high water line, whichever is greater. Only elevated walkovers can extend seaward of the general permit line. Non-habitable major structures that are not landward of a major road or landward of the second line of construction must be less than 6,300 square feet and cover a maximum of 65% of the shore-parallel dimension of the parcel. Finally, projects under the general permit must comply with sea turtle and native vegetation protection requirements.[169]

The FDEP may issue general permits to local governments or issue special classes of permits for the construction of minor structures if those structures would not significantly impact the beach-dune system or sea turtles. The general permit line is the seaward limit of construction or landward of a major road or the second line of construction. General permits may be granted for "dune restoration, dune walkovers, decks, fences, landscaping, sidewalks, driveways, pool resurfacing, minor pool repairs, and other nonhabitable structures" if those structures would not harm the beach-dune system or sea turtles.[170] These permits may also be granted for new construction, additions, repairs, or rebuilding to an existing non-habitable structure, but do not apply to swimming pools.[171]

A permit is not required for development if the development pertains to the:

> modification, maintenance, or repair to any existing structure within the limits of the existing foundation which does not require,

[167] FLA. STAT. ANN. § 161.041; FLA. ADMIN. CODE ANN. r. 62B-49.001.
[168] FLA. ADMIN. CODE ANN. r. 62B- 33.004(2)(b).
[169] *Id.* r. 62B-34.060.
[170] FLA. STAT. ANN. § 161.053(17-18).
[171] *Id.*

> involve, or include any additions to, or repair or modification of, the existing foundation of that structure.[172]

The FDEP may grant waivers or variances of setback lines if the construction or excavation of a structure includes "adequate engineering data concerning shoreline stability and storm tides related to shoreline topography," pipeline and pier construction, or if existing structures are closer to the mean high water mark and have not been "unduly affected by erosion." The proposed development also must comply with the Florida Building Code and other rules.[173] Exemptions may also be granted if the FDEP finds that the relevant shoreline is not impacted by erosion that is substantially damaging to the public.[174]

Similarly, landowners may request review of CCLs that are "unduly restrictive or prevents legitimate use" of the property.[175] The FDEP may adjust the line if it finds the landowner's request is justified upon review. Additionally, minor activities may be exempt from the permitting process.[176] Exemptions for construction are applicable on islands seaward of the coastal CCL within one mile of the centerline of navigation channels or inlets that have suffered erosion from navigation channel maintenance, but the construction must comply with the Florida Building Code.[177]

Enforcement may involve nuisance, first degree misdemeanor charges, or a maximum of $10,000 fine for each violation. The FDEP maintains the authority to alter or remove structures below the mean high water line that pose a risk to human life, health, or welfare, or are undesirable or unnecessary, which serves as

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[172] *Id.* § 161.052(6).
[173] *Id.* § 161.052(2).
[174] *Id.* § 161.052(4).
[175] *Id.* § 161.053(2)(a).
[176] These include boat moorings, maintenance of existing beach-dune vegetation, burial of marine life on unvegetated beach, pier removal from the unvegetated beach or seaward of mean high water, temporary emergency vehicular access with immediate restoration, debris removal, limited roof overhang construction, public lifeguard stands, landscaping more than "30 feet landward of the frontal dune, escarpment, or coastal armoring structure" that does not involve excavation of existing grade or destruction or removal of native salt-resistant vegetation, and minor construction and excavation with minimal disturbance. FLA. STAT. ANN. § 161.053(11)(c)(1-9); FLA. ADMIN. CODE ANN. r. 62B-33.004.
[177] FLA. STAT. ANN. § 161.142(3).

an emergency provision. The FDEP's authority also extends to enforcing the relevant and related provisions.[178]

IV. ADVANTAGES OF ADAPTIVE MANAGEMENT TECHNIQUES IN SHORE PROTECTION LAWS

Each shoreline responds uniquely to sea level rise based on surrounding development, topography, erosion rates, and the rate of sea level rise. Sea level rise is a dynamic phenomenon, so adaptive management is an advantageous policy tool for coastal management and resiliency. States incorporating adaptive management techniques into legal provisions may offer greater coastal resiliency by using emerging data to adjust jurisdictional areas, much like the procedural provisions in existing state laws identifying coastal erosion rates to establish floating setback lines. In this way, adaptive management better monitors and models shoreline changes to respond to informational gaps regarding the extent of sea level rise on coastal communities.[179]

