Sea Grant Law Center

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Law and Policy Research, Education, and Outreach within the Sea Grant Network: Introduction to the Special Issue

Jim Wilkins[1]

This special issue of the *Sea Grant Law and Policy Journal* contains articles from a symposium held in September 2013 at the University of Mississippi School of Law in Oxford, Mississippi. The symposium, entitled "Law and Policy Research, Education, and Outreach within the Sea Grant Network," brought together members of the Sea Grant Legal Network (SGLN) from around the country to meet and share their work and experiences with each other. The papers presented at the symposium and published here highlight the applied legal research and work products SGLN members have produced as part of their jobs at their respective Sea Grant programs, which are slightly different than the more traditional academic or scholarly explorations usually found in law journals.

The SGLN is a small, informal professional networking organization composed of legal programs and lawyers who are specialists and extension personnel within university-based Sea Grant College Programs. Each coastal and Great Lakes state, as well as Puerto Rico and Guam, have Sea Grant College Programs that are recognized and established through a partnership between the respective universities and the National Oceanic and Atmospheric Administration within the U.S. Department of Commerce. Members of the SGLN are somewhat unique within the Sea Grant network in that less than a third of the Sea Grant College Programs have legal programs or legally trained staff. That number has been increasing recently, however, as more programs recognize the importance of legal expertise and capacity.

The Louisiana Sea Grant Law and Policy Program at Louisiana State University and the Mississippi-Alabama Sea Grant Legal Program at the University of Mississippi School of Law are the oldest legal programs within Sea Grant. Each program was established in 1972 and has worked continuously for over 40 years to meet the legal research, education, and outreach needs of coastal communities in the Northern Gulf of Mexico. The National Sea Grant Law Center is a Sea Grant institutional project established in 2002 to, among other things, provide legal research, education, and outreach services to the 30 Sea Grant programs. The Rhode Island Sea Grant Legal Program was established in 2003 and is housed within the Marine Affairs Institute at Roger Williams School of Law. The newest legal program within the Sea Grant network is the North Carolina Coastal Resources Law, Planning, and Policy Center, established in 2004. It is important to note, however, that this partnership between North Carolina Sea Grant, the University of North Carolina School of Law, and the University of North Carolina Department of City and Regional Planning was an outgrowth of North Carolina Sea Grant's longstanding (since the 1970s) legal specialist position. A number of other Sea Grant programs, including Florida, Hawaii, Illinois-Indiana, New York, Virginia, and Washington, have staff with legal backgrounds or partnerships with legal clinics in their states.

The Sea Grant College Programs' mission is to assist constituents in the wise and sustainable use of coastal resources through research, education, and outreach. In recent decades the exponential increase of natural resources laws and regulations has changed the dynamics of coastal resource management. Though sound science is more important now than ever for making wise decisions about resource management, social and political influence on those decisions have often been the pivotal factors. The integration of science, which is increasingly complicated and inaccessible to lay people,

[1] James Wilkins is the Director of the Louisiana Sea Grant Law & Policy Program at Louisiana State University and currently serving as Past Chair of the Sea Grant Legal Network. Jim served as SGLN chair from 2011-2013. He has a Master's degree in Biology from Texas A&M University and a J.D. from LSU Law Center.

into laws and thereby into regulatory and judicial decision-making has greatly increased the need for accessible interpretations and an understanding of science and the law and the legal systems. The members of the SGLN fill part of this important need by providing the best available legal information to their constituents, which include not only the public and federal, state, and local governments, but also their colleagues in the Sea Grant College Programs. Some of the most important impacts of SGLN members' work are borne out of the synergy between the SGLN and the extension and education components of the Sea Grant programs.

Many in the SGLN have spent their careers working on natural resources legal issues and are recognized experts in their fields. Some have scientific training as well, which adds an extra dimension to their understanding of the interaction of law and science. The range of topics and issues members of the SGLN handle on a daily basis is very wide. In recent years, coastal safety and resiliency issues have risen to prominence, as demonstrated by three of the articles in this volume. At the same time, the Sea Grant College programs remain committed to their more traditional areas of emphasis, including fisheries, wetlands and other natural resources, ports, and coastal businesses. Two of the articles in the symposium address fisheries issues, albeit from different perspectives, and demonstrate how varied the work of the SGLN can be. The pieces in this issue cover an eclectic group of topics but represent only a small glimpse at the SGLN's repertoire. The SGLN and its members believe these articles will be interesting and informative to a wide audience and welcome any feedback and professional interactions that may be generated by them.

The article by Martin Jaffe and Mary Woloszyn takes the unique approach of examining the effects of warmer winters in the urban setting using Chicago as a case study. The city's Sustainable Chicago Action Agenda focuses mainly on warmer summers but is broad enough to allow consideration of adaptation measures for warmer winters. The article discusses the possible impacts of increased winter temperatures and precipitation and their effects on flood risks and increased freeze-thaw cycles. The force of water expanding as it turns to ice is a very powerful and destructive force, and more freeze-thaw cycles will increase maintenance requirements on roads and other structures, hinder the operations of transit facilities, and pose public safety issues as more material is loosened and falls from buildings onto city sidewalks. A higher percentage of winter precipitation falling as rain rather than snow will change flooding patterns, although one study determined that there may be a lower frequency of destructive freezing rain and ice storm events. Climate change may also increase the percentage of snowfall that is heavier and wetter. Heavy snow is more destructive to roofs, trees, and power lines causing dangerous conditions and blackouts, and the associated health risks include heart attack risks from shoveling heavy snow. The article discusses possible adaptation strategies drawing on examples from other cities, concluding that current local climate adaptation plans in the region are still too heavily weighted towards changing summer conditions, and that winter adaptation measures are legally defensible and should be transferable throughout the region. Finally, the article postulates that incremental changes in adaptation measures would be the best strategy and that the current adaptive management framework may not be appropriate because of the long-term data analysis required to identify trends in climate change and the short-term variability that can mask those trends.

Lisa Schivianato and Joe Kalo discuss public trust issues on North Carolina's beaches. This topic is particularly relevant to the issue of climate change adaptation given the impending collision between the massive amount of coastal development and sea level rise. The article's two case studies seek to tease out the public nature of dry sand beaches and the legal rights and responsibilities of beachfront property owners and the public when beaches naturally migrate. The main issues in determining the public/private character of North Carolina's dry sand beaches are the state's public trust doctrine and the common law doctrine of custom, as well as the extent of any easement that may exist. The doctrine of custom would be the source of public dry sand beach rights in the state, but despite statutes affirming customary use, the state's courts have yet to decide the issue. The article discusses artificially

nourished beaches, which are becoming an important component of developed shorelines, as billions of dollars are being spent by federal, state, and local governments on U.S. beach renourishment projects. Distinguished from natural beaches, the public investment in artificially constructed beaches can change the ownership and rights of use depending on the pre-project water lines and the language of any easement agreements required for the renourishment projects to be conducted. When natural forces erode beaches to the extent that private structures sit in the water, a question arises as to whether the structures' location violates federal or state law. The federal navigation servitude and the Rivers and Harbors Act are implicated when the structures sit below mean high water mark. Federal case law from one circuit holds that property owners can be compelled to move their structures located below the mean high water mark because of erosion, but not as the result of avulsive events. State common law and statutes would require removal of obstructions to navigation whether from erosion or avulsion, but do not compel the removal of abandoned property. Structures that are not abandoned on dry sand beaches may present a problem if they are not actually nuisances and do not interfere with the public's right of use. The North Carolina courts seem to have difficulty with the ambulatory nature of shores and what that means to public/private property rights, but the issue will definitely have to be resolved as sea levels rise.

Catherine Janasie's article explores climate change adaptation on Dauphin Island, Alabama. The article discusses in detail the climate induced threats that the residents of this low-lying barrier island may face in the coming decades. Land loss, sea level rise, and storms all pose significant problems to coastal barrier islands and the residents of Dauphin Island are seeking information and assistance in addressing those hazards. The Mississippi-Alabama Sea Grant Legal Program, working with the Mobile Bay National Estuary Program, organized and assisted in conducting a Vulnerability-Consequence Planning Scenarios (VCAPS) workshop to aid the residents in understanding what climate change could mean to the long-term sustainability of the community. The VCAPS process uses local knowledge and experience to identify the unique vulnerabilities for the particular community and the best ways to mitigation impacts from a local perspective. A wide range of participants were gathered for the workshop to make sure as many viewpoints as possible were considered. Getting the participants to agree on solutions proved difficult, but several suggestions for future action such as catching rain to reduce flooding and beach renourishment came out of the workshop. Legal issues such as public/private shore boundaries and regulation of non-water dependent uses will need further study.

Nicole Faghin's article discusses measures several states have taken to promote the viability of working waterfronts. The article looks at the work of legislatively created committees charged with developing strategies to protect working waterfronts such as land use planning, submerged lands leasing, direct and indirect funding incentives, development rights transfers and purchases, and education. In addition to legislators, the committees included representatives from governmental agencies charged with managing ocean and coastal resources, private sector representatives from the commercial and recreational fishing industries, marine trades, construction and real estate, and environmental NGOs. The definitions of what constitutes a working waterfront have not been consistent over the years, but they commonly emphasize the fishing industry and quite often ports. The committees operated in slightly different ways, but they all developed recommendations that commonly included better planning and zoning, funding/taxing mechanisms, and education. Implementation of the committees' recommendations has varied considerably among the states ranging from legislation requiring local governments to plan for working waterfronts in their comprehensive plans to mapping coastlines to determine the extent of working waterfronts for future planning. Some states changed tax assessment procedures to assist working waterfront property owners, one state reduced its submerged lands lease fees, several states provided direct funding to purchase property, easements, and development rights and to build infrastructure, and several states

developed education and outreach programs to inform the public about the importance of working waterfronts.

Finally, Melissa Chalek writes about legal issues affecting shellfish relay for depuration in Rhode Island. Relay of shellfish from areas where water quality problems can make it unsafe to eat to areas where it can be cleansed by depuration can be an effective way to increase shellfish growing areas. However, in some states like Rhode Island, laws requiring long wait times before relayed shellfish can be harvested make relaying less profitable and therefore impracticable. The article examines federal depuration requirements that allow for variability based on several physical parameters, such as water temperature, salinity, and species, and the laws of other states and Canada, all of which require far shorter depuration periods than Rhode Island. Rhode Island law also discourages private relay operations by favoring public relay programs in required approvals and permits. Though Rhode Island has valid reasons for its long depuration period requirements, the article argues persuasively that changes in its current policies would be beneficial to the industry and could be accomplished while still protecting public health.

An Initial Assessment of Winter Climate Change Adaptation Measures for the City of Chicago

Martin Jaffe and Mary Woloszyn[1]

Abstract: There has been little assessment of winter climate changes and their associated urban impacts. Most climate adaptation planning, including the City of Chicago's Climate Action Plan and its Sustainability Action Agenda, focuses on adapting to hotter summers, including more frequent summer heat waves and droughts, greater flood risks from a higher percentage of annual precipitation occurring in the form of more severe storms, and shifts in ranges of flora and fauna (including disease vectors). This Article examines municipal adaptation to some of the impacts of a shorter and warmer winter season in the upper Great Lakes region, using Chicago as a case study. These largely unexamined impacts include a likely greater intensity of winter precipitation events (with a greater percentage of the winter precipitation falling as rain), changes in snowfall density (with more snowfalls possibly in the form of heavy, wet snow), and a possible increase in the frequency of freeze-thaw cycles.

I. Introduction

As state and federal efforts to reduce greenhouse gas emissions to mitigate global climate change face political constraints and obstructionism, climate initiatives adopted by local governments are emerging as an increasingly important response to political inaction and gridlock. Local officials are embracing a growing number of policies, incentives, and regulations to reduce greenhouse gas emissions and to better address the impacts of future climate changes. The Midwest regional report in the most recent draft National Climate Assessment suggests that the major climate change impacts in urban areas within the Great Lakes region include the increased risks of flooding and erosion, more summer heat waves which pose public health risks for vulnerable populations from both heat stroke and air pollution, and more droughts which impact natural resources, water resources, and crops.[2]

[1] Martin Jaffe is an Associate Professor, Department of Urban Planning and Policy at the University of Illinois at Chicago and Environmental Planning Specialist with Illinois-Indiana Sea Grant College Program. Mary Woloszyn is Extension Climatologist, Midwestern Regional Climate Center (Illinois State Water Survey) and the Illinois-Indiana Sea Grant College Program, University of Illinois at Urbana-Champaign. Appreciation is given to Andrew Shook and Danielle Chiorottino, graduate student research assistants at UIC, for this project. This research was funded by the Great Lakes Integrated Science and Assessment program at the University of Michigan, Ann Arbor.

