

Shoreline Access and Climate Change in the Northeast United States

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Executive Summary

From the smallest of sandy footpaths to fishing piers extending from city waterfronts, public shoreline accesses play an essential role in connecting people to the coast of the United States. These accesses, which provide spaces for the public to get to the shore for a multitude of activities, are a critical component of the coastal zone, which is densely populated and features a wide array of uses. As coastal erosion, sea level rise, and other climate change effects threaten our coasts, understanding the climate-related impacts to shoreline access points and developing approaches to ensure that access is maintained in the face of these impacts will become increasingly important. This review examines shoreline access in four Northeast US states—Connecticut, Maine, New York, and Rhode Island—through background research and informational interviews with government employees and coastal scientists. The paper presents several climate change impacts of concern for shoreline access and explores current efforts to address these climate impacts along with strategies for building adaptation capacity in the future.

Participants identified physical impacts including sea level rise, shoreline change, and reduction in available public space, along with social impacts such as changes in use and use conflicts, as their most pressing climate change concerns at shoreline accesses. Coastal management programs have existing capacity to adapt to climate change impacts, including coastal zone management and planning strategies, state climate legislation, the role of municipalities, and statewide inventories and data collection efforts. In the future, strategies such as increased data collection, adaptive management, and emphasizing community outreach and education can further enhance this capacity for adaptation. Based on the results of research and informational interviews, three recommendations intended for state agencies working on shoreline access initiatives are presented: (1) develop state shoreline public access management plans, including climate adaptation strategies; (2) support data collection efforts to understand climate impacts on shoreline accesses; and (3) review state legislation related to the public trust doctrine and shoreline access to the coastal zone and clarify as needed.

Introduction

In the United States, nearly 40% of the population resides in coastal counties that account for just under 10% of land mass in the country.¹ The Northeast US, spanning from Virginia to Maine, is the most populous region of the country with approximately 70 million people, 82% of whom live in coastal counties.² These coastal regions host a wide variety of uses, from tourism and recreation to essential commerce such as shipping and fishing, making the area highly desirable despite the limited space available for these various uses. One essential use of the coastal zone is public shoreline access, which consists of spaces that provide the general public access to publicly owned land and waters under state jurisdiction. These access points allow the public to get close to, or into, the coastal waters in a particular area, and can be owned or maintained by state agencies, nonprofit organizations, or private landowners. Nestled amongst private homes, commercial spaces, and natural barriers, these accesses, which can range from state parks with boat ramps to small sand-covered footpaths, help connect people with public lands for a variety of recreational and commercial activities.

Due to the location and nature of shoreline access points, climate change impacts will undoubtedly affect these areas. Impacts such as sea level rise, coastal erosion, coastal flooding, habitat migration, and even changes to marine species distribution are already affecting the Northeast US coast, making this area a particularly interesting case study. Connecticut, Maine, New York, and Rhode Island were selected as areas of interest to narrow the scope of the review. This project was designed to answer the question: how are coastal states maintaining existing public shoreline access and ensuring future access in the face of climate change impacts? To address this question, I explored how the coastal zone, and shoreline access more specifically, is managed in each state, including the role of federal, state, and municipal entities and their legal frameworks. Next, I identified the most pressing climate-related changes that may impact shoreline access, including physical and social impacts. Finally, I explored current planning efforts and capacity for adaptation, as well as strategies for adapting to these climate change impacts in the future. This information was collected through background research along with a series of semi-structured informational interviews with government employees working on

¹ National Oceanic and Atmospheric Administration. (n.d.) *Fast Facts: Economics and Demographics*. NOAA Office for Coastal Management. <https://coast.noaa.gov/states/fast-facts/economics-and-demographics.html>

² National Oceanic and Atmospheric Administration. (n.d.). *Northeast Region*. National Marine Ecosystem Status, NOAA. <https://ecowatch.noaa.gov/regions/northeast>

shoreline access initiatives along with scientists focused on climate change in the coastal zone. Based on this research, I identified three recommendations for state agencies to facilitate the adaptation of shoreline access programs in the face of climate change: (1) develop state shoreline public access management plans, including climate adaptation strategies; (2) support data collection efforts to understand climate impacts on shoreline accesses; and (3) review state legislation related to the public trust doctrine and shoreline access to the coastal zone and clarify as needed.

Climate Change in the Coastal Zone

As anthropogenic climate change continues to accelerate, many changes to the coastal zone have been observed and are only expected to worsen. Several effects of climate change will impact coastal habitats, including changes in ocean temperature, sea level rise, ocean acidification, coastal erosion, and increased severity and frequency of storms.³ With regards to physical alterations to the existing coastline, the most pressing of these effects include sea level rise and stronger, more frequent storm events, which can lead to coastal erosion, flooding, migration of beaches and other natural habitats, or loss of these entire areas.

Sea Level Rise

Sea levels have been rising rapidly across the world's oceans, with an average increase of roughly 3 millimeters per year since the mid-1980s, significantly higher than the rate of 1.4 millimeters per year observed during the 20th century.⁴ Sea level rise rates in the Northeast are among the highest in the United States, a trend which is expected to continue through the 21st century.⁵ According to a 2017 NOAA report, the relative sea level in the Northeast US is expected to be .3 to .5 meters higher than the global mean sea level under intermediate prediction

³ Dupigny-Giroux, L.A., Mccray, E.L., Lemcke-Stampone, M.D., Hodgkins, G.A., Lentz, E.E., Mills, K.E., Lane, E.D., Miller, R., Hollinger, D.Y., Solecki, W.D., Wellenius, G.A., Sheffield, P.E., MacDonald, A.B., Caldwell, C. (2018). *Impacts, Risks, and Adaptations in the United States: Fourth National Climate Assessment, Volume II*. U.S. Global Change Research Program. DOI: 10.1730/NCA4.2018.CH18

⁴ Sweet, W.V., Kopp, R.E., Weaver, C.P., Obeysekera, J., Horton, R.M., Thieler, E.R., & Zervas, C. (2017). *Global and Regional Sea Level Rise Scenarios for the United States*. (NOS CO-OPS 083). National Oceanic and Atmospheric Administration. https://tidesandcurrents.noaa.gov/publications/techrpt83_Global_and_Regional_SLR_Scenarios_for_the_US_final.pdf

⁵ Dupigny-Giroux, L.A., Mccray, E.L., Lemcke-Stampone, M.D., Hodgkins, G.A., Lentz, E.E., Mills, K.E., Lane, E.D., Miller, R., Hollinger, D.Y., Solecki, W.D., Wellenius, G.A., Sheffield, P.E., MacDonald, A.B., Caldwell, C. (2018). *Impacts, Risks, and Adaptations in the United States: Fourth National Climate Assessment, Volume II*. U.S. Global Change Research Program. DOI: 10.1730/NCA4.2018.CH18

scenarios, which project a sea level rise of .5 to 1.2 meters by 2100.⁶ This rise in sea level will lead to permanent inundation of previously dry land, in addition to increasing the severity of coastal flooding, including tidal flooding and storm-related flood events.⁷

Coastal Flooding

As sea levels rise and storms become increasingly severe and frequent, coastal flooding is expected to become a serious climate change impact. Some areas in the Northeast have seen a 100-200% increase in high tide flooding, which can limit access to coastal spaces as well as cause physical damage.⁸ Annual high tide flooding frequencies increased by 75% from 2000 to 2015 along the Northeast Atlantic coast, and flooding is only expected to increase in the future.⁹ Increased storm severity and frequency can worsen this flooding, as well as cause additional damage from storm surges, a pulse of seawater pushed inland by a severe weather event.¹⁰

Coastal Erosion

Increased sea level rise, strong wave action from storms, and coastal flooding events can lead to coastal erosion, or the removal of natural sediments including sands, rocks, and soils from coastal areas.¹¹ This process can be devastating to natural habitats as well as coastal infrastructure, causing roughly \$500 million per year of property loss across the United States.¹² The Northeast Atlantic coast features morphologies ranging from sandy beaches to rocky cliffs,

⁶ Sweet, W., Kopp, R., Weaver, C., Obeysekera, J., Horton, R., Thieler, E., & Zervas, C. (2017). *Global and Regional Sea Level Rise Scenarios for the United States*. (NOS CO-OPS 083). National Oceanic and Atmospheric Administration.

https://tidesandcurrents.noaa.gov/publications/techrpt83_Global_and_Regional_SLR_Scenarios_for_the_US_final.pdf

⁷ Sweet, W.V., Kopp, R.E., Weaver, C.P., Obeysekera, J., Horton, R.M., Thieler, E.R., & Zervas, C. (2017). *Global and Regional Sea Level Rise Scenarios for the United States*. (NOS CO-OPS 083). National Oceanic and Atmospheric Administration.

https://tidesandcurrents.noaa.gov/publications/techrpt83_Global_and_Regional_SLR_Scenarios_for_the_US_final.pdf

⁸ Dupigny-Giroux, L.A., Mecray, E.L., Lemcke-Stampone, M.D., Hodgkins, G.A., Lentz, E.E., Mills, K.E., Lane, E.D., Miller, R., Hollinger, D.Y., Solecki, W.D., Wellenius, G.A., Sheffield, P.E., MacDonald, A.B., Caldwell, C. (2018). *Impacts, Risks, and Adaptations in the United States: Fourth National Climate Assessment, Volume II*. U.S. Global Change Research Program. DOI: 10.1730/NCA4.2018.CH18

⁹ Sweet, W.V., Dusek, G., Obeysekera, J., & Marra, J.J. (2018). *Patterns and Projections of High Tide Flooding Along the U.S. Coastline Using a Common Impact Threshold*. (NOS CO-OPS 086). National Oceanic and Atmospheric Administration.

https://tidesandcurrents.noaa.gov/publications/techrpt86_PaP_of_HTFlooding.pdf

¹⁰ U.S. Climate Resilience Toolkit. (March 25, 2020). *Storm Surge*. National Oceanic and Atmospheric Administration. <https://toolkit.climate.gov/topics/coastal/storm-surge>

¹¹ U.S. Climate Resilience Toolkit. (April 1, 2021). *Coastal Erosion*. National Oceanic and Atmospheric Administration. <https://toolkit.climate.gov/topics/coastal-flood-risk/coastal-erosion>

¹² U.S. Climate Resilience Toolkit. (April 1, 2021). *Coastal Erosion*. National Oceanic and Atmospheric Administration. <https://toolkit.climate.gov/topics/coastal-flood-risk/coastal-erosion>

which also leads to variability in erosion vulnerability—sandy beaches exposed to the open coast are the most susceptible to erosion impacts.¹³

Habitat Reduction

The effects of coastal erosion, repeated flooding events, and sea level rise can make previously occupied areas unsuitable for particular ecosystems, causing habitats such as salt marshes, dunes, barrier beaches, and other coastal systems to move landward.¹⁴ However, if infrastructure exists behind these ecosystems, they are unable to migrate and ultimately can be reduced significantly if not lost altogether. These habitats provide essential ecosystem services, including critical protections against climate change impacts, nursery habitat for marine organisms, feeding or habitat areas for birds, and bring incalculable aesthetic value to coastal areas.¹⁵

Species Distribution and Abundance

Warming sea temperatures have caused distribution shifts and are projected to cause declines in many economically and culturally important species, including cod, lobster, and sea scallops.¹⁶ A recent species vulnerability analysis found that roughly 50% of fish and invertebrate species in the Northeast region will be “highly or very highly vulnerable to climate change” under high change scenarios.¹⁷ This ecosystem shift is expected to have social impacts as well, from increasing the distance fishers must travel and the effort they expend to catch their usual species to changing the cultural ties to commercial fisheries and their products on a local or regional level.¹⁸ In Maine particularly, public access points are often used by commercial or

¹³ Birchler, J.J., Dalyander, P.S., Stockdon, H.F., & Doran, K.S. (2015). *National Assessment of Nor'easter-Induced Coastal Erosion Hazards: Mid- and Northeast Atlantic Coast*. United States Geological Survey. <https://doi.org/10.3133/ofr20151154>

¹⁴ New York, government employee.