Adaptive management began as a natural resource management tool in the 1970s to address dynamic environmental issues that were not entirely understood. The iterative approach to manage these environmental issues, albeit costly to staff projects to research shoreline changes, specifically calls for clear goals to reduce uncertainty and acknowledgement thereof, measurable indicators for progress over time, and regular monitoring of outcomes and impacts to inform subsequent decision-making.[180] Adaptive management can only be used when legal provisions allow for iterative decision-making.[181] Therefore, the shore protection laws in Florida, North Carolina, South Carolina, and Virginia better fit the adaptive management approach because they involve review of the coastal erosion rates pertaining to the jurisdictional area at issue.

States considering regular review of jurisdictional areas can choose intervals that align with available resources as measuring coastal erosion rates is

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[178] Fines for violations must not exceed $10,000. Each day of a continued offense is a separate penalty. The violating person may also be guilty of a first-degree misdemeanor or public nuisance. *Id.* §§ 161.054, 161.081 and 161.121. In addition to the Department, "state attorneys, or other prosecuting officers… and sheriffs and their deputies" may enforce provisions of the Act. *Id.* § 161.071.

[179] Holly Doremus, *Adaptive Management as an Information Problem*, 89 N.C. L. REV. 1455, 1498 (2011).

[180] HOLLY DOREMUS ET AL., CTR. FOR PROGRESSIVE REFORM, MAKING GOOD USE OF ADAPTIVE MANAGEMENT 2 (2011).

[181] *Id.*

expensive and takes time. For example, North Carolina reviews the long-term average erosion rate every five years, with one of those years intensively reviewing the changing shoreline with a computer program and aerial photographs.[182] Florida, on the other hand, updates coastal CCLs after the lines have been rendered ineffective by hydrographic and topographic data or when local officials request a new coastal CCL, despite experts suggesting review every five years.[183]

South Carolina reviews setback lines at least every ten years.[184] Reviewing setback lines at least every ten years, however, may not be sufficient for effective shoreline protection as more frequent and extreme weather events occur and the expected accelerated rate of sea level rise over the next century.[185] Even reviewing setback line formulas every decade is an improvement from referring to original lines. As such, fixed setback lines may still protect against coastal erosion and sea level rise if provisions to reconsider the line are added to existing laws.

Fixed setback lines are appealing as a bright-line rule to treat neighbors equally and better align with the state's identified purpose for coastal management, but the current limitations are problematic. No state discussed in this article using a fixed setback line includes statutes or regulations to change the line like states using and reviewing floating setback lines. For example, the original state plane coordinates established in 1979 still apply in Alabama despite significant erosion since, so some areas of the CCL are now offshore and underwater without statutory provisions to change the setback line.

Specifically, development on Alabama's Dauphin Island remains especially vulnerable to sea level rise because the land has eroded landward of the CCL allowing virtually any construction to occur without a state permit.[186] Seawall construction in recent years exemplified this problem because the seawalls were not subject to the state permitting authority as they were landward

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[182] *What You Should Know About Erosion and Oceanfront Development*, N.C. ENVTL. QUALITY, https://deq.nc.gov/about/divisions/coastal-management/coastal-management-oceanfront-shorelines/what-you-should-know-about-erosion-oceanfront-development (last visited Aug. 16, 2019).
[183] FLA. STAT. § 161.053(2)(a).
[184] S.C. CODE ANN. § 48-39-285.
[185] NATIONAL CLIMATE ASSESSMENT, *supra* note 9.
[186] Davina L. Passeri et al., *Dynamic Modeling of Barrier Island Response to Hurricane Storm Surge Under Future Sea Level Rise*, 149 CLIMATIC CHANGE 413 (2018).

of the CCL.[187] The seawalls have already accelerated erosion, leaving little room for birds and nesting turtles and failing to protect structures from flooding and storm events.[188]