[2] *See generally* Sara C. Prior & Donald Scavia, *Midwest in* NATIONAL CLIMATE ASSESSMENT AND DEVELOPMENT ADVISORY COMMITTEE DRAFT CLIMATE ASSESSMENT (V. 11. Jan. 2013), *available at* http://ncadac.globalchange.gov/download/NCAJan11-2013-publicreviewdraft-chap18-midwest.pdf.

Warmer average annual temperatures and a greater frequency of more severe storms will also raise health, safety, and ecological concerns because of the consequent shifts in the ranges of disease vectors, changes in habitats, alterations in invasive species, and increased risks of flooding and pollution from urban stormwater runoff.

Communities can do two things to address these issues. First, they can attempt to reduce carbon emissions in order to slow down the rate of climate change (climate change *mitigation*). Second, they can change their policies and programs to better deal with the projected impacts of a changing climate (climate change *adaptation*). Climate change mitigation strategies typically address reducing greenhouse gas emissions through energy conservation by promoting alternate energy resources and encouraging the use of transportation modes (e.g., bicycling, transit, or walking) that minimize the burning of fossil fuels. Climate change adaptation strategies, on the other hand, can involve a wide range of activities and programs to adjust local government practices and services in order to better reduce a community's vulnerability to current and projected future climate change impacts through, for example, rain gardens, reducing impermeable surfaces, or urban cooling centers. A growing number of communities within the Great Lakes region are adopting plans, policies, and programs that promote both climate change mitigation and adaptation by municipalities and their residents. When such plans focus primarily on changing governmental programs and actions, they are known as "Climate Action Plans."

Most of the guidebooks that promote climate change planning and the adoption of local Climate Action Plans focus on the most significant impacts generated by the global climate models employed by the International Panel on Climate Change and the National Oceanic and Atmospheric Administration (NOAA).[3] These assessments have emphasized summer season impacts, especially the impacts of longer and warmer summer seasons on heat wave risks and greenhouse gas emissions since electrical energy generation peaks in the summer months from higher air conditioning loads, producing more greenhouse gases from power plant emissions. Power plant and other emissions also increase urban air pollution during the summer "ozone season," with the associated health risks often exacerbated by heat waves and urban heat island effects. The greater weather variability caused by climate change also leads to more severe storms and their associated impacts – principally increased flood risks and more power blackouts – and, paradoxically, to a higher risk of summer droughts, with their associated impacts on agriculture and water resources. Common adaptation strategies promote greater urban resilience to the societal disruption caused by these extremes in precipitation. For example, flood risks can be mitigated through spatial development policies (e.g., keeping vulnerable development out of high-risk areas), by building codes (e.g., elevating habitable areas), and by reducing peak flood levels by intercepting and infiltrating stormwater runoff with green infrastructure practices before it reaches a waterway or overwhelms a sewer system.

By addressing only the major summer season impacts of climate change, most local adaptation plans ignore the societal and environmental impacts of warmer and possibly shorter winters. This Article examines some of the winter adaptation policies that can be considered in developing local Climate Action Plans. In developing these winter adaptation measures, specific attention was paid to

[3] *See, e.g.,* KENNETH E. KUNKEL, REGIONAL CLIMATE TRENDS AND SCENARIOS FOR THE U.S. NATIONAL CLIMATE ASSESSMENT, PART 3. CLIMATE OF THE MIDWEST U.S., NOAA Technical Report NESDIS 142-3 (2013).

the 2008 Chicago Climate Action Plan[4] and the Sustainable Chicago 2015 Action Agenda. These City of Chicago initiatives were chosen because of Chicago's status as an early adopter of climate change planning in the Great Lakes region. In fact, Chicago's climate programs are the only ones cited within the Great Lakes region in the Adaptation chapter of the most recent draft National Climate Assessment.[5] Since the city has long been a regional leader in planning for climate mitigation and adaptation, other Great Lakes communities facing similar climate change impacts can learn from Chicago's policies, programs, and outreach efforts.

Chicago's 2008 Climate Action Plan consists of 35 measures set forth in four sections – three of the sections address climate change mitigation (especially the promotion of energy conservation practices to reduce greenhouse gas emissions), with one section devoted to climate change adaptation. Initially administered by the Department of the Environment (DoE), Chicago's climate adaptation strategies focus on managing heat, pursuing innovative cooling, managing stormwater, and promoting green urban design, preserving plants and trees, and engaging the public and businesses. The Chicago Climate Action Plan's specific adaptation tactics include reducing vulnerability to extreme heat and precipitation events; reducing the vulnerability of buildings, infrastructure, and equipment to extreme weather conditions; and reducing Chicago's vulnerability to future ecosystem degradation.[6]

In 2011, after the election of a new mayor, Chicago eliminated its DoE in an administrative reorganization, reallocating many of DoE's staff to other municipal agencies. A Chief Sustainability Officer position was created in the Mayor's Office, which took over the management of the Chicago Climate Action Plan and also instituted a new, shorter-range environmental initiative called the 2015 Sustainable Chicago Action Agenda.[7] The 2015 Sustainable Chicago Action Agenda focuses on economic development and job creation, energy efficiency and clean energy, transportation options, water and wastewater, parks, open space and healthy food, waste and recycling, and climate change. The climate change category contains three goals, two of which address the reduction of carbon emissions and pollutants and the last of which expressly addresses climate change adaptation:

> *GOAL 24. PROTECT THE CITY AND ITS RESIDENTS BY PREPARING FOR CHANGES IN THE CLIMATE*
>
> *Research suggests that Chicago could experience a significant shift in climate and increasing frequency of severe storms. High emissions projections show that by the end of the century, Chicago summers will be similar to those in Baton Rouge today. Chicago will work proactively to*

[4] CITY OF CHICAGO, CHICAGO CLIMATE ACTION PLAN (2008), *available at* http://www.chicagoclimateaction.org/filebin/pdf/finalreport/CCAPREPORTFINALv2.pdf.

[5] *See* Rosina Bierbaum, Arthur Lee & Joel Smith, *Adaptation in* NATIONAL CLIMATE ASSESSMENT AND DEVELOPMENT ADVISORY COMMITTEE DRAFT CLIMATE ASSESSMENT 983, 992-93 (V. 11, January 2013), *available at* http://ncadac.globalchange.gov/download/NCAJan11-2013-publicreviewdraft-chap28-adaptation.pdf.

[6] CITY OF CHICAGO, CHICAGO AREA CLIMATE CHANGE QUICK GUIDE: ADAPTING TO THE PHYSICAL IMPACTS OF CLIMATE CHANGE (Julia Parzen ed. 2008), *available at* http://www.chicagoclimateaction.org/filebin/pdf/ADAPTATION4POST2.pdf.

[7] CITY OF CHICAGO, 2015 SUSTAINABLE CHICAGO ACTION AGENDA (2013), *available at* http://www.cityofchicago.org/city/en/progs/env/sustainable_chicago2015.html.

respond to climate change by advancing policies and solutions to prepare for a changing climate and protect our people, infrastructure and natural resources.

Key Actions:

- *Prepare for the human impacts of climate change by supporting people with information and services, such as cooling centers.*
- *Prepare the natural environment for climate impacts and maintain biodiversity.*
- *Prepare the infrastructure for climate change by reducing the urban heat island effect, managing flooding from high intensity storm events, and strengthening resiliency to extreme weather.*[8]

As with the Chicago Climate Action Plan, Chicago's emphasis on climate adaptation within its sustainability agenda remains focused largely on mitigating summer impacts (e.g., providing cooling centers and reducing heat island effects), although the goals and some of the actions are phrased broadly enough to accommodate many winter climate change impacts as well. The next section examines what these winter impacts are likely to be, a topic that is usually given only brief mention in the climate change adaptation literature.

II. Projected Winter Season Climate Changes

Identifying the potential winter impacts of climate change that can affect Chicago's facilities and operations is important since there has been relatively little attention paid in the climate adaptation literature to either winter climate change or its impacts. For example, the U.S. Global Climate Change Research Program's 2009 national assessment forecasts milder winters, earlier loss of ice cover on waterways and waterbodies, and loss of winter recreational opportunities as possible winter climate change impacts for the Midwest region, but does not discuss how these emerging impacts should be addressed by local officials.[9] The Great Lakes Supplement to NOAA's coastal climate adaptation guidebook notes that "[S]ince 1951, there has been an upward trend in snowfall along the southern and eastern shores of the Great Lakes," and identifies an increased number of nonfatal traffic accidents as an impact of this trend.[10] However, many of these winter impacts are only of limited concern to Chicago since the Chicago Park District does not have any ski resorts and only a few outdoor skating rinks and sledding hills, Chicago's lakefront is largely armored (reducing its storm and erosion susceptibility), and most of Chicago's expressways (except for Lake Shore Drive) and transit facilities are located inland, outside of the lake-effect zone.

Chicago's background report for the Climate Action Plan on forecasted climate change in Chicago examined potential changes and variability in temperatures and precipitation under various emissions

[8] *Id.* at 35.

[9] *See generally* U.S. GLOBAL CHANGE RESEARCH PROGRAM, GLOBAL CLIMATE CHANGE IMPACTS IN THE UNITED STATES 2009 REPORT (2009), *available at* http://nca2009.globalchange.gov/.

[10] TERRI CRUCE & ERIC YURKOVITCH, NOAA OFFICE OF OCEAN AND COASTAL RESOURCE MANAGEMENT, ADAPTING TO CLIMATE CHANGE: A PLANNING GUIDE FOR STATE COASTAL MANAGERS – A GREAT LAKES SUPPLEMENT 8, 44 (2011), *available at* http://coastalmanagement.noaa.gov/climate/docs/adaptationgreatlakes.pdf.

scenarios in order to frame the municipal policies and actions that could be developed in the 2008 Chicago Climate Action Plan. This climate study's Executive Summary notes that projected impacts from "… substantial increases in annual and seasonal temperatures and extreme heat events, particularly under the higher emissions scenario" included adverse impacts on human health (especially from respiratory diseases that can be triggered or worsened by increased summer air pollution events).[11] The Executive Summary also notes that changes in the frequency of vector- and water-borne disease outbreaks can also pose climate-related health risks. Since the background report stressed summer season climate change trends and impacts, this focus was mirrored in most of the measures proposed within the Chicago Climate Action Plan.

The background report's Executive Summary projects winter and spring precipitation increasing by about 10% by mid-century and 20-30% by the end of the century under both low and high emissions scenarios, with little change in summer precipitation (although higher temperatures may increase evaporation rates, reducing soil moisture) and with increased intensity of heavy precipitation events. Noting that rainfall events of 2.5 inches or more in 24 hours are historically associated with flooding in Chicago, the report predicts a higher frequency of such events in the future. Habitats are also likely to shift northward, with associated impacts on species distributions, pathogen ranges, and water quality. Changes in hydrology and temperatures are also likely to effect the built environment, especially the patterns of energy use and the costs of responding and adapting to natural hazards.

The background report's summary of the projections and impacts of climate change in Chicago makes only a few references to forecasting winter season changes and impacts. These involve both the mortality and morbidity impacts of warmer winters and the impacts of changes in winter snowfalls. With respect to the former issue, the Executive Summary notes that:

> Cold-related morbidity and mortality is more likely than not to decrease as winter temperatures warm. However, most winter mortality is due to the transmission of infectious agents as people are confined indoors for longer periods of time, rather than being caused by individual extreme cold events. For this reason it is difficult to quantify both the relationships between cold weather and health issues as well as how current rates of cold-related illnesses and death might be altered by future climate change.[12]

With respect to forecasting the winter impacts of changing snowfall patterns, the Executive Summary notes a likely decline in winter snow cover within the Chicago metro area:

> Although winter temperatures are very likely to continue to warm, it is more likely than not that only a slight decrease in snowfall occurs under the higher emissions scenario and little change under the lower emissions scenario. This is because the effect of warmer temperatures may be counteracted by increased winter precipitation. Warmer temperatures are likely to reduce snow

[11] KATHARINE HAYHOE & DONALD WUEBBLES, CHICAGO CLIMATE ACTION PLAN, CLIMATE CHANGE AND CHICAGO: PROJECTIONS AND POTENTIAL IMPACTS, EXECUTIVE SUMMARY vii (2008), *available at* http://www.chicagoclimateaction.org/filebin/pdf/report/Chicago_climate_impacts_report_Executive_Summary.pdf.

[12] *Id.* at ix.

cover on the ground, however, with a projected loss of up to 30 days of snow cover under higher emissions and half that under lower emissions by end-of-century.[13]

Updated projected changes in annual and seasonal temperatures and precipitation for the Midwest were recently undertaken by Kunkel et al. for NOAA, as part of the U.S. Global Change Research Program.[14] This study found trends toward warmer seasonal temperatures, especially warmer winter and spring seasons, and a low frequency of cold waves in the Midwest since the mid-1990s. As with the Chicago Climate Action Plan's background study, the more recent analyses have also found that the frequency and intensity of extreme precipitation in the region has increased, with Great Lakes water levels of the combined Lake Michigan-Huron system and ice cover on regional lakes declining. The freeze-free season across the Midwest is also likely to lengthen by 20-30 days, according to climate change modeling. This study also notes that there is a great deal of uncertainty in the modeling of future precipitation changes.