¹⁵ Wigand, C., Ardito, T., Chaffee, C., Ferguson, W., Paton, S., Raposa, K., Vandemoer, C., & Watson, E. (2017). *A Climate Change Adaptation Strategy for Management of Coastal Marsh Systems*. *Estuaries and Coasts*, 40, 682–693. <https://doi.org/10.1007/s12237-015-0003-y>

¹⁶ Dupigny-Giroux, L.A., Mecray, E.L., Lemcke-Stampone, M.D., Hodgkins, G.A., Lentz, E.E., Mills, K.E., Lane, E.D., Miller, R., Hollinger, D.Y., Solecki, W.D., Wellenius, G.A., Sheffield, P.E., MacDonald, A.B., Caldwell, C. (2018). *Impacts, Risks, and Adaptations in the United States: Fourth National Climate Assessment, Volume II*. U.S. Global Change Research Program. DOI: 10.1730/NCA4.2018.CH18

¹⁷ Dupigny-Giroux, L.A., Mecray, E.L., Lemcke-Stampone, M.D., Hodgkins, G.A., Lentz, E.E., Mills, K.E., Lane, E.D., Miller, R., Hollinger, D.Y., Solecki, W.D., Wellenius, G.A., Sheffield, P.E., MacDonald, A.B., Caldwell, C. (2018). *Impacts, Risks, and Adaptations in the United States: Fourth National Climate Assessment, Volume II*. U.S. Global Change Research Program. DOI: 10.1730/NCA4.2018.CH18

¹⁸ Dupigny-Giroux, L.A., Mecray, E.L., Lemcke-Stampone, M.D., Hodgkins, G.A., Lentz, E.E., Mills, K.E., Lane, E.D., Miller, R., Hollinger, D.Y., Solecki, W.D., Wellenius, G.A., Sheffield, P.E., MacDonald, A.B., Caldwell, C. (2018). *Impacts, Risks, and*

recreational fishers to access public trust lands that serve as harvesting grounds for various species.¹⁹ Shifts in species availability and distribution will likely impact the use frequency of certain shoreline accesses.

Federal Legal Framework

The federal government plays a critical role in facilitating public shoreline access across the country, namely through the Coastal Zone Management Act (CZMA) as well as the federally recognized public trust doctrine. The public trust doctrine establishes and protects the public's rights to natural lands, while the CZMA enables states to develop coastal management programs, under which public access is often implemented. Though states and municipalities are the key actors when it comes to establishing, maintaining, and protecting shoreline accesses, federal laws and policies provide the frameworks within which these entities can work.

Coastal Zone Management Act

The Coastal Zone Management Act, passed in the US in 1972, provides essential support for public shoreline access efforts in coastal states.²⁰ This legislation, among other efforts, initiated the National Coastal Zone Management Program, a voluntary state-federal partnership that provides support for the development and implementation of coastal zone management programs in coastal states.²¹ The Act specifically notes “public access to the coasts for recreational purposes” as part of state coastal zone management program responsibilities in section 303.²² Section 306A of the Act also outlines the Coastal Resource Improvement Program, which provides grant funding for projects including those that provide access to public beaches and other coastal areas, such as the construction of paths, walkways, benches, and parks.²³ The coastal zone enhancement grants, part of the Coastal Zone Enhancement Program, can also be utilized for “attaining increased opportunities for public access, taking into account current and future public access needs, to coastal areas of recreational, historical, aesthetic,

Adaptations in the United States: Fourth National Climate Assessment, Volume II. U.S. Global Change Research Program. DOI: 10.1730/NCA4.2018.CH18

¹⁹ Maine, government employee.

²⁰ Coastal Zone Management Act, 16 U.S.C. § 1451 *et seq.* (1972). https://coast.noaa.gov/data/czm/media/CZMA_10_11_06.pdf

²¹ National Oceanic and Atmospheric Administration. (n.d.). *The National Coastal Zone Management Program*. NOAA Office for Coastal Management. <https://coast.noaa.gov/czm/>

²² Coastal Zone Management Act, 16 U.S.C. § 1452 (1972). https://coast.noaa.gov/data/czm/media/CZMA_10_11_06.pdf

²³ Coastal Zone Management Act, 16 U.S.C. § 1455a. (1972). https://coast.noaa.gov/data/czm/media/CZMA_10_11_06.pdf

ecological or cultural value.”²⁴ All four states considered in this review are participants in this program, which offers an opportunity for states to identify needs and areas for improvement, then to work with NOAA to develop strategies to address these needs.²⁵ In the past decade alone, nearly 1,000 public access sites were created and over 2,800 existing sites were enhanced across the country via the Coastal Zone Management Program.²⁶ This governmental support will only become more integral to establishing and maintaining public access as the impacts of climate change begin to affect these areas.

The Public Trust Doctrine

The public trust doctrine plays a critical part in establishing and protecting the public’s right to access the shoreline in perpetuity. The doctrine, which dates back to sixth-century Roman laws that in turn influenced English common law, states that public trust lands, waters, and other resources are held by states for public benefit, establishing the rights of people to enjoy the areas through a variety of recognized uses.²⁷ While the public trust doctrine can be applied to an assortment of natural resources and spaces, it is frequently used to justify access to coastal areas. Along the coast, a state’s ownership of tidal waters, or waters affected by the tide, comes from the direct adoption of English common law.²⁸ These waters and associated bottomlands are held in the public trust by the state.²⁹ The US Supreme Court later clarified that states own the land under all tidal waters, not just “navigable-in-fact” waters, or those that can be traversed using “customary modes of trade and travel on water”³⁰, in 1988 with *Phillips Petroleum Co. v. Mississippi*.³¹

The US Supreme Court did not clearly articulate the federal public trust doctrine until the 1892 case *Illinois Central Railroad Company v. Illinois*, which defined the doctrine as “a title

²⁴ Coastal Zone Management Act, 16 U.S.C § 1456b. (1972). https://coast.noaa.gov/data/czm/media/CZMA_10_11_06.pdf

²⁵ National Oceanic and Atmospheric Administration. (n.d.) *The Coastal Zone Enhancement Program*. NOAA Office for Coastal Management. <https://coast.noaa.gov/czm/enhancement/>

²⁶ National Oceanic and Atmospheric Administration. (n.d.). *Programs Improve Public Access for All*. NOAA Office for Coastal Management. <https://coast.noaa.gov/states/stories/access-inclusiveness.html>

²⁷ Slade, D.C., Kehoe, R.K., & Stahl, J.K. (1997). *Putting the Public Trust Doctrine to Work, Second Edition*. Coastal States Organization, Inc. <https://shoreline.noaa.gov/docs/8d5885.pdf>

²⁸ Craig, R. (2008). A Comparative Guide to the Eastern Public Trust Doctrine: Classifications of States, Property Rights, and State Summaries. *Penn State Environmental Law Review*, 16(1). 1-113. <https://ssrn.com/abstract=1008161>

²⁹ Slade, D.C., Kehoe, R.K., & Stahl, J.K. (1997). *Putting the Public Trust Doctrine to Work, Second Edition*. Coastal States Organization, Inc. <https://shoreline.noaa.gov/docs/8d5885.pdf>

³⁰ Slade, D.C., Kehoe, R.K., & Stahl, J.K. (1997). *Putting the Public Trust Doctrine to Work, Second Edition*. Coastal States Organization, Inc. <https://shoreline.noaa.gov/docs/8d5885.pdf>

³¹ *Phillips Petroleum Co. v. Mississippi*, 484 U.S. 469, (1988).

held in trust for the people of the state, that they may enjoy the navigation of the waters, carry on commerce over them, and have liberty of fishing therein, freed from the obstruction or interference of private parties.”³² As it stands, the federal public trust doctrine protects navigation, commerce, and fishing uses of publicly-owned lands, and state doctrines can expand on these protections to include additional and in some cases more specific uses.³³

Each state is responsible for implementing its own form of the public trust doctrine, typically through its state Constitution. The doctrine identifies public and private rights in coastal waters and submerged lands by defining: the publicly-owned portions of these spaces; the lines dividing public and private property in submerged lands; the waters subject to private use rights; the lines delineating public and private use rights in the waters; and the protected uses in public areas.³⁴ For the states in this review, only Rhode Island explicitly outlines the public trust doctrine within their state Constitution, though these rights are established and protected in other states via various statutes, legislative definitions, and precedents set through court case outcomes.

Who Owns the Shore?

Ownership of coastal and submerged lands, along with coastal waters, can be complex due to the dynamic nature of these spaces and the difficulty of identifying and demarcating property lines in the field. The states in this review present an interesting case, as property rights and ownership are slightly different in Maine than in Connecticut, New York, and Rhode Island. Areas of the shore are distinguished using two key measurements: the mean low water and mean high-water marks. Mean low water is “the average of all the low water heights observed over the National Tidal Datum Epoch (NTDE)”, which is the 18.6-year period over which tide observations are observed and averaged to calculate these mean values.³⁵ The current NTDE in effect was calculated using values collected from 1983 to 2001 and will be revised in the coming years using data from the next tidal epoch.³⁶ Mean high water is calculated using the same

³² Illinois Central Railroad Co. v. Illinois, 146 U.S. 387, (1892).

³³ Craig, R. (2008). A Comparative Guide to the Eastern Public Trust Doctrine: Classifications of States, Property Rights, and State Summaries. *Penn State Environmental Law Review*, 16(1). 1-113. <https://ssrn.com/abstract=1008161>

³⁴ Craig, R. (2008). A Comparative Guide to the Eastern Public Trust Doctrine: Classifications of States, Property Rights, and State Summaries. *Penn State Environmental Law Review*, 16(1). 1-113. <https://ssrn.com/abstract=1008161>

³⁵ NOAA Tides & Currents. (n.d.). *Tidal Datums*. National Oceanic and Atmospheric Administration. https://tidesandcurrents.noaa.gov/datum_options.html

³⁶ NOAA Tides & Currents. (n.d.). *Tidal Datums*. National Oceanic and Atmospheric Administration. https://tidesandcurrents.noaa.gov/datum_options.html

method but measures high water heights instead. The area from the mean low water mark seaward to three miles offshore is considered state waters, managed by each state in accordance with relevant federal laws. The state holds these lands as part of the public trust, and they are therefore available for a variety of public uses within the boundaries of state and federal law. Inland of the mean high-water mark are coastal uplands, which consist of privately owned properties, where property owners have exclusive use rights unless an easement, right-of-way, or other designation is implemented.³⁷ These uplands can be owned and managed by individuals, businesses, nonprofit organizations, and municipal, state, and federal governments.

WHO OWNS THE SHORE?