Similar to Alabama's lack of authority to update the CCL, Georgia's setback line from 1979 depended on the height of live, native trees and age of certain structures, and was not updated otherwise. Trees grew or were cut down since 1979, perhaps through permitted projects, yet no legal procedure existed to respond effectively to coastal erosion changes altering the jurisdictional line. Furthermore, the zig-zag result of the setback lines protected some unnecessary areas, like parking lots. Fortunately, Georgia is known for successful beach conservation efforts, so the problems associated with the established jurisdictional line did not significantly affect the shoreline and the state's purpose of protecting the sand-sharing system was met.[189] With Georgia's new fixed setback line of twenty-five feet in most areas, changes to effectively protecting the sand-sharing system ought to be noted to compare how different setback lines affect coastal resiliency.[190]

V. CONCLUSION

Setback lines must be enforced to best promote resilient coasts in the face of an uncertain future. Enforcement is necessary when persons act in violation of their permit or when they act without any permit. In these seven states, all but Alabama apply various mechanisms of enforcement. Fines and misdemeanors are the most common mechanisms, but temporary restraining orders and nuisance are also used to enforce the respective legal provisions. In Alabama, the enforcement provisions of ACAMP were repealed in 1994.[191]

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[187] Federal authority for coastal construction begins at the mean high tide line. Dauphin Island had enough shoreline at the time of construction to classify the seawalls as retaining walls, which do not require a federal permit.

[188] William J. Neal et al., *Why Coastal Regulations Fail*, 156 OCEAN & COASTAL MGMT. 21 (2018).

[189] WILLIAM BOYD ET AL., COASTAL NATURE, COASTAL CULTURE: ENVIRONMENTAL HISTORIES ON THE GEORGIA COAST 6-7 (2018).

[190] As previously mentioned, the states examined in this study are intrinsically different so comparing the state setback lines to each other would be misguided. However, updates to setback lines in one state may be compared to previous protective measures to better assess effectiveness of those lines. Still, developing those variables for that comparative analysis is outside the scope of this research.

[191] ALA. ADMIN. CODE r. 335-8-1-.32.

Adaptive management is an appropriate regulatory tool for planning coastal development because it incorporates short- and long-term goals to mitigate sea level rise and coastal erosion through iterative decision-making.[192] Specifically, adaptive management techniques may encompass aspects of shore protection provisions in Florida and Virginia. Florida has multiple methods for establishing setback lines based on location, which better account for the uniqueness of the ecosystems.[193] While Florida is more localized, the Virginia Marine Resources Commission partners with VIMS to establish the coastal erosion rates using the best available data to determine the setback line. By partnering with academic institutions measuring shoreline changes analogous to VIMS, states can identify appropriate jurisdictional areas without such a strain on limited government resources. This relationship fits within the adaptive management model because it offers a method of decision-making with consistent monitoring and flexibility.

The potential next steps for research in this area are widespread since this is the first examination of shore protection laws in these seven states. Sea level rise affects more than the southeastern United States' Atlantic and Gulf beaches; coastal wetlands in estuarine systems are also impacted. Thus, an immediate next step could be to apply the same analytical structure to coastal wetlands. Coastal wetland erosion is not ocean-fronting. While perhaps unintuitive, erosion rates affected by sea level rise may actually be higher on the marsh and bay sides of islands than on the oceanfront.

Upon categorizing existing shore protection laws, future research may consider developing model laws featuring adaptive management techniques. Similarly, researchers may consider other innovative policy options to respond to dynamic shoreline changes. Rather than using a setback line based on physical ecological markers, for example, mapping locations of endangered or threatened species could behoove drawing the jurisdictional area. Finally, future laws could incorporate GIS mapping data to compare current coastal ecosystems and sea level rise predictions to develop a dynamic method for whether the state laws are directly and effectively protecting shorelines and coastal wetlands.

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[192] Klaus Hasselmann et al., *The Challenge of Long-Term Climate Change*, 302 SCIENCE 1923 (2003).

[193] *But see* Thomas K. Ruppert, *Eroding Long-Term Prospects for Florida's Beaches: Florida's Coastal Construction Control Line Program*, 1 SEA GRANT LAW & POL'Y J. 65 (2008), http://nsglc.olemiss.edu/sglpj/Vol1No1/4Ruppert.pdf (last visited Aug. 16, 2019).