To remedy this relatively brief assessment of winter season climate changes affecting the Chicago area, recent research was undertaken by the Great Lakes Integrated Sciences and Assessments Center (GLISA) at the University of Michigan[15] and by the Midwestern Regional Climate Center (MRCC)[16] on potential winter season impacts affecting northeast Illinois and the larger Great Lakes region. The MRCC assessed winter precipitation changes, snowfall trends, snowfall intensity, snow density, and freeze-thaw events for this research project (with GLISA also contributing an analysis and forecast of freezing rain events) – meteorological factors that are typically ignored in national and regional studies of projected future climate change. Because of their potential to impact municipal facilities and operations, it is useful to examine both historical trends and winter climate change forecasts with respect to these meteorological factors.

A. Winter Temperature Trends

In addition to estimating the historical and projected trends in summer temperatures and heat waves, the MRCC also analyzed winter temperature trends for the Chicago area, especially with respect to extreme cold events. "Very cold" days were those where the minimum temperature was less or equal to 32°F, while "extremely cold" days were defined as days when the minimum temperature was equal or less than 0°F. The MRCC found that Chicago typically has about 128 very cold days and about 9 extremely cold days per year, and that there has been a steady decrease in the number of both per year (see Figure 1). Climate studies project that, as a result of climate change, there will be 22 fewer days per year with a minimum temperature below 32°F by mid-century. MRCC therefore concluded:

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[13] *Id.* at xii.

[14] *See* Kunkel, *supra* note 3.

[15] *See* GREAT LAKES INTEGRATED SCIENCES & ASSESSMENT, FREEZING RAIN IN THE GREAT LAKES (2013), *available at* http://glisaclimate.org/media/Freezing%20Rain%20in%20the%20Great%20Lakes%20%286.7.13%29_0.pdf.

[16] *See* Molly Woloszyn, Chicago Winter Climate Parameters Trends and Projections (2013), *available at* http://glisa.msu.edu/news/Chicago-Winter-Trends-and-Projections.pdf; CHICAGO METROPOLITAN AGENCY FOR PLANNING, CLIMATE ADAPTATION GUIDEBOOK FOR MUNICIPALITIES IN THE CHICAGO REGION, APPENDIX A: PRIMARY IMPACTS OF CLIMATE CHANGE IN THE CHICAGO REGION (2013), *available at* http://www.cmap.illinois.gov/livability/sustainability-climate-change/climate-adaptation-toolkit [hereinafter CMAP APPENDIX A].

A composite of global climate models indicate that by the end of the century, the United States will experience a 90% reduction in the frequency of extreme cold-air outbreaks, with the decline possibly even greater in the Great Lakes region. For Chicago, the simulated occurrence of extremely cold days declines by 50% under a low emissions scenario and by 90% (meaning only about one day per year) under a high emission scenario by the end of the 21st century.[17]

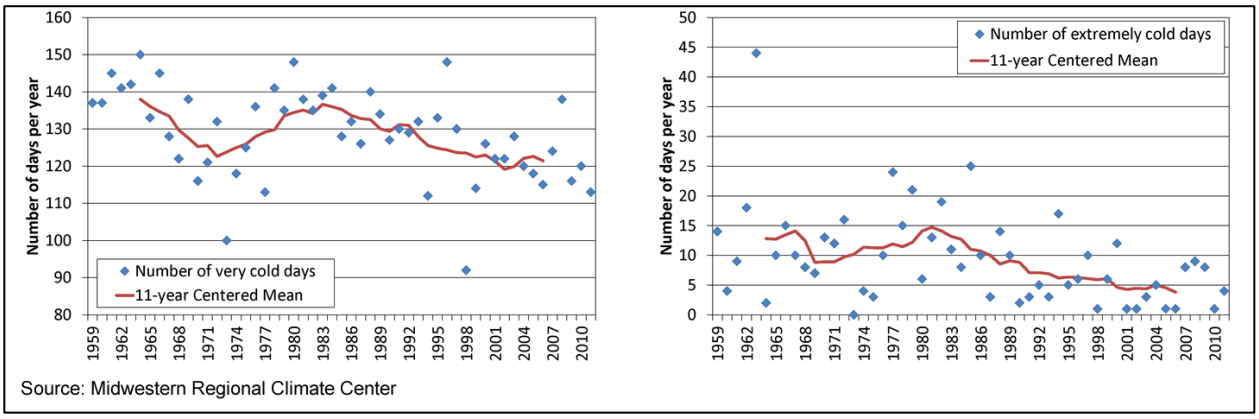

Figure 1. The number of very cold days (left) and extreme cold days (right) per year at Chicago O'Hare. The blue dots represent the number of days per year and the red line shows the 11-year centered mean.

In order to better assess the impacts of these trends on energy use, the MRCC calculated historical trends for heating and cooling needs, expressed as heating and cooling degree days, for Chicago.[18] A cooling degree day is a measurement designed to reflect the demand for energy needed to cool a building, and a heating degree day reflects the demand for energy needed to heat a building. The number of cooling degree days for a given day is calculated by subtracting a base temperature of 65°F from the average daily temperature, while the number of heating degree days for a given day is calculated by subtracting the average daily temperature from a base temperature of 65°F. The MRCC found that the number of heating degree days has declined since the early 1980s, indicating a lower demand for energy needed to heat buildings during the colder months. At the same time, the number of cooling degree days during the warmer months has remained fairly steady since the late 1950s until the last decade, when it began to show an increase (see Figure 2). For the future, climate studies predict that the changes in cooling degree days are anticipated to be larger than the changes in heating degree days, with heating degree days decreasing by 15% across the Midwest region (according to the mean of multiple climate change models) because of warmer winters. Because of warmer summers, climate studies anticipate that by 2041-2070 there will be a 66% increase in cooling degree days when averaged across the Midwest.[19]

[17] CMAP APPENDIX A, *supra* note 16, at 13.
[18] *Id.* at 13-14.
[19] *Id.* at 14.

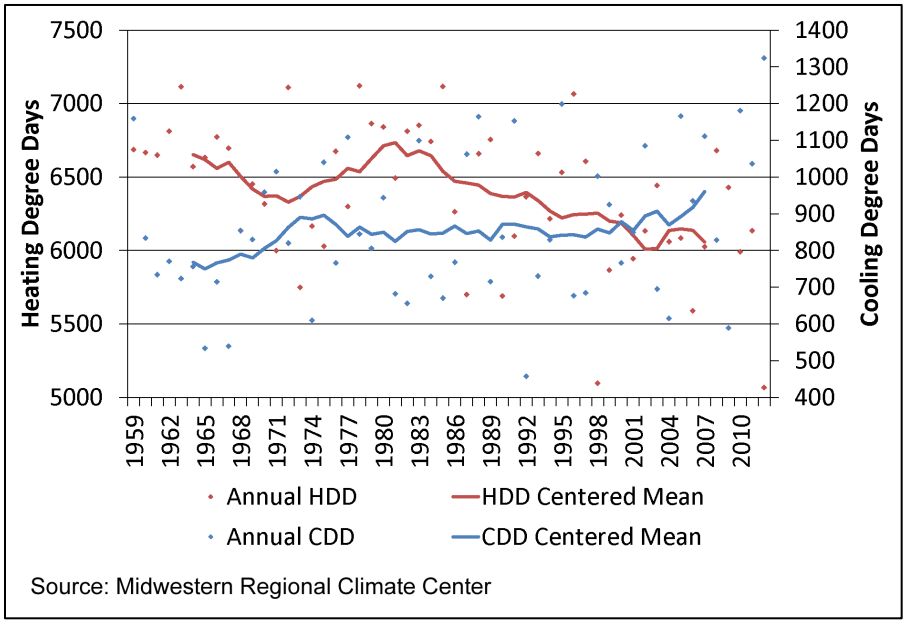

Figure 2. The number of heating degree days (left axis) and cooling degree days (right axis) per year at Chicago O'Hare. The dots represent annual values, while the lines represent the 11-year centered mean.

Longer term annual, seasonal, and even monthly temperature trends tell only part of the story, however. One type of temperature change event that may occur on a daily or even hourly scale is a freeze-thaw cycle – a relatively rapid shift in ambient conditions from a below-freezing to an above-freezing temperature. Using a definition of a "freeze-thaw event" as one where the minimum daily air temperature is at least 26°F and the maximum daily air temperature is at least 43°F, the MRCC notes that, historically, there are about 7.5 such freeze-thaw cycles per year in Chicago.[20]

The MRCC found a statistically significant downward trend in the average number of freeze-thaw events occurring in Chicago each year and also noted a decrease in year-to-year variability, meaning less variability in the number of events from one year to the next (see Figure 3).[21] The MRCC, however, concluded that it was not clear how climate warming may affect the frequency of freeze-thaw cycles. Climate studies hypothesize that less snowy winters might contribute to an increased frequency of soil freeze-thaw cycles. The MRCC also cited a Canadian study of freeze-thaw trends in several Ontario communities, with one community – Harrow, Ontario – located at roughly the same latitude as Chicago. Harrow also experienced 6-7 annual freeze-thaw cycles (comparable to Chicago) and modeling suggests that it may experience as many as 11-12 such cycles annually by 2050.[22]

[20] Woloszyn, *supra* note 16, at 29.
[21] *Id.*
[22] *See* Hugh A. L. Henry, *Climate Change and Soil Freezing Dynamics: Historical Trends and Projected Changes*, 87 CLIMATE CHANGE 421-434 (2008).

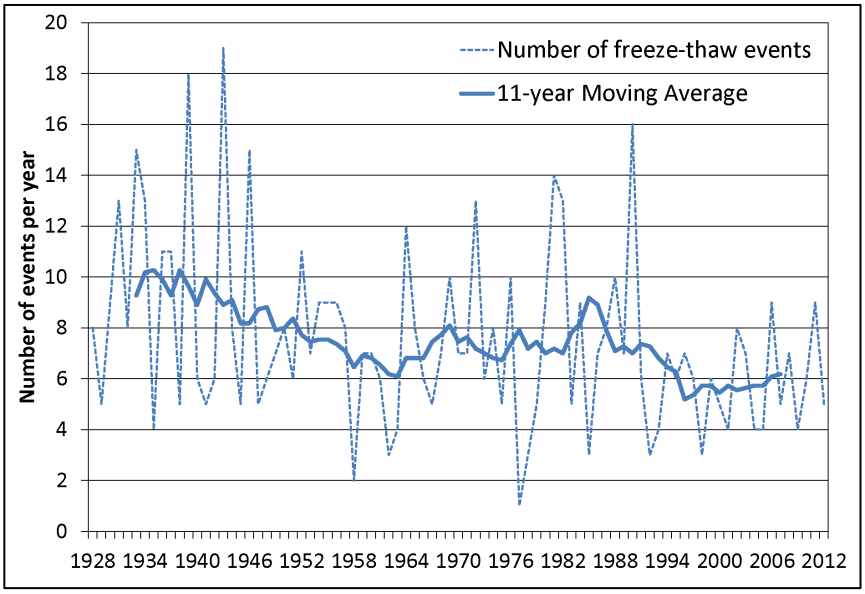

Figure 3. The number of freeze-thaw events at Chicago Midway per year (dotted blue line). The solid blue line shows the 11-year moving average.

If the projected future trends in freeze-thaw cycles in Harrow, Ontario are indeed comparable to Chicago's, then a doubling of such events by 2050 might have significant impacts on Chicago's municipal operations and facilities. Thaws can melt snow and warmer winter temperatures can result in more rain (as discussed below), saturating concrete roads and structures, with the saturated water expanding when it freezes again. When saturated wet concrete refreezes during a freeze-thaw event, the freezing water can expand in the material's pores making it more susceptible to spalling, cracking, and the creation of potholes from surface traffic activity. Moreover, elevated transit stations and tracks can have impaired access or operations when thawed snow or rain quickly refreezes on steel stairways, train platforms, and tracks and switches as ice. Freeze-thaw events might also occur more often on the Chicago Transit Authority's elevated facilities, since they would be most affected by more rapid changes in atmospheric temperatures and would not be as buffered by the thermal mass of soils as would those facilities located at grade or underground.