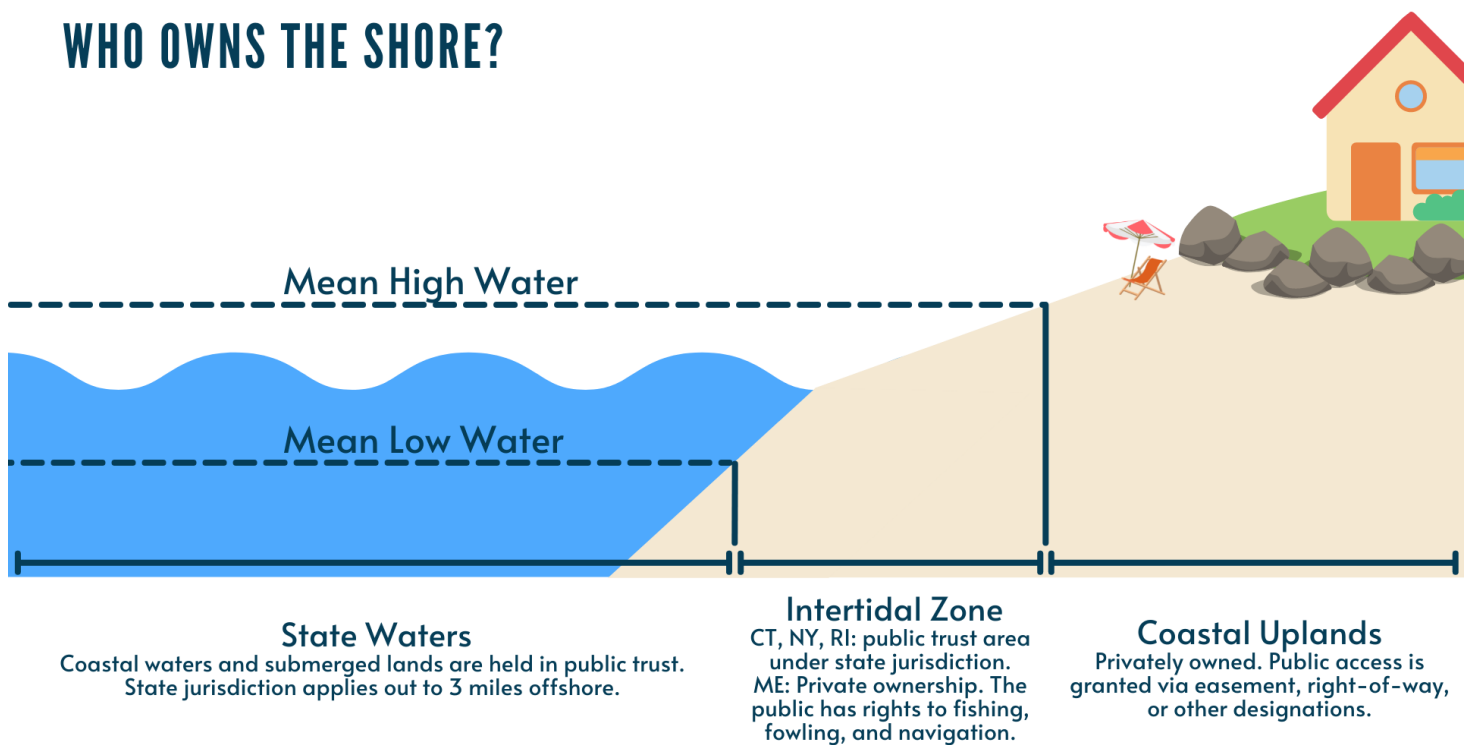


Figure 1. Who Owns the Shore? Adapted from Duff (2016). Image created in Canva.

Between the low water mark and the high-water mark is a slightly more complicated portion of the shore known as the intertidal zone. In most US states, the intertidal zone is under state ownership, extending the public trust area from mean high water out to three miles offshore. However, in a select few states, including Maine, private ownership rights extend to the

³⁷ Duff, J. (2016). Public Shoreline Access in Maine: A Citizen's Guide to Ocean and Coastal Law, Third Edition. *Maine SeaGrant College Program*. <https://seagrant.umaine.edu/wp-content/uploads/sites/467/2019/03/2016-public-shoreline-access-in-maine-508-accessible.pdf>

mean low water mark, meaning that owners of the adjacent coastal uplands also own the intertidal zone. Though private ownership extends to mean low water, however, the public still has rights to access and use the intertidal zone for “fishing, fowling, and navigation” per the Colonial Ordinances, established in the 1640s to govern the state of Massachusetts, for which Maine was once a district.³⁸ The fact that it is effectively impossible to identify the low water mark and high water mark visually without surveying equipment while out on a beach or another area of the coastline further complicates ownership in the intertidal, and can lead to conflict between property owners and the public.

Site Selection and Background Information

This project stemmed from summer work pertaining to shoreline public access in Rhode Island and an interest in learning more about the processes in surrounding states. For this review, I selected four states in the Northeast United States to examine: Connecticut, Maine, New York (with a focus on Long Island and Long Island Sound), and Rhode Island. Connecticut and New York were selected due to their geographical proximity to Rhode Island as well as their connectivity with regards to waterways. In addition, Maine was selected as a comparison point because it is a low-water state, meaning that the public ownership of tidal and submerged lands is slightly different than the ownership in the other states in the review. While these states are in the same geographic region, there are key differences that make shoreline access efforts, as well as the ability to adapt to climate change impacts, unique in each state.

Connecticut

The State of Connecticut features 618 miles of coastline from Greenwich to Pawcatuck, the vast majority of which is adjacent to the Long Island Sound.³⁹ Sheltered by Long Island, the state’s shoreline consists of tidal wetlands and soft and rocky bluffs, along with cobble, gravel, boulder and sandy beaches.⁴⁰ Approximately 3,605,944 people call Connecticut home, many of

³⁸ Duff, J. (2016). Public Shoreline Access in Maine: A Citizen’s Guide to Ocean and Coastal Law, Third Edition. *Maine SeaGrant College Program*. <https://seagrant.umaine.edu/wp-content/uploads/sites/467/2019/03/2016-public-shoreline-access-in-maine-508-accessible.pdf>

³⁹ NOAA Office for Coastal Management. (n.d.) *Shoreline Mileage of the United States*. National Oceanic and Atmospheric Administration. <https://coast.noaa.gov/data/docs/states/shorelines.pdf>

⁴⁰ O’Donnell, J., Barrett, J., & Slovinsky, P. (2016). *Connecticut Beaches and Dunes: A Hazard Guide for Coastal Property Owners*. Connecticut Sea Grant. https://beachduneguide.uconn.edu/wp-content/uploads/sites/1827/2016/08/Final-CTSG-Coastal-Hazards-Beach_Dune.pdf

whom live in coastal towns and cities.⁴¹ Shoreline access in the state is managed by the Connecticut Department of Energy and Environmental Protection (CT DEEP), primarily in the Land and Water Resources division which houses the Connecticut Coastal Zone Management Program, though additional divisions including planning, regulation, and enforcement also contribute to public access initiatives. CT DEEP staff in this division maintain a publicly available coastal access guide featuring upwards of 350 open and active shoreline access sites, including detailed information on each site such as maps, driving directions, parking availability, activities, and facilities.⁴² Accesses included in the guide are often presented to DEEP staff by colleagues working in regulatory or planning departments, or other staffers working on projects involving public access areas, and are added to the public-facing portal once the site is open to the public. The state maintains a database that includes proposed sites as well, helping staff to keep track of how access projects are progressing.⁴³

While Connecticut does not explicitly outline a state public trust doctrine, several court cases have established the precedent of rights to public trust lands stemming from the federal public trust doctrine, including accessing the shoreline. The state defines “public beach” as “that portion of the shoreline held in public fee ownership by the state or that portion of the shoreline below the mean high tide elevation that is held in public trust by the state” in the Connecticut Coastal Management Act, noting the public’s rights to this area.⁴⁴ Several key court cases have confirmed the public’s right to partake in specific activities within the public trust area, including “fishing, boating, hunting, bathing, taking shellfish, gathering seaweed, cutting sedge, and of passing and repassing,” as well as reaffirmed that private ownership of land ends at the mean high-water mark.⁴⁵ Private landowners in the state have exclusive riparian rights of access to navigable waters adjacent to their property, and it is within their rights to install docks, paths, or other infrastructure to access this area.⁴⁶ The public does not have the right to use this

⁴¹ US Census Bureau. (2021). *QuickFacts: Maine; New York; Connecticut; Rhode Island*. <https://www.census.gov/quickfacts/fact/table/ME,NY,CT,RI/PST045221>

⁴² Connecticut Department of Energy and Environmental Protection. (n.d.) *Connecticut Coastal Access Guide*. <https://www.depdata.ct.gov/maps/coastalaccess/index.html>; Connecticut, government employee.

⁴³ Connecticut, government employee.

⁴⁴ Connecticut Coastal Management Act, Ct. Stat. § 22a-93, (1979). https://www.cga.ct.gov/current/pub/chap_444.htm#sec_22a-93

⁴⁵ CT DEEP. (2020, March 6). *Who Owns the Shore: The Public Trust*. <https://portal.ct.gov/DEEP/Coastal-Resources/Living-on-the-Shore-Brochure/Who-Owns-The-Shore-The-Public-Trust#:~:text=Under%20the%20common%20law%20public,in%20trust%20for%20the%20public>.

⁴⁶ CT DEEP. (2020, March 6). *Who Owns the Shore: The Public Trust*. <https://portal.ct.gov/DEEP/Coastal-Resources/Living-on-the-Shore-Brochure/Who-Owns-The-Shore-The-Public-Trust#:~:text=Under%20the%20common%20law%20public,in%20trust%20for%20the%20public>

infrastructure, even if attempting to access the publicly-owned area below mean high-water, as it is considered an extension of private property. This has the potential to impact lateral access along shorelines, particularly as climate change leads to physical changes to the beach that may require the public to traverse areas closer to such structures.

The Connecticut Coastal Zone Management Act (CCMA), passed in 1979, is the primary legislation governing shoreline access in the state. One primary goal of the Act is to “encourage public access to the waters of Long Island Sound by expansion, development and effective utilization of state-owned recreational facilities within the coastal area that are consistent with sound resource conservation procedures and constitutionally protected rights of private property owners.”⁴⁷ The establishment of public accesses is encouraged for coastal development proposals in order to satisfy the requirement that, per the CCMA, waterfront sites should be developed to facilitate “water-dependent uses” unless the site features characteristics preventing those uses.⁴⁸ For some coastal site plans, public access may be a requirement to have the proposal approved by a municipal planning board. Management documents have recommendations for sight selection, signage, and legal requirements to ensure the development and continued maintenance of public accesses at these sites.⁴⁹

As with other nations and states across the globe, Connecticut is facing climate change impacts in its coastal zone. Recent predictions estimate that the sea level in the state could increase 1.5 feet by 2050 and up to 3 feet by 2100—this could lead to a loss of up to 24,000 acres of coastal lands.⁵⁰ The CCMA also includes language around climate change adaptation, including listing “to consider in the planning process the potential impact of a rise in sea level, coastal flooding and erosion patterns on coastal development so as to minimize damage to and destruction of life and property and minimize the necessity of public expenditure and shoreline armoring to protect future new development from such hazards;” as a goal.⁵¹

⁴⁷ Connecticut Coastal Management Act, Ct. Stat. § 22a-93, (1979). https://www.cga.ct.gov/current/pub/chap_444.htm#sec_22a-93

⁴⁸ Office of Long Island Sound Programs. (n.d.) *Connecticut Coastal Management Manual, Section 3: Coastal Uses. Fact Sheet for General Public Access to Coastal Waters*. CT DEEP. https://portal.ct.gov/-/media/DEEP/coastal-resources/coastal_management_manual/manualsection308pdf.pdf

⁴⁹ Office of Long Island Sound Programs. (n.d.) *Connecticut Coastal Management Manual, Section 3: Coastal Uses. Fact Sheet for General Public Access to Coastal Waters*. CT DEEP. https://portal.ct.gov/-/media/DEEP/coastal-resources/coastal_management_manual/manualsection308pdf.pdf

⁵⁰ Quincy, S., Pryzbek, A., Pritchard, K., & Kubik, E. (2020). *Connecticut: Our Changing Climate*. Connecticut Department of Energy and Environmental Protection. <https://portal.ct.gov/-/media/DEEP/education/kellogg/CT-Changing-Climate-Booklet.pdf>

⁵¹ Connecticut Coastal Management Act, Ct. Stat. § 22a-92, (1979). https://www.cga.ct.gov/current/pub/chap_444.htm#sec_22a-93

Maine

With 3,478 miles of coastline, the ocean is deeply rooted in Maine’s culture and economy, past and present.⁵² Just over 1.3 million people reside in Maine, largely along the coast.⁵³ The coastal economy of the state is heavily reliant on tourism, as well as the historic economically and culturally significant commercial fisheries such as lobster and ground fishes. Many fishers, including wormers, clammers, and surfcasters utilize public accesses to get to the intertidal zone where they can take advantage of their rights to fishing, fowling, and navigation per the public trust doctrine. However, these accesses, many of which are informal paths that cross over private property, are disappearing as property turnover (largely as a result of the COVID-19 pandemic) has led to the dissolution of these “handshake” agreements.⁵⁴ This has led to increased uses at other public access points, creating competition for these spaces that may be exacerbated as climate change impacts effect the areas.

Maine is an interesting case with regards to public ownership of coastal and submerged lands—originally, the state was established as part of Massachusetts in the early 1600s, and historic ordinances establishing private property rights to the mean low water line are still active. While private ownership extends to low water, the public does have established rights to fishing, fowling (hunting), and navigation seaward of mean high water.⁵⁵ Though the Public Trust Doctrine is not formalized in the Maine constitution, Section 1865 of the Maine Revised Statutes states that “the Legislature recognizes that submerged lands are owned by the state for the benefit of the public. These lands are impressed with a public trust.”⁵⁶ An additional statute in Maine legislature that explicitly states the public trust rights in intertidal land, including: “the right to use intertidal land for fishing, fowling, and navigation; the right to use intertidal land for recreation; and any other trust rights to use intertidal land recognized by the Maine common law and not specifically abrogated by statute.”⁵⁷ Several court cases have addressed and established

⁵² NOAA Office for Coastal Management. (n.d.) *Shoreline Mileage of the United States*. National Oceanic and Atmospheric Administration. <https://coast.noaa.gov/data/docs/states/shorelines.pdf>

⁵³ US Census Bureau. (2021). *QuickFacts: Maine; New York; Connecticut; Rhode Island*. <https://www.census.gov/quickfacts/fact/table/ME,NY,CT,RI/PST045221>

⁵⁴ Maine, government employee.

⁵⁵ Duff, J. (2016). Public Shoreline Access in Maine: A Citizen’s Guide to Ocean and Coastal Law, Third Edition. *Maine SeaGrant College Program*. <https://seagrant.umaine.edu/wp-content/uploads/sites/467/2019/03/2016-public-shoreline-access-in-maine-508-accessible.pdf>

⁵⁶ Filled submerged and intertidal lands. Maine Rev. Stat. § 1865 (1997 & rev. 2013). <https://legislature.maine.gov/statutes/12/title12sec1865.html>

⁵⁷ Public trust rights in intertidal land. Maine Rev. Stat. § 573 (1985). <https://legislature.maine.gov/statutes/12/title12sec573.html>

rights within the public trust area of the intertidal and submerged lands. The relatively famed Moody Beach case, *Bell v. Town of Wells*, 1989, affirmed the property rights of private landowners to the mean low water mark but noted that these areas are subject to public easement for fishing, fowling, and navigation.⁵⁸ Several court cases have also centered around defining these public rights, including what types of activities are allowable under the auspice of “fishing”—this term includes harvesting finfish, clams, and floating seaweed, but does not include removing loose seaweed, mussels, or sand and empty shells from the intertidal.⁵⁹ This is a particularly controversial topic in Maine due to the reliance of many individuals on recovering resources from the intertidal and could have implications at public accesses if these areas are being used to recover resources from the intertidal zone.

Establishing and maintaining shoreline access in Maine is a collaborative effort involving several agencies, including the Maine Coastal Program in the Division of Marine Resources, the Land for Maine’s Future Program, and the Division of Agriculture, Conservation and Forestry. The Maine Coastal Program has historically supported and continues to support multiple initiatives related to public access, including inventories, studies, and priority analyses, as well as provide technical assistance to municipalities. The Land For Maine’s Future Program is the primary agency in charge of acquiring lands or designating areas for public access through property purchases, development rights purchases, and establishing easements. The Program, which was started in 1987 in response to Maine residents’ desire for public access to natural spaces, addresses several priorities through their work, including shoreline access and protection of the working waterfront along Maine’s coast. To date, the Program has funded land acquisitions that host 62 water access sites and 26 commercial working waterfront properties, protecting 58 miles of Maine’s coastline.⁶⁰

A variety of geomorphologies can be found along Maine’s coastline—58% consists of rocky, consolidated bluff; 40% is unconsolidated bluff; and roughly 2% of the coast is beach,

⁵⁸ Duff, J. (2016). Public Shoreline Access in Maine: A Citizen’s Guide to Ocean and Coastal Law, Third Edition. *Maine SeaGrant College Program*. <https://seagrant.umaine.edu/wp-content/uploads/sites/467/2019/03/2016-public-shoreline-access-in-maine-508-accessible.pdf>

⁵⁹ Duff, J. (2016). Public Shoreline Access in Maine: A Citizen’s Guide to Ocean and Coastal Law, Third Edition. *Maine SeaGrant College Program*. <https://seagrant.umaine.edu/wp-content/uploads/sites/467/2019/03/2016-public-shoreline-access-in-maine-508-accessible.pdf>

⁶⁰ Maine Department of Agriculture, Conservation and Forestry. (n.d.). *About the Land for Maine’s Future Program*. <https://www.maine.gov/dacf/lmf/aboutus.shtml>

just half of which is sandy.⁶¹ Because of this composition, most of the shoreline is at a low to moderate vulnerability to shoreline change, though around 13% of the shoreline, including unstable bluffs, sand beaches, and dunes, is highly vulnerable to these impacts. Sea level rise trends in the state are on par with global averages, though planning documents developed by the Maine Climate Council recommended committing to managing for 1.5 feet of sea level rise by 2050 and 3.9 feet by the year 2100.⁶² The state will also likely need to anticipate 10-15-fold increase in nuisance flooding as climate change accelerates sea level rise.

New York

The state of New York is unique in terms of coastal zone management as its coastal programs and policies also apply to the Great Lakes, which are not tidally influenced in the same way as ocean coasts. Though shoreline access is an issue along the lakefronts as well, for the purposes of this review, research regarding climate change impacts will be focused on areas adjacent to saltwater bodies, specifically Long Island. Long Island, stretching east of New York City to the border of Connecticut and Rhode Island, features about 1,600 miles of linear coastline and 8,063,232 residents, accounting for approximately 40% of the total population of New York state.⁶³ This geographically and demographically diverse region hosts a suite of natural ecosystems, including salt marshes, barrier beaches, sand dune systems, and more, which exist in tandem with significant human development. Across the state of New York, there are just over 6,000 shoreline access points, ranging from state beaches and boat ramps to scenic overlooks—roughly 177 of these are on the Sound side of Long Island, though the number on the Atlantic side of the island is not currently inventoried and available as an isolated dataset.⁶⁴ The NYS Department of Environmental Conservation website offers information on state beaches, boat

⁶¹ Slovinsky, P. (2021). *Maine Coastal Property Owner's guide to Erosion, Flooding, and other Hazards, 2nd Edition*. Maine Geological Survey. https://digitalmaine.com/mgs_publications/605/

⁶² Slovinsky, P. (2021). *Maine Coastal Property Owner's guide to Erosion, Flooding, and other Hazards, 2nd Edition*. Maine Geological Survey. https://digitalmaine.com/mgs_publications/605/

⁶³ Long Island Index. (n.d.) *What is Long Island*. <http://www.longislandindex.org/what-is-long-island/#:~:text=It%20is%20geographically%20surrounded%20by,extends%20an%20estimated%201%2C600%20miles>.

⁶⁴ NY Department of State. (2020). *New York State Coastal Management Program: 309 Assessment and Strategies, July 1, 2021 through June 30, 2025*. <https://dos.ny.gov/system/files/documents/2021/06/nys-2021-5-yr-assessment-and-strategy.pdf>; Long Island Sound Study. (n.d.). *Public Access to Beaches and Waterways*. <https://longislandsoundstudy.net/ecosystem-target-indicators/public-access-to-beaches-and-waterways/>

launches, and fishing piers along with other accesses via a GIS-based search tool.⁶⁵ Additional information on recreation opportunities is available on the Department of State's data portal.

Shoreline access falls under the jurisdiction of the New York State Coastal Management Program, which is housed in the Department of State. The Program's policies outline specific goals, including to "expand recreational use of coastal fish and wildlife resources in coastal areas by increasing access to existing resources, supplementing existing stocks, and developing new resources", to "protect, maintain, and increase the level and types of access to public water-related recreation resources and facilities," as well as to ensure that "access to the publicly-owned foreshore and to lands immediately adjacent to the foreshore or the water's edge that are publicly-owned shall be provided and it shall be provided in a manner compatible with adjoining uses."⁶⁶ The Long Island Sound Coastal Management Plan also contains language directly addressing the creation and protection of public access along the Sound.⁶⁷ Municipalities are further supported via the Local Waterfront Revitalization Program (LWRP), which helps facilitate the development of local waterfront revitalization plans that can include coastal access. Though there are no formal requirements to consider climate change adaptations when developing these plans, the Program is working to incorporate climate impacts into the planning process, including updating LWRPs to include future climate risk mitigation strategies.⁶⁸ Mitigation can include anything from a physical infrastructure project to developing new policies and laws on a municipal level.

Because of the expansive coastline of New York, the state is vulnerable to sea level rise, coastal erosion, and flooding events resulting from climate change. Estimates adopted by the state government for planning purposes predict sea levels rising anywhere from 8 to 30 inches by 2050, and 15 to 72 inches by 2100 around Long Island.⁶⁹ Sea level rise, in conjunction with coastal storms, which are expected to increase in frequency and severity, also exacerbates coastal

⁶⁵ NYS Department of Environmental Conservation. (n.d.). DECinfo Locator. <https://gisservices.dec.ny.gov/gis/dil/index.html?REC>

⁶⁶ NY Department of State, NOAA Office of Coastal Zone Management. (2020). *New York State Coastal Management Program and Final Environmental Impact Statement*. https://dos.ny.gov/system/files/documents/2021/04/ny_cmp_dec2020_w-bookmarks_working_topost.pdf

⁶⁷ NY Department of State. (1999). *Long Island Sound Coastal Management Program*. <https://dos.ny.gov/system/files/documents/2020/02/liscmp.pdf>

⁶⁸ NY Department of State. (2020). *New York State Coastal Management Program: 309 Assessment and Strategies, July 1, 2021 through June 30, 2025*. <https://dos.ny.gov/system/files/documents/2021/06/nys-2021-5-yr-assessment-and-strategy.pdf>

⁶⁹ NY Department of Environmental Conservation. (2021). *Observed and Projected Climate Change in New York State: An Overview*. https://www.dec.ny.gov/docs/administration_pdf/ccnys2021.pdf

erosion. A study found that for every inch of sea level rise along Long Island’s coast, erosional areas could lose up to 9 feet of shoreline, drastically changing the geomorphology of the shore.⁷⁰

Rhode Island

With 384 miles of coastline, Rhode Island is well known for the recreational and economic opportunities its shores provide, from fishing to walking the beach.⁷¹ Just over one million people live in the “Ocean State”, with nearly 80% of the population residing within a 20-minute drive to the coast.⁷² Shoreline access plays a significant role in supporting recreational uses of the shore across the state. A recent study found that from June to September 2019, approximately 2.5 million visits to the Rhode Island coastline occurred via the state’s shoreline access points such as beaches, marinas, boat ramps, and public parks, including 150,000 visits to state-designated right-of-ways.⁷³ Rhode Island SeaGrant maintains an active, publicly available database of over 400 public access sites, including 230 state-designated ROWs, including information on parking, access structure or type, available activities, and more.⁷⁴ The University of Rhode Island’s Coastal Institute also recently collaborated with the Rhode Island Coastal Resources Management Council (CRMC) to update the database of designated rights-of-way, including essential information on the access and its use along with designation information and history.⁷⁵

The shoreline and state waters of Rhode Island are under the jurisdiction of the Coastal Resources Management Council, established in 1971 to regulate activities in the coastal zone. Among other duties, the CRMC is responsible for discovering and designating public rights-of-way to Rhode Island’s tidal waters, a task outlined in the legislation establishing and empowering the CRMC.⁷⁶ While the CRMC cannot create rights-of-way, staff members do

⁷⁰ NY Department of Environmental Conservation. (2021). *Observed and Projected Climate Change in New York State: An Overview*. https://www.dec.ny.gov/docs/administration_pdf/ccnys2021.pdf

⁷¹ NOAA Office for Coastal Management. (n.d.) *Shoreline Mileage of the United States*. National Oceanic and Atmospheric Administration. <https://coast.noaa.gov/data/docs/states/shorelines.pdf>

⁷² US Census Bureau. (2021). *QuickFacts: Maine; New York; Connecticut; Rhode Island*.