Freeze-thaw cycles can also pose direct public safety risks as well as a higher maintenance burden. The expansive power of water freezing to ice can also affect the integrity of the fasteners connecting building components to a structure's exterior, should precipitation invade a building's structural envelope. Some decorative materials or surface cladding (such as terra cotta, for example) could also crack and fall off buildings as fasteners fail during freeze-thaw events, posing risks to pedestrians and requiring more frequent inspections and repairs by building managers. Winter sidewalks in Chicago already are festooned with signs warning pedestrians of falling ice, and those risks might increase in the future from the rapid thawing of ice on building surfaces or from thawing ice falling from balconies, signs, and other structural projections over sidewalks.

B. Winter Precipitation Trends

The MRCC notes that Chicago historically has received about 37 inches of precipitation per year (as measured at Chicago O'Hare International Airport), but that it varies seasonally, with most precipitation falling in the summer season (33%), followed by spring (27%), fall (25%), and winter (15%). Future projections of seasonal precipitation have a high degree of uncertainty, but "[a] significant number of models project that annual precipitation will increase in the region with seasonal differences expected."[23] Several studies suggest that there are likely to be increases in winter and spring precipitation, but little change in summer and fall precipitation.

The form that such precipitation takes can also have significant impacts on communities. Based on historical records, the MRCC found that precipitation intensity has increased since 1959, meaning that the precipitation is increasingly in the form of heavy storms (see Figure 4).[24] There have been five 24-hour 10-year storms at Chicago O'Hare since the 1980s, for example, and, more ominously, two of those 24-hour 10-year storms have occurred since 2010. Despite a high degree of uncertainty, some studies have projected that the number of days with extreme precipitation (defined as more than 2.5 inches/day) are likely to increase.[25]

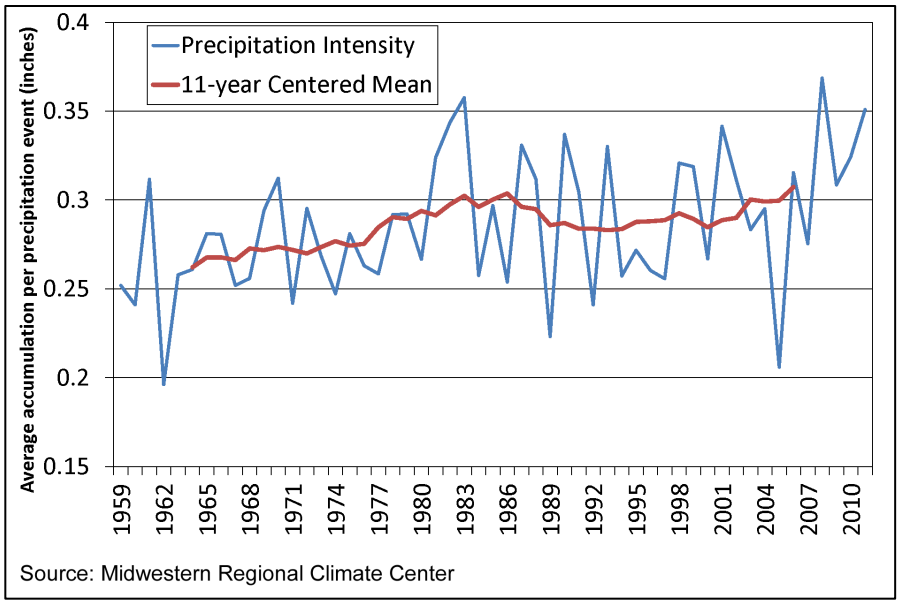

Figure 4. Precipitation intensity, or the average accumulation per event, for Chicago O'Hare. The blue line shows the average precipitation intensity annually and the red line shows the 11-year centered mean.

Increased precipitation is already having significant impacts on Chicago. Basement and street flooding has emerged as a major issue for the City, especially given its old, combined sewer system. Although the Metropolitan Water Reclamation District of Greater Chicago has spent billions in expanding sewer capacity through its Tunnel and Reservoir Project, severe storms still result in large-

[23] CMAP APPENDIX A, *supra* note 16, at 16.
[24] *Id.* at 17-19.
[25] *Id.* at 18.

scale flooding and combined sewer overflow releases to Lake Michigan.[26] The impact is significant enough for Chicago's Division of Water Management to develop and employ sophisticated hydrologic modeling to better predict the basement and surface flooding impacts of storms of various statistical recurrence frequencies (5-year, 10-year, 50-year, etc.) on historically vulnerable neighborhoods.

The MRCC also examined trends in snowfall days and in other winter precipitation variables. An average of 29.4 days per year have more than 0.1 inch of snowfall in Chicago and, because of variability in the climate record, it is difficult to determine what Chicago's winter precipitation trends may be in the future. Historically, 60% of precipitation days in Chicago during the four coldest months (December-March) are days with snowfall, with the rest falling as rain (see Figure 5).[27] Hayhoe et al. projects a decrease in the number of Chicago's snow days by the end of the century, with a 30-50% decrease projected under a low emissions scenario and a 45-60% decrease under a high emissions scenario.[28] Moreover, the Chicago Climate Action Plan's climate change projections found that, as winter temperatures increase, greater amounts of winter precipitation are more likely to be falling as rain rather than snow.[29] There may not be much change in snowfall under a low-emissions scenario, but under a high-emissions scenario, Chicago's average cumulative winter snowfall amount might drop by as much as 10 inches by the end of the century.[30]

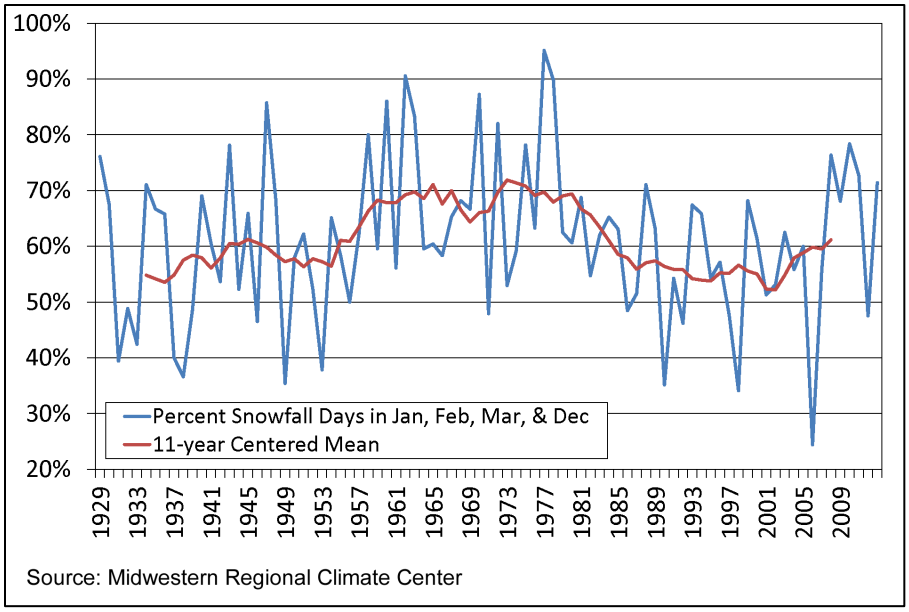

Figure 5. The percent of snowfall days in the snowiest months at Chicago Midway (December-March). The blue line shows the percent annually and the red line shows the 11-year centered mean.

[26] Metropolitan Water Reclamation District of Greater Chicago, Reversals to Lake Michigan (1985-present) in Millions of Gallons (2013), *available at* http://www.mwrd.org/irj/go/km/docs/documents/MWRD/internet/protecting_the_environment/Combined_Sewer_Overflows/pdfs/Reversals.pdf.

[27] CMAP APPENDIX A, *supra* note 16, at 21.

[28] Katharine Hayhoe et al., *Regional Climate Change Projections for Chicago and US Great Lakes*, 36 J. OF GREAT LAKES RESEARCH 7-21 (2010).

[29] HAYHOE & WUEBBLES, *supra* note 11, at xi – xii.

[30] CMAP APPENDIX A, *supra* note 16, at 22.

This shift from declining winter snowfall to increasing winter rainfall can create some significant impacts for the City of Chicago. First the good news – snow entraps pollutants during the winter that are typically released at higher rates to waterways during the spring thaw; with less snow and more rain, this "spring flush" phenomenon may not be as significant (since pollutants would be released at lower rates throughout the winter by snowmelts caused by higher average temperatures and a shorter winter season). So the water quality of waterways in the Chicago region might not be as seasonally variable, possibly because of more consistent rates of snowmelt-related pollutant loading occurring over both the winter and spring. Less snow might also mean less road salting (or possibly lower rates of deicing salt applications), also reducing pollutant loading of chlorides to waterways and landscaped causeways. It would also obviously require less snow plowing.

On the other hand, increased winter precipitation in the form of rain could greatly increase flood risks, especially during an increasing number of freeze-thaw and winter storm events. Rain, especially in the form of heavy rainstorms, falling on snow or on frozen ground would have a higher runoff coefficient than would rain that could infiltrate into soils. This would likely increase the amount of stormwater being discharged to municipal sewers and associated waterways and increasing basement, street, and overland flooding risks to Chicago residents. So winter stormwater release rates and volumes might increase substantially over current conditions for a given storm, even when the pollutant load of the stormwater might be less on a per gallon basis. Moreover, emerging stormwater management practices employing green infrastructure tend to be less effective during the winter, when evapotranspiration rates decline from dormant plants, permeable soils may be blocked if covered by snow, or permeable soils may become saturated and then freeze, impairing infiltration. This would particularly be the case if rain gardens and vegetated swales are used for snow storage during the winter for any snow that may be plowed or removed from pavement, a common seasonal snow management guideline. The stored snow can also displace and reduce the volume of stormwater that could be stored on-site in the rain garden or stormwater management facility, as well as impair its operation.[31]

If rain becomes more common in the winter, what form will this rain take? Because of the possible trend of increased rainstorms during the colder winter season, GLISA was asked to examine whether there will likely be more ice-storms and freezing rain events in Chicago.[32] GLISA defines "freezing rain" as rain that falls on sub-freezing surfaces and forms an icy layer. Crop and fruit damage is a well-known consequence of freezing rain in rural areas, but freezing rain can also pose significant public safety risks and have large societal consequences in urban areas, since it often damages trees and other landscaping, causes power blackouts from downed power lines, and poses higher safety risks from pedestrian slips and falls and more likely automobile accidents. GLISA's analysis of global climate models and the research literature suggests some good news – their study found a decrease in freezing rain events across the Midwest from 1948-2000, and the western portion of the Midwest (which includes Chicago) has fewer freezing rain events than the eastern portion of the region. Moreover,

[31] *See generally* DEB CARACO & RICHARD CLAYTOR, CENTER FOR WATERSHED PROTECTION, STORMWATER BMP DESIGN SUPPLEMENT FOR COLD CLIMATES (1997).

[32] *See* GREAT LAKES INTEGRATED SCIENCES & ASSESSMENT, *supra* note 15.

Chicago's urban heat island effects (which exacerbate heat waves and air pollution events during the summer season) may also further reduce the frequency of freezing rain events during the winter season, since the number of freezing rain events within the City of Chicago is less than the frequency of such events occurring outside the city. The GLISA study concludes that "[t]here is agreement amongst all pieces of evidence (observations, climate models, and theory) to suggest that Chicago, IL will experience less freezing rain events in the future."[33] This finding suggests that as Chicago's climate continues to change, freezing rain and ice storms may not pose as many potential risks to municipal services and facilities as in the past.

GLISA's report on freezing rain in Chicago also notes that "[S]nowfall has decreased in Chicago but the number of storms passing over the Great Lakes has also decreased. At the same time total precipitation in Illinois has not changed significantly, so we expect more winter precipitation to be falling as rain and in potential heavier storm events."[34]

The MRCC also found that there has been a slight increasing trend in snowfall intensity (calculated by dividing the total annual snowfall by the number of days with measurable snowfall) in Chicago since the 1930s, with more snowfall associated with each event (see Figure 6). Since the 1930s, snowfalls averaged about 1 to 1.25 inches in Chicago, but have increased recently to the 1.25 to 1.5 inch range.[35] Future projections suggest that more precipitation in winter and higher temperatures could result in a higher probability of both heavy snowfall and rainfall events, consistent with the increased moisture-holding capacity of the atmosphere from warmer temperatures.

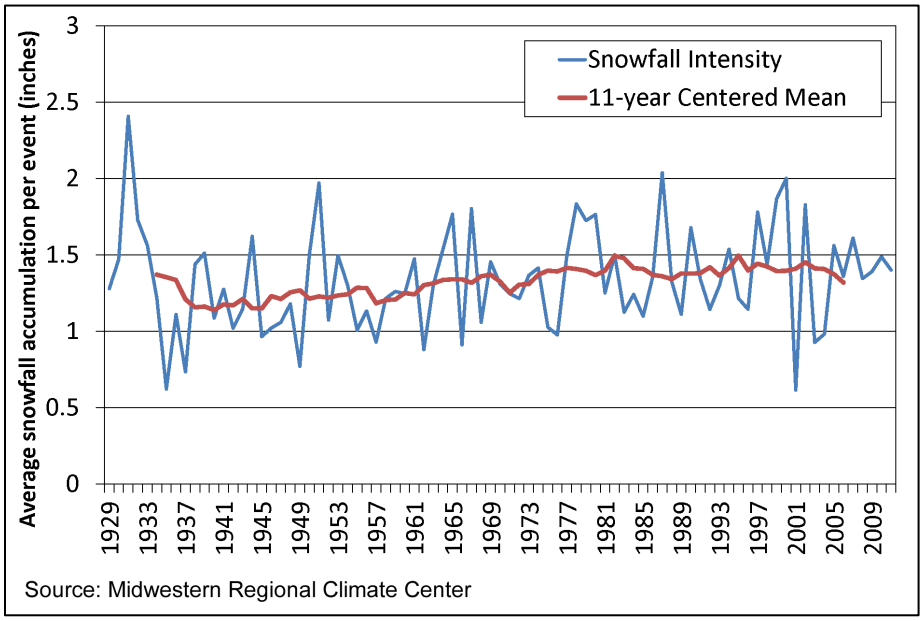

Figure 6. The blue line shows the average snowfall accumulation per event in the winter, while the red line shows the 11-year moving average for Chicago Midway.

[33] *Id.*
[34] *Id.*
[35] Woloszyn, *supra* note 16, at 20-21.

Snow density is also a complicating factor. Based on its water content ratio, the MRCC classified snow as heavy (from 1:1 to 9:1), average (9:1 to 15:1), and light (over 15:1) and found that, historically, "average" snow events have been increasing while both light and heavy snowfalls have been declining (see Figure 7).[36] However, since very few climatic studies have examined future snow density trends, the MRCC hypothesizes, based on theory, that Chicago's snowfalls may become denser because of warmer winter temperatures.[37] If precipitation does in fact increase over the winter season, with the intensity of snowstorms increasing while the frequency declines, then a higher percentage of the blizzards and large snowstorms that would occur may consist of those with heavier and wetter snow.

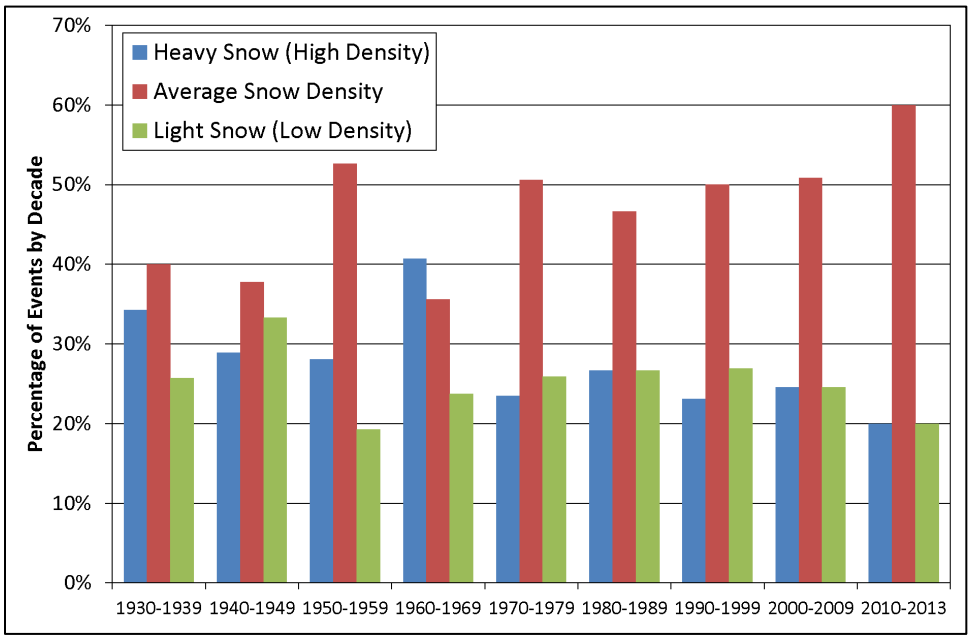

Figure 7. The percentage of high density (blue), average snow density (red), and low density (green) snow events by decade at Chicago Midway.

The impacts of such heavy, wet snowfalls have not yet been discussed with Chicago's Department of Streets and Sanitation staff, but a few scenarios can be developed. Heavy, wet snow does not drift as much as light snow so highways and roads might be less impaired by blizzards. Wet snow might also require lower deicing salt application rates, reducing chloride levels and pollutant loading in the snowmelt runoff and in road spray from vehicles. Any reduction in deicing salt application rates might stress parkway landscaping and street trees less, reducing Chicago's tree maintenance and replacement needs.

On the other hand, many of the impacts of heavy, wet snow would mirror those of heavy ice deposited by ice-storms and freezing rain, with the heavy weight of the snow damaging trees and,

[36] *Id.* at 25-27.
[37] *Id.* at 28.

possibly, automobiles and structures from falling trees and branches.[38] The City of Chicago's urban tree planting lists are currently being re-evaluated in terms of climate change-induced shifts in planting zones, but many of the street trees on Chicago's current planting list do not show up on the list of ice storm-resistant species and therefore may be vulnerable to damage from heavy snow density blizzards. Moreover, structural loading of roofs and buildings is likely to increase from large snowfalls of heavy, wet snow. This may particularly pose problems where green roofs have been installed or retrofitted – structural modifications that already increase the static loading of roof trusses and membranes – which might also increase the risks of large, heavy snowfalls promoting roof and building failure.

Falling tree limbs from heavy snow blizzards might also possibly increase the risks of power blackouts as well as expand the risks of property and automobile damage. This is particularly the case in older cities that still rely on above-ground utility lines. Historical trends are not able to be discerned in power blackouts in the Chicago region that could be correlated with changing trends in winter precipitation and storm events. Although electrical utilities in Illinois are required to file annual reliability reports with the Illinois Commerce Commission (ICC) indicating the extent of energy disruptions and blackouts each year, the data shows no clear trends. Moreover, such analyses would be greatly confounded by a lack of available information concerning the extent of tree trimming undertaken by private landowners, municipalities, and utilities. In other words, a blizzard with heavy, wet snow might cause a tree branch to fall, knocking down a power line and creating a blackout, but if tree branches were trimmed near those power lines the exact same storm might not have the same impact. Since weather reports of severe snowstorms rarely, if ever, report the snow density of the blizzards and ICC records do not indicate the spatial extent of tree trimming activities, it is difficult to determine the cause of the power blackouts or their relationships to either storm events or snowstorm density. But, in theory, heavier and larger snowfalls ought to pose larger risks to trees and, by association, to above-ground utility lines, even though no data is publicly available to show such a correlation.

The societal impacts of an increase in heavy, wet snow from warmer winters have not yet been fully explored in the climate adaptation literature. Shoveling heavy "heart attack" snow certainly poses direct health risks to the person doing the shoveling, especially if there is a family history of premature heart disease.[39] There can also be secondary public health risks posed by the associated winter power blackouts as well. The health impacts of summer power blackouts have been well studied,[40] but little attention has been directed towards winter blackouts. For example, central space heating usually goes out during a blackout, making buildings uninhabitable as interior temperatures drop should a power blackout continue for a long time. This may lead to attempts by residents to heat their buildings and apartments with stoves and ovens and use candles for illumination, with both responses possibly posing increased fire risks and increased risks of carbon monoxide poisoning. If building interiors remain warm,

[38] RICHARD J. HAUER, MARY C. HRUSKA & JEFFREY O. DAWSON, DEP'T OF FORESTRY, UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN, SPECIAL PUBLICATION 94-1,TREES AND ICE STORMS: THE DEVELOPMENT OF ICE STORM-RESISTANT URBAN TREE POPULATIONS (1994), *available at* http://web.aces.uiuc.edu/vista/pdf_pubs/icestorm.pdf.

[39] *See* Robert B. Nichols et al., *Snow Shoveling and the Risk of Acute Coronary Syndromes*, 101 CLINICAL RESEARCH IN CARDIOLOGY 11 (2012).

[40] *See, e.g.,* Shao Lin S et al., *Health Impact in New York City during the Northeastern Blackout of 2003*, 126 PUB. HEALTH REPORTS 384 (2011).

food poisoning risks might also increase as stored or frozen food spoils as temperatures rise in non-functioning refrigerators and freezers, similar to the food safety issues that arise with summer season power blackouts.

III. Winter Climate Adaptation Measures for Chicago

A literature review of winter climate adaptation measures and policies within local climate adaptation plans turned up only a scant few examples that could possibly be adapted to Chicago's Climate Action Plan and the climate change goals of the Sustainable Chicago Action Agenda. For example, the City of Keene, New Hampshire has examined winter impacts to the local economy (especially winter recreation), plant species' growth cycles, and roof sturdiness under snow loading, adopting policies to encourage more pitched roofs, crowning highways with a tighter design radius to remove water better, examining the use of road materials more tolerant of freeze-thaw cycles, and retraining people who might lose their jobs (snow plowing, maple sugaring) because of climate changes.[41] NOAA's Great Lakes Environmental Research Laboratory in Ann Arbor, Michigan, undertook a needs assessment of climate changes in the Great Lakes, identifying a need to consider how projected climate change impacts will affect various economic sectors[42] – for instance, whether communities would need to change their current snowplowing operations in order to respond to the regional trend of heavier but fewer snowstorms.

The City of Toronto, Canada, has also examined winter climate change adaptation issues. Using climate modeling, the city forecasted its winter climate impacts, focusing on managing stormwater flows and basement flooding risks. Its policies also promote the installation of back-up power generation capability at wastewater and water treatment plants that might be impacted by winter power blackouts. Other winter adaptation measures include improved monitoring for snow and freezing rain conditions, the installation of more resilient traffic signal controllers, and improved design standards for infrastructure that might be damaged by winter storms.[43] In examining potential climate change adaptation measures that could be considered by the City of Chicago, it would be useful to organize the strategies in terms of those specific winter climate changes that are likely to have the largest impacts on city facilities and operations. These would include historical and projected changes in average winter temperatures, winter precipitation, and in the frequency of freeze-thaw events.

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[41] *See* CITY OF KEENE, NEW HAMPSHIRE. ADAPTING TO CLIMATE CHANGE: PLANNING A CLIMATE RESILIENT COMMUNITY (2007), *available at* http://www.ci.keene.nh.us/sites/default/files/Keene%20Report_ICLEI_FINAL_v2_0.pdf.

[42] DAWN NELSON, HEATHER ELMER & PATRICK ROBINSON, NOAA TECHNICAL MEMORANDUM GLERL-158, PLANNING FOR CLIMATE CHANGE IN THE LAURENTIAN GREAT LAKES BASIN: A NOAA NEEDS ASSESSMENT: FINAL REPORT 13 (2013), *available at* http://www.glerl.noaa.gov/ftp/publications/tech_reports/glerl-158/tm-158.pdf.

[43] CITY OF TORONTO (ONTARIO), TORONTO'S ADAPTATION ACTIONS (2011), *available at* http://www1.toronto.ca/staticfiles/City%20Of%20Toronto/Environment%20and%20Energy/Our%20Goals/Files/pdf/toronto_cc_adapt_actions.pdf.

A. Warmer Winter Temperatures

Based on the projected seasonal changes in both heating and cooling degree days from a warming climate, these trends will likely result in only negligible economic impacts to the average Chicago household, which will end up paying only about $48 less (in 2013 USD) per year on its energy costs by mid-century. This low economic impact is due to the greater energy efficiency of air conditioning units when compared to space heating technologies, though these household expenditures can increase greatly if energy costs substantially more in the future. It is also important to distinguish these changes in seasonal energy costs from their seasonal energy impacts. Since peak energy use is in summer, these projected changes in annual household energy expenditures may not necessarily correspond to future trends in carbon and other greenhouse gas emissions from power plants and other sources. Moreover, the public health and functional impacts of such energy use are likely to become even more exacerbated by the projected increased frequency of summer air pollution, heat waves, and urban heat island effects. This suggests that Chicago's current policies to reduce air pollution from fleet vehicles and power plants in its Sustainable Action Agenda still makes a lot of sense from a summer season climate change perspective.

The extent and seasonal patterns of water pollution may change considerably with warmer winters and should be accommodated in Chicago's urban stormwater management programs. Even if not released at ambient levels that can pose direct air pollution health risks during the winter, the particulates and other pollutants still settle out of the air and can still impair the region's aquatic ecosystems either directly, through atmospheric deposition to Lake Michigan, or indirectly, by being deposited on the ground and carried by stormwater and snowmelt to a waterway via Chicago's combined sewer system. Moreover, modeling such pollution paths is likely to be complicated by more frequent winter season snowmelt events as temperatures continue to rise during the winter season. More frequent winter thaws might also likely change the region's traditional seasonal fluctuations in water pollution loads by periodically releasing smaller quantities of pollutants entrapped by the snow more often during winter thaws, instead of retaining pollutants for a longer period of time over the winter and then releasing them to waterways at higher concentrations during the spring thaw.