<https://www.census.gov/quickfacts/table/ME,NY,CT,RI/PST045221>; URI Coastal Institute. (n.d.) *Coastal Access Data & Resources*. <https://ci.uri.edu/access/>

⁷³ Twichell, Julia. (2021). *How Do We Use Our Coasts?* Narragansett Bay Estuary Program.

<https://storymaps.arcgis.com/stories/b994fade18bb4f1bb82dea62956c3139>

⁷⁴ Shoreline RI. (n.d.) *Explore Rhode Island’s Coast*. Rhode Island SeaGrant. <https://www.shoreline-ri.com/>

⁷⁵ URI Coastal Institute. (2021). *CRMC-Designated Rights-Of-Way*.

<https://crmcgis.maps.arcgis.com/apps/instant/attachmentviewer/index.html?appid=7f8f263ce81c4e269c4b87a35371f86f>

⁷⁶ Coastal Resources Management Council, R.I. General Laws § 46-23-1 *et seq.*

<http://webservice.rilin.state.ri.us/Statutes/TITLE46/46-23/INDEX.HTM>

conduct legal research, often in partnership with municipalities, nonprofit organizations, or community members, to identify paths to the shore historically used by the public. This process can be largely community-driven, offering the public ample opportunities to present possible accesses as well as comment on those moving through the designation process. While landowners, from individuals to municipalities or state agencies, can establish and maintain shoreline access points, CRMC-designated rights-of-way cannot be transferred, developed, or abandoned, offering an additional level of protection valid for perpetuity.⁷⁷ Several CRMC employees work to some extent on public access issues, including two policy analysts, the communications and outreach coordinator, enforcement officers, and a staff attorney, though there are no full-time staff dedicated to this effort.

The Rhode Island Constitution clearly outlines the state’s public trust doctrine, including the people’s rights to the coast for “fishing from the shore, the gathering of seaweed, leaving the shore to swim in the sea and passage along the shore.”⁷⁸ In Rhode Island, these public trust rights pertain to the area from mean high water to three miles offshore, the portion of the coastal zone under state jurisdiction. Shoreline access is certainly of public interest in the state, and in early 2021, a State House of Representatives resolution was introduced, “creating a special legislative commission to study and provide recommendations on the issues relating to lateral access along the Rhode Island shoreline.”⁷⁹ This commission consists of twelve individuals, including representatives from coastal communities, nonprofit organizations, academic institutions, and various state agencies including the CRMC, and is working to develop a series of recommendations addressing access issues including balancing private and public rights along the shore by March 30, 2022.

Climate change has impacted, and will undoubtedly continue to impact, the Rhode Island coast. Sea level rise is one of the primary threats to Rhode Island’s coastline. Since 1930, sea levels have risen 0.25 meters across the state, for an average rate of 2.75 mm per year.⁸⁰ This rate accelerated to 3.98 mm per year from 1986-2017, exceeding global averages for the same stretch

⁷⁷ Rhode Island Coastal Resources Management Council. (2021) *Shoreline Public Access Frequently Asked Questions*. <http://www.crmc.ri.gov/publicaccess/faqs.html>

⁷⁸ R.I. Const. art. 1, § 17. <http://webserver.rilin.state.ri.us/RiConstitution/ConstFull.html>

⁷⁹ R.I. Gen. Assemb. Jan. Sess. (2021). H-5469. <http://webserver.rilin.state.ri.us/BillText/BillText21/HouseText21/H5469A.pdf>

⁸⁰ Rhode Island Coastal Resources Management Council. (2015). *The Rhode Island Sea Level Affecting Marshes Model (SLAMM) Project*. <https://www.rigis.org/datasets/e0b891e21ea24019b6fc63c3a7ed73d6>

of time.⁸¹ Coastal erosion is also a potential concern for shoreline access, particularly lateral access along coastlines. Rhode Island's shoreline is changing at a rate of 0.57 meters per year, with some estimates suggesting that the south shore of the state could experience a total change of 89 meters by 2065 and roughly 216 meters by 2100.⁸² Often associated with storm events, these dramatic changes along the coast could have significant implications for the location, nature, and safety of public accesses.

Methods

Background Research

To begin my research, I developed a work plan to better refine the questions I needed to answer through background research and informational interviews. Once the plan was completed, I identified a list of several questions to answer, which helped to guide my initial research (See Appendix). These questions were answered through background research and informational interviews. Following the selection of the four states, I conducted a review of relevant documents to understand the context of shoreline access and climate change initiatives in each state. I reviewed an assortment of current legislation and plans for each state, including coastal management acts and the legislation implementing the acts, state general laws and the state constitution, and relevant court case summaries. I also reviewed legislation and management plans related to climate change initiatives in each state for relevant information about impacts or planning in the coastal zone. In addition, I conducted internet searches and examined materials suggested by interviewees related to public access, including SeaGrant publications and other state agency-generated reports.

Informational Interviews

To address my research questions, I identified government employees working on shoreline access as well as coastal scientists from each state. Interviewees were selected by researching current state employees working in positions related to shoreline access and reaching out via email to individuals or general information email addresses for relevant departments.

⁸¹ Rhode Island Coastal Resources Management Council. (2015). *The Rhode Island Sea Level Affecting Marshes Model (SLAMM) Project*. <https://www.rigis.org/datasets/e0b891e21ea24019b6fc63c3a7ed73d6>

⁸² Rhode Island Coastal Resources Management Council. (2018). *Rhode Island Shoreline Change Special Area Management Plan*. http://www.crmc.ri.gov/samp_beach/SAMP_Beach.pdf

Coastal scientists were either recommended by other interviewees and contacted directly, or emailed following research to find individuals working on or with knowledge of climate change impacts in the coastal zone. Overall, I conducted seven semi-structured interviews with twelve individuals from Connecticut, Maine, New York, and Rhode Island. Five of the interviews were conducted with state employees working on projects related to public access, and two interviews were with coastal scientists. In most cases, my initial contact would recommend inviting or extend an invitation to another individual working on shoreline access or relevant research projects, resulting in five of the seven interviews being conducted with pairs of interviewees.

Based on my initial research questions and background research on each state, I developed a series of questions for state government employees and a similar but slightly altered list for scientists. The questions were designed to collect additional information on shoreline access programs, including history, enabling legislation, budgeting, and the role of municipal governments. Additional questions were focused specifically on climate change impacts to shoreline accesses and how programs are considering these impacts for current and future planning. Interviewees were asked a series of questions regarding the shoreline access program or initiatives in each state as well as climate change and its impacts to shoreline access. The question list was slightly different for each interview in order to fill in any data gaps left after conducting background research, but all interviewees were asked the climate change questions (see Appendix). For the interviews with coastal scientists, I asked the same climate change in the coastal zone questions (see Appendix). Each interview lasted thirty minutes to one hour via Zoom, and questions were sent in advance so participants could adequately prepare and/or invite additional staff to participate in the interviews. The semi-structured nature of the interviews ensured that the necessary information was collected while allowing time for follow up questions and any additional information or resources the participants wished to pass along.

Following each interview, audio recordings were transcribed using Zoom or Otter transcription services. Once these transcriptions were produced, I reviewed and edited each transcription to upload into NVivo, where I coded the interviews to identify key themes and sub-themes. The results were broken out into three major themes based on my initial research questions: climate change concerns, current planning and capacity, and future planning and capacity. Each major theme contained sub-themes, which were created based on the content of

the interviews and allowed for a more specific comparison between states on each topic. These sub-themes are used to organize the results below.

Results

The results presented in this section stemmed from the series of informational interviews conducted with government employees and coastal scientists, with some supplemental information from research following up on concepts or specific information mentioned in the interviews. Interviewees are cited by state and “government employee” or “coastal scientist” to maintain relative anonymity. The results are organized into three themes with corresponding sub-themes: climate change concerns, current planning and capacity, and future planning.

Climate Change Concerns

Before determining how states can maintain current or ensure future access to the shore, it is critical to understand which potential impacts are most concerning for state agencies and coastal scientists with regards to shoreline access. Overall, interviewees expressed concerns with both physical and social impacts of climate change on shoreline access in their states. These physical impacts included sea level rise as well as coastal erosion and shoreline change, both of which lead to reduction in spaces available for public use. Social impacts of these physical effects may include changes in use for access areas and property rights issues and conflicts.

Climate Change Concerns	
Physical Impacts	<ul style="list-style-type: none"> • Sea level rise • Coastal erosion • Effects of shoreline hardening • Lack of available space for shoreline access
Social Impacts	<ul style="list-style-type: none"> • Use changes at accesses • Use conflicts • Property rights issues

Table 1. Climate change concerns at shoreline access points.

Physical Impacts

Interviewees from each of the four states mentioned sea level rise and coastal erosion as two key physical impacts that could have effects on shoreline access points to different degrees.

Both of these physical changes can impact the size and location of the accessible public trust area, potentially compounding to reduce available space or change how that space can be used. As sea levels rise, the mean high-water mark will move closer to upland areas, eventually reaching land that no longer offers the same uses as previous areas. Along parts of the coast that remain relatively natural, such as marshes, dune systems, and barrier islands, adjacent habitats can migrate inland as sea levels rise, potentially maintaining a similar space available in the intertidal. The effects of coastal erosion, however, could dramatically change the shore, influencing where the high tide lands. It is also important to note that the tidal epoch used to calculate mean high water is somewhat dated and is currently using data from a 19-year period at least twenty years in the past. The discrepancy between the mean high-water mark as determined using the tidal epoch and where the intertidal is located based on actual wave action in the area could be further exacerbated by sea level rise and coastal erosion.

Multiple interviewees expressed concerns about the impacts that nearby shoreline hardening efforts may have on public access. To protect their upland assets, individual property owners may opt to harden their shorelines or utilize other erosion prevention strategies, but the impact of that on accesses at a site-by-site level is relatively unknown.⁸³ As resilience efforts ramp up, inevitably including hardened shorelines, one interviewee noted that lateral access could be impacted, leaving limited dry sand for people to traverse as sea levels rise or existing sands and sediments move in different ways around these structures.⁸⁴ Some conversations also touched on the inland migration of beaches and marshes, which could be impeded by hardened shorelines or by other natural or manmade infrastructure on private upland property.⁸⁵ Beaches are eroding and moving rapidly right up against highly developed shorelines, and are left with nowhere to go as private landowners work to stop erosion on their properties. As sea levels rise and reach these areas, the water could leave very little, if any, space for the public to traverse in front of seawalls or other hardened structures.

In some states, a lack of available space for shoreline access, in particular sandy beaches, is further exacerbating the impacts of these physical effects and was brought up as a concern. For example, in Maine, there are only 70 miles of beach, half of which are sand beaches, comprising

⁸³ Maine, government employee.

⁸⁴ Rhode Island, coastal scientist.

⁸⁵ New York, government employee; Rhode Island, government employee.

just 1% of the coastline, so “blanket space” is already limited.⁸⁶ Though increasing public access is a priority, there are simply limited quantities of land available to create such spaces.⁸⁷ An interviewee identified a similar phenomenon on Long Island—there is a significant amount of privatization along the shore in some areas, limiting the amount of space available for access in the first place.⁸⁸ Highly developed shorelines, along with barriers to entry such as the need to take a ferry to large expanses of barrier beach along the Atlantic shore, have already limited access to the coasts of the island, and climate change impacts will only reduce access further. Scientists in Rhode Island noted that erosion and sea level rise will likely end up fragmenting beaches, impeding lateral access. In addition, flooding events and increased inundation will impede or reduce access to accesses themselves along with parking and other facilities.⁸⁹ In areas where accessibility or accesses are already limited, climate change impacts could exacerbate this lack of access.

Because of the varied nature of these accesses, and the diverse geology and infrastructure along the coast, these physical impacts can manifest very differently. Several interviewees cited the importance of collecting data and monitoring sites to fully understand the potential impacts to each shoreline access. Interviewees from Connecticut stressed that safety is key for their shoreline access program, noting that increasing storm severity and frequency and its subsequent impacts could render sites unsafe for visitors, underscoring the importance of monitoring these areas. Though we have an understanding of climate change impacts in the coastal zone, it is difficult to predict how exactly these impacts will affect shoreline accesses, especially in states with coastlines that span hundreds of miles and feature many different geomorphologies.

Social Impacts

Interviewees from each of the four states also described several social impacts, including changing uses, use conflicts, and property rights issues, as key concerns related to climate change. The physical impacts associated with sea level rise, coastal erosion, flooding, and others leading to a change or reduction in access can amplify existing social tensions in an already crowded coastal area and may lead to conflict as impacts worsen.

⁸⁶ Slovinsky, P. (2021). *Maine Coastal Property Owner's guide to Erosion, Flooding, and other Hazards, 2nd Edition*. Maine Geological Survey. https://digitalmaine.com/mgs_publications/605/

⁸⁷ Maine, government employee.

⁸⁸ New York, coastal scientist.

⁸⁹ Rhode Island, coastal scientist.

Changes in use of coastal areas were mentioned as climate-related concerns by interviewees from all four states. In Connecticut, for example, interviewees relayed that inundation, whether temporary (as a result of flooding events) or more permanent (from sea level rise and shoreline change) could completely alter the use of certain accesses. One interviewee noted that many accesses are centered around natural features and activities, such as bird watching in marshes—however, if these areas are impacted by climate change, it could degrade the coastal access experience for visitors and perhaps make the site less desirable to visit.⁹⁰ Similarly, a scientist in New York mused about the impacts of warming temperatures and the effects that could have on the beach season—a longer, hotter summer could increase traffic to shoreline accesses, potentially requiring increased staffing, monitoring, and enforcement.⁹¹ The same individual commented on the extensive scope of these climate change impacts as well—in some communities, people may not be able to access their homes during flooding events or even on a daily basis as sea levels rise, much less public access points.

Many Mainers who fish, clam, or worm in the intertidal or coastal waters have historically accessed the coast by traversing private property, relying on “handshake” agreements for their shoreline access.⁹² However, property turnover in the state has increased dramatically as a result of the COVID-19 pandemic, returning some of these previously used paths to private use only and leaving fishers to turn to public access points. This may lead to competition at these sites for parking, use of the intertidal or coastal waters, and other resources. The loss of commercial waterfront to increased development may also increase competition at these public accesses, along with shifts in marine species distribution, which could require fishers to utilize different access points than they have historically frequented.⁹³ Similarly, along the coast of Long Island, fishing ports and ensuring access for commercial fishers is also a consideration, especially in the context of using these ports as hubs for offshore wind project installation and operations.⁹⁴

Property rights and the line between public and private ownership is also a conflict exacerbated in these coastal areas, and questions about how this will be affected as shorelines change were raised in several interviews. Though the public trust doctrine establishes and

⁹⁰ Connecticut, government employee.

⁹¹ New York, government employee.

⁹² Maine, government employee.

⁹³ Maine, government employee.

⁹⁴ New York, coastal scientist.

protects the public's right to the coastal zone, predicting how these ownership rights, whether public or private, will shift and change as lands look and function differently is somewhat unclear.⁹⁵ In the battle of public versus private rights, private rights may have a slight advantage due to the nature of these rights and the spaces they occupy. In Maine, though the public has the right to fishing, fowling, and navigation in the intertidal zone, there have been a plethora of court cases attempting to define what activities are or are not legal in this area.⁹⁶ As the space available along the shore shrinks, there could be more questions about the legality of activities or even the public's presence in certain areas.

Current Planning and Capacity

While most shoreline access efforts or programs are not specifically addressing climate change through their current initiatives, climate change planning and resilience efforts aimed at addressing some of the concerns identified are absolutely a priority for coastal programs and state governments more generally, which may positively affect shoreline access initiatives. Each of the four states in this review do have some capacity for addressing climate change impacts and planning, including coastal zone management and planning strategies, state climate legislation, the role of municipalities, and statewide inventories and data collection efforts.

Coastal Zone Management and Planning

Each of the four states have comprehensive coastal zone management plans and initiatives that consider the impacts of climate change. For coastal projects in New York, developers and project managers are required to account for current sea level rise projections when designing structures in accordance with building codes. The state also has regulatory programs to limit additional hardened structures along shorelines in an effort to minimize impacts on marsh and beach migration, potentially enhancing lateral access along shorelines. The Local Waterfront Revitalization Program is working to address climate change as part of the planning process, such as by incorporating more natural features in project design. The LWRP also developed risk assessment maps and tools that municipalities can use to identify vulnerable assets and develop strategies to increase resilience.

⁹⁵ Connecticut, government employee; Maine, government employee; Rhode Island, government employee.

⁹⁶ Maine, government employee.

In Connecticut, several divisions within DEEP such as permitting take climate change impacts into account, requiring that coastal development be consistent with the state’s Coastal Management Act, which aims to “consider in the planning process the impact of a rise in sea level, coastal flooding and erosion patterns on coastal development.”⁹⁷ The regulatory program reviews coastal activities and considers impacts to coastal resources, including public access, which is considered a resource. In addition, the public access program does have the opportunity to advise on municipal decisions and certain other projects, where they can take potential climate change impacts into account when recommending public access in an area. Similarly, in Rhode Island, coastal development regulations are working to enhance access by requiring plans for certain developments or structures to include public access.⁹⁸ Rhode Island also has a comprehensive special area management plan (SAMP) dedicated to shoreline change, which includes a section identifying that shoreline accesses are at risk to climate change impacts but noting that no studies have been conducted to determine the vulnerability of these areas.⁹⁹ This document provides guidance for coastal development projects, such as those that are required to include public accesses, including that developers must consider the formally adopted sea level rise and storm surge projections when proposing coastal projects, and that projects with public access need to consider potential coastal hazards in the planning stage.¹⁰⁰

At the Maine Coastal Program and the Land for Maine’s Future (LMF) Program, there is currently no specific plan around how to address climate impacts to properties with shoreline access, though the programs do take these potential effects into account. Before acquiring property, LMF looks at sea level rise data, predicted coastal hazards, marsh migration models and other data sources to understand what the risks will be in the long term.¹⁰¹ This process is particularly important for working waterfront projects, which need to be able to sustain use in perpetuity. Generally, if modifications are needed to adapt to climate change impacts, the development process would fall under the jurisdiction of the Maine Coastal Program or the US Army Corps of Engineers.¹⁰² LMF staff also work to provide managers with information and

⁹⁷ Connecticut Coastal Management Act, Ct. Stat. § 22a-92, (1979). https://www.cga.ct.gov/current/pub/chap_444.htm#sec_22a-93

⁹⁸ Rhode Island, government employee.

⁹⁹ Rhode Island Coastal Resources Management Council. (2018). *Rhode Island Shoreline Change Special Area Management Plan*. http://www.crmc.ri.gov/samp_beach/SAMP_Beach.pdf

¹⁰⁰ Rhode Island Coastal Resources Management Council. (2018). *Rhode Island Shoreline Change Special Area Management Plan*. http://www.crmc.ri.gov/samp_beach/SAMP_Beach.pdf

¹⁰¹ Maine, government employee.

¹⁰² Maine, government employee.

data up front to make informed decisions about how climate change impacts will affect site, though there are no requirements to consider these potential implications. Many applicants are required to develop management plans to receive funding, and adaptive management is a necessary component.¹⁰³ LMF provides funding with the understanding that managements strategies may need to change over time to accommodate changes resulting from climate impacts. Because LMF is typically not involved in the management of properties that they provide funding for, they have relatively limited influence over how the property is managed— however, property managers do need to consult with other agencies in the state government such as the Bureau of Parks and Lands and the Maine Coastal Program, which do require climate planning to varying degrees.¹⁰⁴ When LMF acquires an access point, it can range in size from two to 200 acres, increasing access opportunities within individual properties and potentially helping to ensure that access to the shore using that property is maintained even if climate change impacts affect a portion of the area.¹⁰⁵

State Level Climate Legislation and Planning

There are varying levels of climate change legislation and planning coming from each state government, which may have implications for shoreline access programs and their current or future climate change planning efforts. Connecticut has been very proactive in developing climate legislation, many pieces of which could have implications for the coastal zone. These Acts include Public Act 18-82, which integrated new sea level rise projections into state and municipal planning documents as well as coastal management laws; Special Act 13-9, endorsing the establishment of a Coastal Climate and Resiliency Center for technical support; and Public Act 13-179, requiring the development of best practices for permitting coastal structures and refining coastal regulatory procedures.¹⁰⁶

In Maine, the Governor has prioritized strategizing for climate change through various planning efforts, including establishing the Maine Climate Council through a June 2019 law, who developed the Maine Won't Wait plan.¹⁰⁷ The plan outlines several goals along strategies to

¹⁰³ Maine, government employee.

¹⁰⁴ Maine, government employee.

¹⁰⁵ Maine, government employee.

¹⁰⁶ CT Department of Energy and Environmental Protection. (2019). *Connecticut Legislation & Executive Orders on Climate*. CT.gov. <https://portal.ct.gov/DEEP/Climate-Change/Connecticut-Legislation--Executive-Orders-on-Climate>

¹⁰⁷ Maine Climate Council. (2020). *Maine Won't Wait: A Four Year Plan for Climate Action*.

https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/MaineWontWait_December2020.pdf

achieve the goals, including: adopting official sea level rise projections, assessing climate vulnerability and providing design guidance, enhancing monitoring and data collection, and increasing conserved lands in the state to 30%.¹⁰⁸ The New York Coastal Management Program also outlines several predicted climate change impacts, as well as climate-related goals such as reducing greenhouse gas emissions, developing adaptation strategies, and adopting official sea level rise projections for management.¹⁰⁹ New York legislators have also passed legislation aimed at addressing climate change and its impacts, including the Community Risk and Resilience Act, which tasked the DOS, the Department of Environmental Conservation, and additional partners to develop model local laws designed to increase climate resilience in coastal communities.¹¹⁰

In Rhode Island, the recently amended 2021 Act on Climate established a council responsible for “assessing, integrating, and coordinating climate change efforts” across state agencies.¹¹¹ Goals outlined in the Act include: increasing the understanding of climate change effects; assessing vulnerability of infrastructure and natural systems to impacts of climate change, and implementing strategies to protect and adapt these assets; and working with academic institutions and federal agencies to assess these threats and develop tools to address them.¹¹² This Act and its goals may help to support research regarding climate change impacts in the coastal zone, which could be essential for understanding impacts to shoreline accesses.

The Role of Municipalities

In all four states, municipalities can play a critical role in discovering, establishing, and maintaining public shoreline accesses. Connecticut, Maine, New York and Rhode Island are all home rule states, meaning that state constitutions grant municipalities, towns, villages or

¹⁰⁸ Maine Climate Council. (2020). *Maine Won't Wait: A Four Year Plan for Climate Action*.

https://www.maine.gov/future/sites/maine.gov/future/files/inline-files/MaineWontWait_December2020.pdf

¹⁰⁹ NY Department of State, NOAA Office of Coastal Zone Management. (2020). *New York State Coastal Management Program and Final Environmental Impact Statement*. https://dos.ny.gov/system/files/documents/2021/04/ny_cmp_dec2020_w-bookmarks_working_topost.pdf

¹¹⁰ NY Department of State, NOAA Office of Coastal Zone Management. (2020). *New York State Coastal Management Program and Final Environmental Impact Statement*. https://dos.ny.gov/system/files/documents/2021/04/ny_cmp_dec2020_w-bookmarks_working_topost.pdf

¹¹¹ 2021 Act on Climate, R.I. General Laws, § 42-6.2-1 *et seq.* <http://webservice.rilin.state.ri.us/Statutes/TITLE42/42-6.2/INDEX.htm>

¹¹² 2021 Act on Climate, R.I. General Laws, § 42-6.2-1 *et seq.* <http://webservice.rilin.state.ri.us/Statutes/TITLE42/42-6.2/INDEX.htm>

counties the ability to pass laws and govern themselves within state and federal law.¹¹³ In general, municipalities are responsible for maintaining shoreline accesses within their town boundary, which may include addressing climate change impacts. While municipal management of coastal accesses can facilitate a more spatially focused effort, this can also complicate matters slightly, as municipal governments can manage these resources differently town to town or city to city. However, municipalities can also offer additional and more site-specific management capacity, making their efforts towards shoreline access initiatives invaluable.