B. Winter Precipitation

A higher frequency of snowmelt during the winter from warmer average temperatures, coupled with increased frequencies and intensities of winter precipitation (especially more winter precipitation in the form of rain) will likely further increase surface and basement flood risks within the City of Chicago. Some of these risks are already being assessed by the city's Department of Water Management, which has developed its own hydrologic simulation model using sewer capacity, precipitation, and topographic data in order to identify specific areas of the city that are likely to experience significant street and basement flooding during heavy rain. These areas are often targeted for municipal urban stormwater management practices. The city's Green Neighborhoods initiative, for example, is converting vacant lots into rain gardens in older South-side neighborhoods with a history of flooding problems.

It is hard to assess many of the tradeoffs of reducing winter flood risks, since most precipitation forecasts in down-scaled global climate models have relatively large margins of error. For instance, in the case of blizzards, the lower discharge rate of snowmelt runoff during thaws might reduce some of the peakiness of stormwater contributions to waterways, reducing peak stream levels and their associated flood risks. The higher frequency of winter rainstorms, however, may greatly increase overland flooding risks, especially if the snow stored on parkways and curbs from street plowing blocks street grates, and the stored snow also reduces the storage capacity and operational efficiency of on-site stormwater management facilities. Chicago's flood risk models may need to be modified to accommodate these additional winter stormwater loads to Chicago's currently undersized combined sewer system. The extent of future basement flooding during warmer winters experiencing a greater share of the city's annual precipitation, for example, may be greater than that anticipated from modeling historical average annual precipitation patterns because of the winter drainage impairments caused by snow, the synergistic effects of combined snowmelt and stormwater discharges from more winter thaws, and an increased frequency of heavier winter rain events.

Rain falling on snow or on frozen ground will also have a higher runoff coefficient than rain falling on bare ground in warmer seasons, further complicating the assessment of winter flood risks. For example, there is less evapotranspiration when plants in rain gardens or vegetated swales are dormant during the winter, impairing the operational efficiency of some green infrastructure practices. Moreover, deicing salts carried by snowmelt or winter stormwater runoff could possibly increase the maintenance burden on some green infrastructure practices as plant materials become stressed and need to be replaced.

Some of this maintenance burden might be offset, however, if warmer winters and more winter rainstorms require lower rates and quantities of deicing salt applications to ensure adequate traffic safety during the winter. More monitoring of on-site green infrastructure performance during the winter months makes sense, and, until the city's stormwater modeling can better account for the projected shifts in winter precipitation patterns induced by climate change, an increased margin of safety in the design of such facilities (perhaps oversizing green infrastructure by 20-25% to account for its likely future impaired efficiency during the winter) might be a good precaution, especially since the useful lives of such installations in new development will likely extend into the mid-century, when climate change and its associated impacts become more apparent.

An increase in snowstorm intensity, coupled with a greater frequency of heavy, wet snowfalls, will also likely lead to more frequent power blackouts and more extensive tree damage during the winter season. Some of the impacts of power blackouts during the winter season were discussed above, but Chicago's responses to the public health risks posed by these events may be different if they occur during the colder winter season rather than during the warmer summer months. For example, reducing some of these public health risks may require establishing emergency heating centers, the same way that the city responds to heat stroke risks to vulnerable populations during heat waves by operating emergency summer cooling centers. Either the same facilities used for emergency cooling during heat waves could be used for emergency heating during winter power blackouts, or alternate strategies could be considered by Chicago's emergency response operations, especially if the cooling/heating centers also become nonfunctional because they are located within an area subject to the power blackout. In such cases, Chicago Transit Authority buses may possibly be used for emergency heating

until power can be restored to residences, assuming the same larger snowstorm events that took out the power do not also prevent emergency access to vulnerable households to allow such emergency heating services to be provided.

Food might also spoil in refrigerators during winter blackouts, posing food poisoning risks to households similar to those encountered with power blackouts during the summer season.[44] Unlike some of the summer season health risks, though, some food items vulnerable to spoilage could be moved from the refrigerator and stored temporarily out of doors, especially if cold or below-freezing outdoor temperatures were to continue until power is restored. Chicago's Department of Public Health does not currently have any guidelines concerning food safety or emergency space heating during power blackouts, and a public outreach and education initiative on these issues could help minimize these risks.

This trend towards fewer but larger winter precipitation events poses some interesting challenges to municipal services, especially regarding tradeoffs in municipal road salting and snow plowing operations. Should fewer plows and salting vehicles be purchased, but staffed and operated for longer periods of overtime during each less frequent blizzard? Or, should more plows and salt trucks be used during the rarer large snowstorms, with the higher acquisition costs offset by longer equipment service lives and lower overtime charges for the larger snowplow staff? The answers to such questions will depend on the sizes and allocations of future municipal budgets and on cost-effectiveness analyses that can better monetize and compare the different operational tradeoffs. An increased frequency of heavy winter rainstorms also poses equally significant challenges to municipal operations, especially with respect to combined sewer overflow and urban flooding issues.

Other adaptation measures that could be considered to address the impacts of an increased frequency of larger, heavier, and wetter snowfalls is the reconsideration of Chicago's tree planting lists. Such lists are already being reevaluated to address shifts in growing seasons caused by a changing climate, but the selection of tree species that are less vulnerable to damage from blizzards and snowstorms with heavier snow density also makes sense should the frequency of such events increase in the future. Similarly, franchise arrangements with utility providers should specify an increased schedule of tree trimming around above-ground power lines, to account for the higher blackout risks from heavier snowfalls. Building codes and development regulations governing new development should also specify or encourage the underground installation of all utilities to further reduce these power blackout risks.

C. Freeze-Thaw Events

An increase in the frequency of winter freeze-thaw events is likely to impose greater stress on the built environment, especially if entrapped water freezes and expands within a saturated medium (such as concrete) or within the intersection of two different media (such as concrete and asphalt). This condition will likely result in a higher probability of roadway pothole formation, the spalling of concrete,

[44] *Keeping Food Safe during an Emergency*, FOOD SAFETY AND INSPECTION SERVICE, U.S. DEP'T OF AGRIC., http://www.fsis.usda.gov/wps/portal/fsis/topics/food-safety-education/get-answers/food-safety-fact-sheets/emergency-preparedness/keeping-food-safe-during-an-emergency/CT_Index (last visited Dec. 16, 2013).

masonry or other similar structural surfaces, and the increased loading (by ice expansion) of structural fasteners on building exteriors or on projections over sidewalks and other public ways. These freeze-thaw events can result in increased road repairs and structural inspection and maintenance costs.

With an increase in freeze-thaw cycles, municipal road maintenance budgets may need to increase, as well as the frequencies of roadway inspections and resurfacing projects. One policy to address these risks is for the City of Chicago to promote and improve inter-departmental coordination with respect to infrastructure repair and replacement and roadway resurfacing projects. Infrastructure repair and replacement often requires the digging up of paved streets and the use of asphalt patching after subsurface maintenance. Since asphalt and concrete have different coefficients of expansion during seasonal temperature changes, there are opportunities for water to breach the point of connection between the two materials, creating structural failure as the water freezes and thaws. Better scheduling of subsurface infrastructure repair that is coordinated with street resurfacing projects can minimize patching of utility trenches and ensure the roadway's surface integrity against freeze-thaw stresses for a longer duration. The use of innovative paving materials, such as permeable paving, to help control stormwater runoff by encouraging its percolation into subsurface storage vaults or into permeable soils may also reduce freeze-thaw stress by removing the water from the paving material's pores before it can freeze and expand (provided these materials do not become saturated).[45] But this paving strategy may also require increased maintenance (such as periodic street sweeping or vacuuming to prevent clogging from fine sediments), which must be offset against the savings from avoided pothole repairs.

Pedestrian safety issues arising from structural vulnerability caused by freeze-thaw cycles can be addressed by an increase in the structural inspection frequency of vulnerable buildings (e.g., those with terra cotta cladding) and with those buildings that have obstructions over sidewalks and public ways. These may pose the greatest risks to pedestrians should water breach the exterior cladding or structural fasteners and then expand when frozen. The City's façade inspection ordinance currently requires inspections every five years, but an accelerated inspection schedule may be needed as freeze-thaw cycles increase in frequency. Other measures to address these risks can include increased mandatory insurance requirements for buildings with projections over public ways and possibly even the greater encouragement of design features in new buildings to reduce pedestrian exposure (such as increasing the zoning bonuses for building setbacks that increase with building height or for pedestrian arcades, both of which can "shelter" pedestrians from falling debris).

Deicing of elevated train station platforms, stairways, and switching gear might also need to occur more often as the number of freeze-thaw events increase with climate change. Elevated facilities might be at greater exposure to the icing hazards of thawed and refrozen snowmelt or frozen winter rain than transit facilities located at grade or underground simply because they are decoupled from the thermal mass of soils. Protecting transit users from icing hazards, however, may involve some operational tradeoffs, since a greater frequency of deicing salt applications may result in increased equipment corrosion, requiring higher maintenance and replacement expenditures. When these secondary impacts of salt use are considered, the installation and greater use of infrared heating lamps on elevated transit stairs and platforms might be a more cost-effective strategy to reduce passenger icing

[45] NATIONAL READY MIXED CONCRETE ASSOCIATION, FREEZE-THAW RESISTANCE OF PERVIOUS CONCRETE (2004).

hazards than the increased use of deicing salts. These decisions will require careful economic analyses to better assess the tradeoffs, especially if future energy costs increase.

IV. Conclusions

We probably know a bit more about winter climate adaptation issues now than in the past, but local adaptation plans still emphasize summer climate change impacts over winter ones. There is a need within the Great Lakes region to consider both summer and winter climate changes in assessing municipal vulnerability to climate change. Many of the climate changes projected for the Chicago metropolitan region are also relevant to other areas of the Great Lakes basin, and many of the possible winter climate change adaptation measures are also likely to be transferable to other, smaller communities within the region. These changes include warmer winters, more winter rainfall, more frequent blizzards, and larger snowstorms (often with a higher snow density), and local policies and practices should recognize these changes and their impacts.

Given the breadth of municipal enabling legislation and home rule authority, there should be few legal constraints involved with a city modifying its operations and responses to winter conditions to address emerging climate change trends and impacts. Making operational changes proposed within a municipal climate adaptation or sustainability plan often imposes unwanted costs on residents and taxpayers, but, over the longer term, failing to change municipal practices and requirements to address emerging winter climate trends may end up imposing even greater costs on both individuals and society.

Most of our recommendations concerning the Chicago Climate Action Plan and Sustainability Action Agenda represent relatively minor and incremental changes to existing programs. Moreover, we believe that most adaptations to climate change must be incremental, since, in the case of adopting climate adaptation measures, increased short-term weather variability (several 100-year storms in a single year, for example) will often hide the longer-term climatic trends and processes that will have the largest aggregate impacts on city operations and staffing. Despite its current popularity, an adaptive management framework may not be a preferred approach where such trends can only be discerned by analyzing a century or more of meteorological records. The climate-change "signal" that would be used to trigger municipal action under an adaptive management framework is likely to be hidden in the "noise" of a decade's worth of data averaging, especially if weather variability is also increasing as a result of a changing climate. Careful long-term trend analyses and periodic (perhaps every decade) reviews of and adjustments to municipal programs and operations in light of the perceived or forecasted trends may be a more useful and cost-effective approach than one that uses an extreme weather event (e.g., a drought, heat wave, or blizzard) as a justification to radically transform public policy.

Customary Right of Use: Potential Impacts of Current Litigation to Public Use of North Carolina's Beaches

Joseph J. Kalo and Lisa Schiavinato[1]

Abstract: This Article analyzes the legal questions surrounding public use of the dry sand beaches in North Carolina. For much of the state's history, the relative rights of the public and oceanfront property owners to use the dry sand beaches have been loosely defined. Two cases, however, bring this issue to the forefront and encourage a more concrete definition of both the public's rights and private property owners' rights. This Article analyzes these legal questions within the context of a coastal town's claim of an easement to protect public trust use of the beach, and a post-storm scenario where a house or multiple houses may end up on the dry sand beach. These scenarios bring up two major legal questions: (1) whether North Carolina's common law makes all natural dry sand beaches open to public use; and (2) whether the government may force an oceanfront property owner to remove her house that ends up on the dry sand beach due to natural forces. With respect to the first question, the authors argue in support of the right of customary use of North Carolina's dry sand beaches, but recommend court resolution of certain common law questions to fully settle the issue. As to the second question, the authors find limited federal authority to require removal of houses that constitute an obstruction to navigation, and they also find limited North Carolina legal authority to require removal of houses that end up on the dry sand beach. The authors' suggested central test for determining whether the State of North Carolina legally may require removal is whether a particular house or group of houses unreasonably interferes with the public's ability to exercise its public trust rights.