The Maine government offers a variety of grant programs to support municipalities developing public access, including: the Shore and Harbor Management Program through the Division of Marine Resources, where municipalities apply for funds to support right-of-way discovery and waterfront planning, including public access for recreation, fishing, and other activities; the Submerged Lands Program at the Division of Agriculture, Conservation and Forestry, which provides planning and construction funds for coastal zone projects including access; and the Department of Transportation's Shore and Harbor Improvement Program, offering funds for project construction.¹¹⁴ At the Land for Maine's Future Program, municipalities can apply to receive funds that support land acquisitions for shoreline access. Over the past five to ten years, one interviewee noted, municipalities have gained more awareness that constituents are interested in accessing and guaranteeing their continued access to the shore, leading communities to get more involved in establishing shoreline accesses.¹¹⁵ Maine also has a robust land trust community, offering an opportunity for municipalities and land trusts to collaborate to acquire and manage lands. LMF has found that partnered projects are more successful, along with projects that provide clear benefits to towns and their residents, such as water access for fishers.¹¹⁶

New York also empowers municipalities to lead the charge on public access discovery and designation through Local Waterfront Revitalization Plans. These plans, along with harbor management programs, are developed by municipalities with technical assistance from the state and can include public access.¹¹⁷ Town Trustees, a board of elected officials responsible for

¹¹³ National League of Cities. (n.d.) *Cities 101—Delegation of Power*. <https://www.nlc.org/resource/cities-101-delegation-of-power/>

¹¹⁴ Maine, government employee.

¹¹⁵ Maine, government employee.

¹¹⁶ Maine, government employee.

¹¹⁷ New York, government employee.

working on governance within each municipality, can play a big role in developing plans as well. In Rhode Island, municipalities can submit public accesses to be formally designated by CRMC, or they can implement accesses themselves. Municipalities discover possible right-of-ways in their jurisdiction, generally as part of the goals outlined in a coastal or harbor management plan.¹¹⁸ Town employees or private citizens can then conduct research and present it to the CRMC, who will assist with research as necessary and work through the designation process. Similarly, in Connecticut, municipalities can submit possible access sites. In addition, the Connecticut Coastal Zone Management Program does have jurisdiction to review and comment on particular projects, including those proposed by municipalities.¹¹⁹ State employees can work with municipal entities to suggest potential candidates for public accesses on proposed projects.

Statewide Inventories & Data Collection

Statewide inventories of shoreline access points not only provide a great resource for the public to find access points, but they can also be an essential tool for understanding the impacts of climate change on these areas. These inventories and the databases created for public or internal use include detailed information on each site, including existing infrastructure, facilities, and the area surrounding the access, in addition to maps showing the location of the access. This geospatial data can be used to conduct inundation analyses, identify accesses with infrastructure that may not hold up to possible impacts, or track collected data over time.

Rhode Island and Connecticut each actively maintain a public-facing database of shoreline access points, complete with helpful information on all sites. In Rhode Island, the University of Rhode Island Coastal Institute recently worked to update the CRMC's ArcGIS-based right of way database to include updated imagery, designation documents, and logistical information (parking, type of access, etc.) for each of the state's 227 formally designated rights-of-way. The Rhode Island SeaGrant also hosts a website with 400-plus public accesses, including CRMC rights-of-way along with additional areas such as boat ramps, public beaches, town beaches, and others. The state of Maine is planning on conducting a comprehensive inventory of accesses, which will require a significant amount of effort as there are thousands of miles of shoreline, a plethora of formal and informal accesses, and a variety of resource users.¹²⁰

¹¹⁸ Rhode Island, government employee.

¹¹⁹ Connecticut, government employee.

¹²⁰ Maine, government employee.

Though New York does not currently host any sort of public access-specific database, a few different publicly available resources do include information on public access, including the NYS DEC website as well as a NYDOS-maintained data portal.

Data collection, modeling, and projections are an essential part of developing management strategies for the coastal zone, including shoreline access points. Interviewees from each state relayed that current modeling and projections predicting impacts such as sea level rise and flooding are used frequently in coastal zone management, and some noted that these would be useful if applied to shoreline access planning and management. Inter-office or even inter-agency collaboration plays a key role in data collection and relaying this information to individuals working on shoreline access initiatives. Some interviewees noted that though they did not conduct research related to climate impacts or develop projections and models themselves, other divisions or departments within state agencies do, and share this information with those working on shoreline access. In Maine, for example, the LMF program is using data to understand what the predicted changes are to a property to help facilitate planning efforts.¹²¹ The state government has been proactive in terms of planning and climate preparedness, using models and a variety of other tools to develop resilience and mitigation strategies.

Scientists at the University of Rhode Island Coastal Institute are currently working on several projects related to shoreline access, including field work, education and outreach, and database management. In addition to working on the shoreline access database, scientists are also conducting field research to understand how tidal datums translate themselves onto Rhode Island's beaches—researchers visit beaches once per month for two to three hours around low tide to measure the extent of the highest waves at set intervals, which provides essential data on the amount of space available below mean high water for the public to use on the beach.¹²² This data can be used in conjunction with beach profiling data to track changes to the mean high water line, and the space usable by the public, over time. The state also collaborated with a number of academic institutions and nonprofit organizations to develop the Sea Level Affecting Marshes Model (SLAMM), which can be used to determine how marshes will be impacted by

¹²¹ Maine, government employee.

¹²² Rhode Island, coastal scientist.

sea level rise and could be a useful tool for identifying physical impacts to accesses along with how uses might change at a particular site.¹²³

More broadly, in the state of Maine, a recent report titled *Changing Shorelines: Adaptation Strategies for Maine's Coastal State Parks* looked at five state parks along the coast and reported on possible climate impacts to each park.¹²⁴ Because of the variable nature of Maine's coastal geology and its shoreline accesses, it can be difficult to fully understand and quantify the impacts of climate change on these areas. However, this report provided in-depth data and research on each site, which could be an excellent blueprint for conducting further research on other shoreline access points across the state.

Barriers to Implementation

While shoreline access is a priority in each of these four states, there are some limitations that may create barriers to maintaining current or designating future shoreline accesses. In Connecticut, the loss of existing public access sites to climate change impacts is a pressing concern, as sites cannot necessarily be replaced because public access designation is somewhat opportunistic.¹²⁵ A similar situation arises in Maine, where the Land for Maine's Future Program is working to acquire, or financially assist other organizations to acquire, land parcels and working waterfront spaces that would accommodate public shoreline access. Though LMF does take climate change impacts into consideration when looking to facilitate the acquisition of a property, they too are limited by the available properties, and cannot always acquire areas that will be minimally impacted now or in the future.¹²⁶ Due to the opportunistic nature of these land acquisitions, staff are relatively limited in their ability to select areas that would be less susceptible to potential climate change impacts, and are limited in control over the property as funds are allotted to a municipality or other organization.

Funding, in particular to support staff time, can also be a challenge to climate change planning for shoreline access. In all four states, individuals working on public access programs sit in a state agency such as the department of marine resources, coastal management programs,

¹²³ Rhode Island Coastal Resources Management Council. (2015). *The Rhode Island Sea Level Affecting Marshes Model (SLAMM) Project*. <https://www.rigis.org/datasets/e0b891e21ea24019b6fc63c3a7ed73d6>

¹²⁴ Slovinsky, P., Leyden, K., Dickson, S., Gordon, R., Cameron, D., & Spiess, A. (2016). *Changing Shorelines: Adaptation Planning for Maine's Coastal State Parks*. Maine Department of Agriculture, Conservation and Forestry. http://digitalmaine.com/geo_docs/7

¹²⁵ Connecticut, government employee.

¹²⁶ Maine, government employee.

and the department of state, and are primarily funded via state budgets. Staff sizes working to some extent on public access issues range from just a few individuals (3 to 5) to close to 50 people, though these estimates are difficult because not all staff dedicate all of their time to access issues and are often spread across divisions within departments. Additional funding opportunities may come in the form of grants, state bonds, or federal support from NOAA or other agencies focused on coastal restoration, management, and access.¹²⁷ Because of this somewhat limited or potentially inconsistent funding, coordinating with municipalities, community groups, and even individuals is key for identifying, designating, and maintaining public access.

Future Planning

Interviewees generally agreed that it is important to factor in climate change impacts when planning for shoreline access in the future. Building off of the current capacity in each state, from climate change legislation to collaborations with municipalities, climate change impacts can be incorporated into planning and management processes. Primary mechanisms included using sea level rise and inundation projections or models to understand how public accesses will be affected, leaning on existing policy tools that require coastal development projects to consider impacts, and prioritizing community outreach and education.

Increased Data Collection, Projections & Modeling

Several interviewees mentioned the importance of continuing to use projections and models for planning purposes, particularly sea level rise models. Modeling and data can be used to predict the impacts of climate change on a particular access point before it is designated, allowing managers to develop a plan for addressing these impacts.¹²⁸ Projections and models may also help managers to determine how uses will change at certain accesses based on impacts.¹²⁹ However, models are a prediction for the future, and while they can be very accurate, the implications on a site-by-site basis may be challenging to extrapolate from this prediction. Providing resources to collect data on climate impacts to shoreline accesses will be essential for developing management strategies and planning resources to ensure that access is maintained in

¹²⁷ Maine, government employee.

¹²⁸ Maine, government employee.

¹²⁹ Rhode Island, government employee.

perpetuity. Scientists in Rhode Island noted that next steps in their work included inundation analyses to identify sites that may be at increased risk for flooding.¹³⁰ Developing or incentivizing the use of existing risk assessment maps can also help to identify at-risk areas. For example, the state of New York has developed tools to search for possible public parcels to acquire and use for access points, which, if paired with other models or layers such as inundation or coastal hazards, could provide critical information for understanding the risks associated with a public access in a certain area and develop appropriate management plans, or help to identify sites that would not require adaptation over time.¹³¹ These tools should be used to make sure that public access is currently available in all municipalities, and that these accesses will continue to be available as climate change impacts increase.¹³²

Adaptive Management

The existing policies and management plans in place will continue support shoreline access initiatives, and climate legislations have the potential to support future planning efforts that include these climate impacts. However, developing adaptive management strategies will be essential for ensuring public access into the future. For example, the Land For Maine's Future program is looking to make some updates to become more proactive in terms of climate planning. In evaluating the most recent rounds of funding applications, LMF assigned extra points to projects that considered climate change in the planning process and are making adjustments to the property to accommodate some of these changes.¹³³ LMF also recently revisited the land acquisition priorities that have governed LMF's work for the past 30 years, and adding language about climate change impacts and access to the water have come up as priorities.¹³⁴ In general, they underscored the need to use adaptive management strategies, and to ensure that the legal language in documents can be adaptive as well. Addressing or mitigating physical impacts are going to require the strategic management of existing shorelines, such as the barrier islands off of Long Island's Atlantic coast. These ecosystems, under appropriate management, can be used to enhance resilience and increase available access.¹³⁵ Interviewees

¹³⁰ Rhode Island, coastal scientist.

¹³¹ New York, government employee.

¹³² New York, government employee.

¹³³ Maine, government employee.

¹³⁴ Maine, government employee.

¹³⁵ New York, coastal scientist.

also noted the importance of collaboration for planning at the state and community level—in Maine, for example, there have been some efforts to organize groups of towns to conduct regional planning, which could be an excellent model for shoreline access management.¹³⁶ The key role that municipalities play in shoreline access discovery, designation, and continued management underscores the importance of fostering these collaborative relationships where communities can learn from one another.