[1] Joseph J. Kalo and Lisa Schiavinato are co-directors of the North Carolina Coastal Resources Law, Planning, and Policy Center (http://www.nccoastallaw.org). Kalo is also Graham Kenan Emeritus Professor of Law with the University of North Carolina School of Law. Schiavinato is also the coastal law, policy, and community development specialist with North Carolina Sea Grant. The Center is a partnership between North Carolina Sea Grant, the UNC School of Law, and the UNC Department of City and Regional Planning. The authors thank Center Research Law Fellows Jack Lyman and Kelly Anderson for their research assistance for this article.

I. Introduction

North Carolina's ocean beaches and waters define and support the state's coastal economy.[2] Hundreds of thousands of tourists flock to the coast every year spreading across the dry sand beaches and venturing into the near-shore waters.[3] To meet the demand of vacationers, oceanfront and non-oceanfront hotels, motels, houses, and cottages provide accommodations. Many older, smaller cottages are, or have been, knocked down and replaced by large "oceanfront homes" with eight or more bedrooms.[4] The importance of public beaches to the economies of beach towns sometimes comes into conflict with the rights of oceanfront property owners, and parties turn to the court system to resolve these challenging legal and public policy issues.

The conflicting viewpoints come from general assumptions made by the public that dry sand beaches are a form of public park, upon which they can put up their volleyball nets and beach umbrellas, spread out their blankets, and eat their picnic lunches. For them, the beaches are "public."[5] Some owners and renters of oceanfront homes, on the other hand, may hold different assumptions about the use of dry sand beaches, perhaps because some of these people come from states with a different legal tradition—a tradition in which the dry sand beaches are viewed as private, areas from which the public may be excluded.[6]

Unfortunately, North Carolina law does not provide easy answers to these questions. For much of North Carolina's history, the relative rights of the public and oceanfront property owners to use the dry sand beaches have been loosely defined.[7] This was due in part to the slow pace of development of much of the state's oceanfront shoreline and, in some cases, limited access to the more remote parts of the Outer Banks.[8] Consequently, there were fewer opportunities for conflict between oceanfront property owners and the general public. All that changed in the latter half of the 20th century. Over the past 60

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[2] *See, e.g.*, 2000 N.C. Sess. Laws ch. 67, § 13.9(a)(3) ("North Carolina's beaches are vital to the State's tourism industry."); Jeff Hampton, *Hatteras Tourism Study Buoys N.C. 12 Advocates*, PILOTONLINE.COM (July 14, 2013), http://hamptonroads.com/2013/07/hatteras-tourism-study-buoys-nc-12-advocates ("According to the $25,000 study by the University of North Carolina, tourists on Hatteras Island spent $204 million in 2011, creating more than 2,600 jobs with a payroll of $41 million. Property and sales taxes there contributed $10.3 million to state coffers and $9.4 million to local revenue. Property values total $2.1 billion."); Rob Morris, *$12.3 Million in Sandy Aid to Help Area Parks*, THE OUTER BANKS VOICE (May 7, 2013), http://outerbanksvoice.com/2013/05/07/12-3-million-in-sandy-aid-to-help-parks-and-refuges/ (reporting U.S. Senator Kay Hagan (D-NC) as saying "[o]ur parks, refuges, and beaches are critical to North Carolina's coastal economy" and that "thousands of residents and visitors … visit [coastal North Carolina] each year and fuel [the state's] tourism economy").

[3] *See* N.C. DEP'T OF ENVTL. AND NATURAL RES., NORTH CAROLINA BEACH AND INLET MANAGEMENT PLAN: FINAL REPORT at XII-2 to XII-3 (April 2011), *available at* http://dcm2.enr.state.nc.us/BIMP/BIMP%20Section%20XII%20-%20Funding%20Prioritization%20Formatted.pdf.

[4] *See* KAREN BACHMAN, NORTH CAROLINA'S OUTER BANKS 359 (2009).

[5] *See* Joseph J. Kalo, *The Changing Face of the Shoreline: Public and Private Rights to the Natural and Nourished Dry Sand Beaches of North Carolina*, 78 N.C. L. REV. 1869, 1878 (2000) [hereinafter Kalo, *Changing Face*].

[6] *See id.* at 1876–77.

[7] *See* Joseph J. Kalo, *North Carolina Oceanfront Property and Public Waters and Beaches: The Rights of Littoral Owners in the Twenty-First Century*, 83 N.C. L. REV. 1427, 1429 n.3 (2005) [hereinafter Kalo, *Oceanfront Property*].

[8] *See id.* at 1429–31; Kalo, *Changing Face*, *supra* note 5, at 1874–76.

years, the barrier islands experienced a marked increase in development, better roads, and expanded public access to beaches.[9] This growing public presence on the beach has lead to more conflicts between the beach-going public and adjacent oceanfront property owners.

These conflicts have lead to litigation that may provide some answers as to the degree, if any, dry sand beaches are public. One case, *Nies v. Town of Emerald Isle*,[10] presents the issue of whether the state or a local municipality can limit the activities of oceanfront property owners in their use of the dry sand beach if they hold title to that portion of the beach.[11] The other case, *Town of Nags Head v. Cherry*,[12] raises the related issue of whether an oceanfront property owner has to remove any structure that ends up on the dry sand beach as a result of natural shoreline erosion.[13] These two cases raise four unresolved questions. *Nies* raises the first two questions outlined below, while *Cherry* implicates the third and fourth questions.

(1) Does the common law, as interpreted by North Carolina courts, in fact make all natural dry sand beach areas open to public use?
(2) If yes, as an exercise of the power to regulate activities on dry sand beaches to protect the public's rights, to what extent may the appropriate governmental entity limit oceanfront property owners' use of the dry sand beach?
(3) May the appropriate governmental entity force an oceanfront property owner to remove any structure that ends up on the dry sand beach due to the natural movement of the shoreline?
(4) If through the natural movement of the shoreline, a house, structure, or part of a house or other structure ends up lying seaward of the mean high water mark (MHWM),[14] under what circumstances may either the federal government or the state require the owner of the house or other structure to remove it, or remove it and assess the costs to the owner? This question implicates both federal and state law.

The answers the courts give to these questions will determine the future of North Carolina's ocean beaches. Part II of this Article will discuss the unsettled legal issue of whether the state's common law recognizes a customary right of use of the dry sand beaches and then address the issue of to what extent a governmental entity may limit an oceanfront property owner's use of the dry sand beach. Part III will discuss the right of state government or federal government to force an oceanfront property owner to remove a structure that ends up on the dry sand beach or in navigable waters or, in the

[9] *See* Kalo, *Oceanfront Property*, *supra* note 7, at 1430 n.6.
[10] Nies v. Town of Emerald Isle, North Carolina, No. 11 CVS 1569 (N.C. Superior Ct. Dec. 9, 2011).
[11] *See* Complaint at 14–26, Nies v. Town of Emerald Isle, North Carolina, No. 11 CVS 1569 (N.C. Superior Ct. Dec. 9, 2011) [hereinafter *Nies Complaint*].
[12] 723 S.E.2d 156 (N.C. App. 2012), *appeal dismissed*, 732 S.E.2d 580 (N.C. 2012), *discretionary review denied,* 733 S.E.2d 85 (N.C. 2012).
[13] *Id.* at 157.
[14] MHWM is sometimes referred to as the "mean high water line" (MHW line) or, in tidal areas, as the "mean high tide line" (MHTL). While the term is a somewhat nebulous one, it may be defined, at least in North Carolina, as "an average of the heights of tidal waters over some period of time" rather than a more rigid "line, such as the vegetation line, determined by the height of the highest tides." Kalo, *Changing Face*, *supra* note 5, at 1879–83.

alternative, whether the appropriate governmental entity may remove the structure and then assess removal costs to the owner. Part IV calls for the North Carolina courts to provide guidance on questions that involve state common law.

II. Does the Public have a Customary Right to Use Dry Sand Beaches in North Carolina?

In discussing the first two questions, it is important to draw a distinction between North Carolina's public trust doctrine and the public's common law customary right to use the state's dry sand beaches. Both are common law doctrines, but the geographic scope of each differs. Under North Carolina's common law public trust doctrine, navigable-in-fact waters and submerged lands lying seaward of the MHWM are public trust waters[15] and State-owned public trust submerged lands.[16] There is no disagreement as to that. The disagreement and uncertainty are about whether the public has a common law customary right to use an area above the MHWM, that area being the dry sand beach. The dry sand beaches are generally defined as the area lying between the MHWM and the first line of protective dunes or vegetation.[17] Furthermore, the disagreement is limited to the public's right to use *natural* dry sand beaches. If the dry sand beach is nourished through a publically funded beach nourishment project then, according to subsection 146-6(f) of the North Carolina General Statutes, the dry sand beach is State-owned public trust lands.[18] Those dry sand beaches are simply State-owned submerged lands that have been raised above the MHWM.

On the other hand, if the dry sand beach is natural and unnourished, then fee title to the dry sand beach will generally be part and parcel of the title of the oceanfront property owner.[19] As a general rule, the oceanward title of the property owner extends to the MHWM. This doctrine is codified in subsection 77-20(a) of the North Carolina General Statutes, which provides that the "seaward boundary of all property within the State of North Carolina … which adjoins the ocean, is the mean high water mark."[20] Therefore, the legal uncertainty and disagreement is limited to whether the title of the owner of a natural dry sand beach is subject to a common law customary public right of use. The answer to the question may lie in the court's response to the *Nies* litigation.

A. Nies v. Emerald Isle—*The Essential Facts*

[15] Although the State doesn't hold title to these waters, CRC rules state these waters are "public trust waters."
[16] N.C. GEN. STAT. § 77-20(a) ("The seaward boundary of all property within the State of North Carolina, not owned by the State, which adjoins the ocean, is the mean high water mark."); Kalo, *Changing Face*, *supra* note 5, at 1879.
[17] N.C. GEN. STAT. § 77-20(e) ("Natural indicators of the landward extent of the ocean beaches include, but are not limited to, the first line of stable, natural vegetation; the toe of the frontal dune; and the storm trash line.").
[18] *See id.* § 146-6(f) ("[T]he title to land in or immediately along the Atlantic Ocean raised above the mean high water mark by publicly financed projects which involve hydraulic dredging or other deposition of spoil materials or sand vests in the State. Title to such lands raised through projects that received no public funding vests in the adjacent littoral proprietor. All such raised lands shall remain open to the free use and enjoyment of the people of the State, consistent with the public trust rights in ocean beaches, which rights are part of the common heritage of the people of this State.").
[19] Kalo, *Changing Face*, *supra* note 5, at 1896.
[20] N.C. GEN. STAT. § 77-20(a).

In *Nies*, four plaintiffs filed an inverse condemnation lawsuit against the Town of Emerald Isle, asserting that recent amendments to the town code constitute a taking of their private property rights.[21] The origins of *Nies* can be traced back to Emerald Isle's 2005 beach nourishment project.[22] As is customary with such projects, the town sought easements from all oceanfront property owners.[23] Two of the plaintiffs signed the Perpetual Easement agreement prepared by the Town, while the other two plaintiffs did not.[24] Ultimately, the town sued the two plaintiffs who did not sign to condemn the necessary easements, and a consent order was entered.[25] According to the *Nies* complaint, plaintiffs argue that the 2005 beach nourishment project did not result in the deposit of sand onto their properties, but instead "seaward of the mean high water mark and only on the public trust portion of the beach *below* mean high water."[26]

B. Emerald Isle Beach Equipment Ordinance

After the beach nourishment project was completed, the town amended its code in 2010 to include a section entitled "Unattended Beach Equipment Prohibited."[27] Section 5-101 of the ordinance states:

> All beach equipment must be removed from the beach strand by its owner or permitted user on a daily basis. All beach equipment unattended and remaining on the beach strand between 7 PM and 8 AM will be classified as abandoned property and will be removed and disposed of by the town.[28]

Oceanfront property owners can get "up to 2 special exemption stickers," which allow them to leave that number of equipment out overnight with the stickers affixed.[29] Section 5-102 of the ordinance provides that from May 1 to September 1:

> No beach equipment, *attended or unattended*, shall be placed within an area twenty (20) feet seaward of the base of the frontal dunes *at any time*, so as to maintain an unimpeded vehicle

[21] *See Nies Complaint*, *supra* note 11, at 14–26. The remaining claims are other takings claims. *See id.* at 26–30.
[22] *See id.* at 4.
[23] *See id.* at 6–7.
[24] *See id.* at 7–9.
[25] *See id.* at 9. The consent order easement was more limited than the one signed by the other plaintiffs. *See id.* at 11.
[26] *See id*. at 5.
[27] Emerald Isle, N.C., Ordinance of 1-12-10(1) (codified as amended at EMERALD ISLE, N.C., CODE OF ORDINANCES ch. 5, art. VIII (2012)).
[28] EMERALD ISLE, N.C., CODE OF ORDINANCES § 5-101 (emphasis added).
[29] The stickers will not be issued to guests of owners, although the owners may affix the stickers to equipment offered as part of a total rental package. *See Unattended Beach Equipment Ordinance: General Notes and Information*, TOWN OF EMERALD ISLE (2010), *available at* http://www.emeraldisle-nc.org/pdfs/BeachEquipmentFAQ.pdf. Therefore, for example, family members of the owners, who are there with the owner's permission, would not be entitled to obtain stickers.