Community Education and Outreach

Community education and outreach efforts, including volunteer monitoring and stakeholder engagement, can play a critical role in maintaining shoreline access in the face of climate change. It is important to connect with local partners who are able to observe changes on a local scale—these individuals or community groups are generally much more aware of changes than people outside of the community. In Rhode Island, CRMC and SeaGrant staff have prioritized communication around public access to help people connect with existing and future resources through a series of informational webinars along with educational materials. All states had helpful web-based resources focused on various aspects of public shoreline access, from documents explaining the public trust doctrine and the public’s right to the shore to digital maps of available accesses. These resources provide the public with critical information regarding their rights and abilities to access the shore, and should continue to be maintained especially as those abilities may shift as a result of climate change impacts to the coastal zone. In addition, maintaining the GIS-based databases such as the Connecticut Coastal Access Guide and the map of Rhode Island CRMC-Designated Rights-Of-Way to the Shore provide an excellent up-to-date resource to increase use of these accesses, which can ultimately build support for the continued discovery, development, and protection of these shoreline access points.

Public shoreline access is an issue with many involved parties—stakeholders range from state and local governments, who designate the accesses, to any member of the public who walks down one of these sandy paths or to the edge of a bluff to watch a sunset. Increasing communication with and between stakeholders is essential and can help garner additional support for public access initiatives. Fostering a sense of community can truly be an asset. Stakeholder engagement can facilitate the sharing of local knowledge about certain areas to comprehensively

¹³⁶ Maine, government employee.

quantify climate change impacts. Communities can also actively participate in managing these public spaces through monitoring and stewardship efforts. State entities are often hands-off following the initial designation or acquisition of access sites, relying on municipal and community groups to maintain accesses, especially as climate change impacts begin to affect physical structures or suitable uses of the areas. Continued stewardship of these areas is essential for ensuring that access is maintained along changing coasts.¹³⁷ Programs such as Rhode Island's Adopt-An-Access program can connect groups or individuals with an access to maintain, ensuring that the area remains safe and suitable for use. In addition, those who adopt the site can monitor for any physical or use changes over time, providing data crucial for understanding the physical and social effects of climate change on specific areas. Connecting with community members who are using accesses or who visit a particular area frequently is vital, as they are often much more aware of changes over time than those outside of the community and can provide invaluable information on how these accesses are being impacted.¹³⁸

Conclusion and Recommendations

Comprehensively planning for the future, in particular one where climate change impacts will directly affect shoreline access points, is no small feat. In my conversations with practitioners, both government employees and coastal scientists, I found that while we have a relatively robust understanding of how climate change will impact our coasts on the whole, it is unclear exactly how shoreline accesses will be impacted. These accesses vary so dramatically in their structure, location, exposure, and use that it can be difficult to narrow down the scope of research and predict specific impacts. Physical impacts including sea level rise, shoreline change (and strategies to address that change), and a lack of space to implement coastal accesses will undoubtedly change where and how we use shoreline access points. These physical impacts will ultimately lead to social impacts such as use changes and property rights conflicts, which are exacerbated in these closer quarters, underscoring the need for planning and management strategies that consider climate change impacts to shoreline accesses.

However, hope is not lost for ensuring continued connections to the shore. I was inspired by the passion for maintaining public access that was so clear in my various conversations, along

¹³⁷ Rhode Island, coastal scientist.

¹³⁸ Maine, government employee.

with the forward thinking of state governments with regards to climate change preparedness, resilience, and mitigation. Each state has a framework of existing resources and capacity to address climate impacts to shoreline accesses, including coastal zone management and planning efforts, a strong municipal role, and statewide data collection and inventory efforts. Though these efforts can experience barriers, namely the opportunistic nature of public access discovery and designation along with a lack of funding, building off of current capacity and using tools such as increased data collection, adaptive management, and education and outreach could ensure that shoreline access initiatives are maintained or expanded into the future.

Based on the results of background research and the informational interviews, I have developed three recommendations for state governments, specifically the agency or agencies tasked with coordinating shoreline access efforts, in order to ensure the current and future protection of shoreline access in the face of climate change.

(1) Develop state shoreline public access management plans, including climate adaptation strategies.

While the states in this review do have extensive coastal management plans which include language regarding public access, creating a shoreline access-specific planning document could be a useful tool to distinguish and further support public access initiatives. Developing a formal shoreline public access management plan would provide an excellent framework for planning in the future, especially with regards to climate change impacts. This plan, which could either be a standalone management plan or be incorporated into any number of existing documents such as coastal management or special area management plans, should include an inventory of current shoreline access points as well as plans for routinely conducting inventories; goals for maintaining or expanding shoreline access in the state; research priorities, including those related to climate change impacts; and education and outreach goals. The plan should be developed through a collaborative process involving government agencies working on shoreline access initiatives, with a stakeholder engagement component to ensure that the plan is addressing the needs of communities that use shoreline accesses.

(2) Support data collection efforts to understand climate impacts on shoreline accesses.

State agencies tasked with managing shoreline access should collaborate with other state agencies, municipalities, academic institutions, nonprofit organizations, and other groups as relevant to bolster data collection at and monitoring of shoreline access sites. These data-driven efforts should focus on quantifying both the physical and social impacts of climate change on shoreline access. While it is essential to understand how impacts such as sea level rise, coastal erosion, and flooding will change the appearance and suitable uses of shoreline accesses, it is also critical to include social data. Supporting a research project to identify the types of activities people use accesses for, the frequency of visitation to each access, the infrastructure or facilities people utilize while there, and other relevant information could help managers to develop management strategies that protect these uses in the face of climate change. These programs could be an excellent way to increase stakeholder engagement in shoreline access initiatives through volunteer monitoring of sites, drawing on community knowledge and assets to enhance the coastal spaces that they use and value. Site-specific data could be organized and presented to the public through existing statewide inventories and other online tools.

(3) Review and clarify state legislation related to the public trust doctrine and shoreline access to the coastal zone

While each of the four states do work to ensure the public's rights to the coastal zone, clarifying how the public trust doctrine is implemented, including the public's rights in the public trust area, could be beneficial for the continued protection of these rights and spaces. States should convene a working group consisting of personnel working on public access initiatives along with legal consultants to conduct a comprehensive review of existing laws and precedents related to ensuring the public's rights to the coastal zone. The working group should then determine whether developing legislation to formally outline their public trust doctrine, including protections for these rights as climate change impacts affect the location or characteristics of the public trust area, is an appropriate next step. If existing legislation adequately and clearly outlines the public's rights in the coastal zone, or once new legislation is proposed and passed, the working group should collaborate with outreach coordinators of their respective agencies and other organizations as appropriate (such as SeaGrant offices, academic institutions, or nonprofits) to create a public-facing document that outlines these legislations and such. Some states do already have information available on this subject, including webpages and

printable guides—these documents should be updated as necessary or replaced with more suitable options if deemed appropriate.

Limitations and Further Research

There were some limitations associated with this study. First, though the area of interest was the Northeast US, only four states were included in this project. Because shoreline access is managed differently in each state, these four may not provide adequate representation of all Northeast states. Within each state, only two to four people were interviewed, and though they were selected based on their involvement with shoreline access initiatives as government employees or coastal scientists, additional perspectives from other groups such as municipalities, nonprofit organizations, or other stakeholders may have been beneficial to gain a complete understanding of the topic.

There are several areas of further research that could be expanded upon following this review, including: conducting social impact analyses of shoreline access development in each state; conducting inundation analyses to understand impacts of sea level rise and increased coastal flooding on shoreline accesses; and studying shoreline access availability for environmental justice communities. Shoreline access is also an issue of public interest in many other states across the nation, so there are ample opportunities to conduct similar reviews with a different subset of states. It would also be interesting to compare shoreline access initiatives and rights in the United States to another country, particularly examining the presence and/or the implications of the public trust doctrine.

Appendix

Initial Recruiting Email

Hello (name),

My name is Emily Bodell and I am a second-year Master of Environmental Management student with the Nicholas School of the Environment at Duke University. I am reaching out today because I am conducting research on public shoreline access programs and their planning capacity with regards to climate change impacts for my master's project, and you (were recommended by your colleague, NAME) (noted as the primary contact for your state's shoreline access program) (other means of discovery). Would you be interested in speaking with me for 45 minutes to an hour regarding (your state's shoreline public access program) (climate change impacts on shoreline access/ coastlines in your state)? I am widely available (dates) so please do let me know what time or date works for you.

Thank you very much, and I look forward to hearing from you!

Best,

Emily Bodell

Informed Consent Statement

Thank you for agreeing to speak with me about (your state's public shoreline access program) (the effects of climate change on shoreline access points in your state). For my master's project, I am conducting a comparative analysis of shoreline public access programs in a selection of New England/Northeast states, and am interested in exploring the capacity of programs to prepare for or mitigate the effects of climate change on these accesses. This interview will likely last around 45 minutes to 1 hour, and I will be asking a series of questions—please feel free to skip over any questions that you would rather not answer. I am not aware of any risks associated with participating in this interview, and some benefits may include learning more about public access programs in neighboring states once research is complete. I will be recording this Zoom call for my use only (to generate a transcript for note-taking) and will not share audio or video recordings with anyone else. With your permission, I would like to include you by name or job title in my final report and presentation, which will be presented to the MEM cohort, faculty, friends, and family. The end product is a final report that will be published in the Duke Archives. I am also planning to make copies of my final project available to other interviewees if requested. If you prefer to remain anonymous, please let me know and I will refrain from using any identifying information in my final project. Do I have your permission to a) record this Zoom call for my use only, and b) use your name and/or job title in my final report and presentation if necessary?

Interview Questions

The following list of questions was generated at the beginning of the project with a goal of answering each question through background research and/or informational interviews with representatives from each state. For the “general questions”, not all questions listed were asked of each interviewee, but were investigated through research. The set of questions each interviewee was asked was selected in advance after identifying gaps in the data collected via background research. All interviewees were asked to answer the “climate change adaptations” questions, and all were asked about the role of municipalities in shoreline access development.

Interviewees: Government employees working on shoreline public access programs.

General Questions re: shoreline access in each state

- What is the ownership situation for tidal lands in your state? Which portions of the beach are in the public trust? Are there any key legal cases/laws that I should review that set this precedent?
- What legal rights to people have to the coast in the state?
 - How does lateral access factor in? Is that a protected right, and if so, in what capacity?
- Designation process for public rights-of-way:
 - Who can designate a public right-of-way?
 - Does the state have a designation process?
 - What does that process look like?
 - What additional protections does state designation offer if available?

General Questions re: shoreline public access program

- When did your public shoreline access program start?
- What State legislation, if any, exists in support of public shoreline access initiatives?
 - How is the public trust doctrine upheld in the state?
- How many staff members, if any, are dedicated to this program?
- Does the program have any designated funding?
- What role does municipal government play in improving/ maintaining shoreline access?
- How is this program affected by Federal policies such as the Coastal Zone Management Act? Are there other Federal legislations that impact shoreline access in the state, and if so, how?

Climate Change Adaptations

- What are your biggest concerns with regards to shoreline access and climate change? Are there particular climate change effects that you anticipate will be most impactful?
- How do you see these effects of climate change impacting coastal access points (including lateral access along the shore)? These can be physical alterations, changes in use, or other impacts.
- Does your shoreline access program include planning for these changes due to climate change? If so, how?

- Do you anticipate needing to factor potential impacts of climate change into future planning for shoreline access? For example, to determine siting access points, number and size of access points, type of areas being designated.
 - If you are strategizing for the effects of climate change, what tools (could be modeling, policy tools, educational efforts) have you found to be most effective?

Interviewees: Scientists and other experts working on climate change impacts in coastal communities.

Climate Change Impacts to the Coastal Zone

- What type of work do you conduct in your state? How does this relate to climate change impacts in the coastal zone?
- What are your biggest concerns with regards to shoreline access and climate change? Are there particular climate change effects that you anticipate will be most impactful?
- How do you see these effects of climate change impacting coastal access points?
 - How has the mean high-water line/ area designated as public land changed over time? Is this something that you monitor?
 - Have there been changes in lateral access over time, and if so, what do those changes look like?
- Are there any existing models/ tools that are currently in use to better understand these impacts?
- Do you anticipate needing to factor potential impacts of climate change into future planning for shoreline access? For example, to determine siting access points, number and size of access points, type of areas being designated.
 - If you are strategizing for the effects of climate change, what tools (could be modeling, policy tools, educational efforts) have you found to be most effective?