> travel lane for emergency services personnel and other Town personnel providing essential services on the beach strand.[30]

Among a number of claims, the *Nies* plaintiffs are challenging both of these prohibitions. The case remains in its early procedural stages; the town recently attempted to remove the case to federal court, but that court refused to accept the case and remanded it to the state court where the complaint had been filed originally.[31]

The enforceability of these prohibitions against oceanfront property owners and their guests in the first instance depends upon whether the easement rights acquired by the town are broad enough to encompass such prohibitions. If the court decides that the easements allow such prohibitions, then there is no need for the court to decide more fundamental questions about the public's common law customary right to use dry sand beaches.

However, the plaintiffs' complaint does raise these more fundamental questions. In their complaint, the plaintiffs characterize the "public trust beach" as the "area below (i.e., seaward of) mean high water."[32] According to the plaintiffs, public use is limited to this area. This assertion is a direct challenge to the position of the State that all natural dry sand beaches, from the MHWM to the first line of vegetation or the frontal dunes, are open to public use.[33]

C. Natural Dry Sand Beaches and North Carolina's Public Trust Doctrine

It is the position of the State of North Carolina that, as a matter of customary law, all natural dry sand beaches are open to public trust uses, and that any private title to that area is burdened by the right of the public to make such uses. Subsection 77-20(d) of the North Carolina General Statutes states:

> The public having made frequent, uninterrupted, and obstructed use of the full width and breadth of the ocean beaches of this State from time immemorial, ... [has] the right ... to the customary free use and enjoyment of the ocean beaches.[34]

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[30] EMERALD ISLE, N.C., CODE OF ORDINANCES § 5-102(a) (emphasis added). In November 2011, after the *Nies* lawsuit was filed, the ordinance was amended to limit its application to the period of "high beach visitation" based on its finding that "there was no practical need for a designated lane at other times of the year." *See* Emerald Isle, N.C., Ordinance of 11-15-11 (codified as amended at EMERALD ISLE, N.C., CODE OF ORDINANCES ch. 5, art. VIII (2012)). That amendment does not change the conclusions reached in this article.

[31] *See* Nies v. Town of Emerald Isle, No. 4:12-CV-10-F, slip op. at 12 (E.D.N.C. Mar. 26, 2013). The federal district court found that the Nieses had not exhausted their state condemnation remedies and that their federal claims were unripe for purposes of federal jurisdiction, and even went so far as to grant the Nieses' motion for attorney's fees after concluding that "the [Town] lacked an objectively reasonable basis for seeking removal." *See id.* at 5, 8–9, 11.

[32] *See Nies Complaint*, *supra* note 11, at 7.

[33] *See* notes 34-35 and accompanying text.

[34] N.C. GEN. STAT. § 77-20(d); *see also id.* § 113A-134.1(b) ("The General Assembly finds that the beaches and coastal waters are resources of statewide significance and have been customarily freely used and enjoyed by people throughout the State.").

Left undefined and uncertain in subsection 77-20(d) is what area is encompassed by the term "ocean beaches." Subsection 77-20(e) offers some clarification, stating that "[t]he landward extent of the ocean beaches is established by the common law and interpreted and applied by the courts of the State."[35] That subsection then continues, "[n]atural indicators of the landward extent of the ocean beaches include, but are not limited to, the first line of stable vegetation; the toe of the frontal dune; and the storm trash line." The area described by subsection (e) is what the public customarily calls the "dry sand beach." Thus, the subsection is a clear statement that the General Assembly believes the public has a common law customary right of use of the dry sand beaches. In addition, newly enacted legislation re-affirms the legislature's assertion of a customary right.[36] Two other state-level entities have also asserted the customary right—the North Carolina Attorney General and the Coastal Resources Commission (CRC). The North Carolina Attorney General's Office asserts the customary right in a 1996 advisory opinion,[37] while the CRC asserts the customary right in its shorefront access policies.[38] However, the State's position remains untested in the courts.

Whether the courts ultimately accept the existence of a common law right depends on their answers to three basic questions:

- First, does North Carolina recognize the general common law doctrine of custom? Some states such as Florida,[39] Oregon,[40] and Hawaii[41] recognize this doctrine, but most states do not.[42] North Carolina's body of law contains only two cases discussing the doctrine, and neither is directly on point. An 1857 Supreme Court decision suggests that the doctrine is not part of North Carolina law[43] and an 1870 case suggests that it may be.[44]

- Second, if the doctrine of custom is part of the state's common law, what are the criteria for determining whether a customary right exists? The leading case is *State ex rel Thornton v. Hay*,[45] a 1969 Oregon decision. In *Thornton*, the Oregon Supreme Court set forth the

[35] *Id.* § 77-20(e).
[36] *See id.* § 160A-203 ("Nothing in this section shall be construed to … impair the right of the people of this State to the customary free use and enjoyment of the State's ocean beaches…").
[37] Ops. N.C. Atty. Gen. 279 (Oct. 15, 1996), *available at* http://www.ncdoj.gov/About-DOJ/Legal-Services/Legal-Opinions/Opinions/Ocean-Beach-Renourishment-Projects.aspx.
[38] *See* 15A N.C. ADMIN. CODE 07M.0301.
[39] *See* City of Daytona Beach v. Tona-Rama, Inc., 294 So. 2d 73 (Fla. 1974) (in which the Florida Supreme Court recognized the doctrine of custom as a means by which the public can establish rights to use the dry sand beaches of Florida for recreational purposes).
[40] *See* State ex rel. Thornton v. Hay, 462 P.2d 691, 673 (Or. 1969) (in which the Oregon Supreme Court recognized a customary right of the public to use dry sand beaches in the state).
[41] In re Application of Ashford, 440 P.2d 76 (Haw. 1968) (in which the Hawaii Supreme Court recognized that Hawaii's land laws are based on ancient tradition, custom, practice, and usage).
[42] *See generally* JON W. BRUCE & JAMES W. ELY, JR., THE LAW OF EASEMENTS AND LICENSES IN LAND, § 6:3 (2013) (discussing easements derived from the public trust doctrine and collecting cases).
[43] *See* Winder v. Blake, 49 N.C. 332, 336 (1857) (implying that the doctrine of custom cannot affect common law rights).
[44] *See* Bost v. Mingues, 64 N.C. 44, 46–47 (1870) (recognizing custom of the country to allow livestock to run at large).
[45] 462 P.2d 671 (Or. 1969).

essential elements of a claim of customary use: (1) Long and general usage; (2) Without interruption; (3) Peaceful and free of dispute; (4) Reasonable; (5) Certain as to its scope and character; (6) Without objection by landowners; and (7) Not contrary to other customs or laws of the state.[46] One may assume that, if the North Carolina courts recognize the common law doctrine of custom, they would apply the same criteria.

- Third, does the evidence of public use of North Carolina's dry sand beaches establish the requisite "long and general usage"? In Oregon, the "general usage" of the state's dry sand beaches was traced back to use by Native Americans prior to the arrival of European settlers.[47] Historical evidence does exist regarding the use of North Carolina beaches to support a claim of a long-term, varied use by various segments of the public.[48]

If the North Carolina courts affirm the existence of the public's customary right of use, a follow-up question arises—to what extent is the oceanfront property owner's use of the dry sand beach limited by the public's right of use? The best analogy lies in the general law of easements. Under accepted easement principles, a servient landowner may make any use of land burdened by an easement that does not unreasonably interfere with the dominant estate's use.[49] Assuming the public has a common law customary right to use the dry sand beach, one must remember the public's use is not exclusive. It is a right shared with the oceanfront property owner who holds title to the dry sand beach.

In *Nies*, the town may have authority to prohibit people who do not have the oceanfront property owner's permission from leaving beach equipment overnight,[50] but not necessarily to restrict what the oceanfront property owner does on her property. If the town could not restrict the amount of recreational equipment an oceanfront property owner leaves in her backyard overnight, it may not be able to restrict the *number of pieces* of beach equipment an oceanfront property owner leaves overnight in her oceanfront beach backyard *unless* the overnight presence of the beach equipment can be shown to *unreasonably interfere* with the public's right of use. In this instance and in the absence of such a showing, the restriction might be a "taking."[51]

Another example to illustrate this distinction might be a restriction on allowing dogs on the beach. Assuming the town has the authority to issue such a regulation,[52] it could place restrictions on the

[46] *Id.* at 677 (citing 1 WILLIAM BLACKSTONE, COMMENTARIES *75–*78).
[47] *Id.* at 673.
[48] *See* DAVID BROWER, LISA BUCKLEY & KATE ESCHELBACH, UNIV. OF N.C. AT CHAPEL HILL, DEP'T OF CITY & REG'L PLANNING, NORTH CAROLINA TRADITIONAL BEACH USE PILOT STUDY 1 (2005) (on file with authors).
[49] BRUCE & ELY, *supra* note 42, § 8:20, ("The owner of the servient estate *may utilize* the easement area *in any manner and for any purpose* that does not unreasonably interfere with the rights of the easement holder." (emphasis added)).
[50] Whether a municipality has such authority and, if so, the extent of that authority, are issues discussed *infra* in connection with the *Cherry* case.
[51] While this is issue is important in *Nies*, establishing whether or not there is a taking is beyond the scope of this article. *But see* Andrus v. Allard, 444 U.S. 51 (1979). "[T]he denial of one traditional property right does not always amount to a taking. At least where one owner possesses a full 'bundle' of property rights, the destruction of one 'strand' of the bundle is not a taking, because the aggregate must be viewed in its entirety." *Id.* at 65-66.
[52] *See e.g.,* KILL DEVIL HILLS, N.C., CODE OF ORDINANCES, § 94.06 (2006).

general public bringing their dogs to the beach but likely could not prohibit the oceanfront property owner or her guests from doing so on that portion of the public beach to which she holds title.

D. Nourished Dry Sand Beaches and the Public Trust Doctrine

If a strand of beach is the product of a publicly financed beach nourishment project, then the analysis may change. When a beach is nourished, title to the filled area seaward of the pre-project MHWM lies with the State as public trust lands.[53] Title to any area filled landward of the pre-project MHWM is, and remains, in the hands of the oceanfront property owner. Prior to the nourishment project, the entity responsible for the project would acquire an easement over that area from the adjacent oceanfront owner.

What rights an oceanfront property owner has to access and use the filled area seaward of the pre-project MHWM all may depend upon the exact language of the easement agreement signed by the property owner. For example, the easements for the 2010 Town of Topsail Beach nourishment project contain specific language stating that oceanfront property owners retain "all such rights and privileges that arise from the status of a littoral property owner, including but not limited to access to the [MHWM]."[54] If such language is in the agreement, then the oceanfront property owner should retain the same rights of use over the newly created dry sand beach as she had over the pre-project dry sand beach.[55] However, in the absence of such language, the rights of the oceanfront property owner may be no greater than that of the general public and subject to limitations such as those imposed by the Town of Emerald Isle Code.

E. The Town's Claim of an Easement

In its town code chapter regulating beach activities, the Town of Emerald Isle also is, in essence, declaring that it has a 20-foot-wide easement across a portion of the dry sand beach.[56] Although the town's motive may be laudable, in its effort to protect public trust use of its beach and promote the safety of beachgoers, the issue remains—is the town entitled to such an easement without compensating the oceanfront property owner?

1. Natural Dry Sand Beaches

If the oceanfront property owner is being prohibited from placing any beach equipment in an area of a natural dry sand beach to which the oceanfront property owner holds legal title, that prohibition

[53] N.C. GEN. STAT. § 146-6(f).
[54] Easement Agreement between Town of Topsail Beach and Ocean Front Property Owner ¶ 3 (Oct. 28, 2009) (on file with authors) [hereinafter "*Topsail Easement*"].
[55] What exactly those "littoral rights" are may be open to debate.
[56] *See* EMERALD ISLE, N.C., CODE OF ORDINANCES § 5-102 (2012).

may be unconstitutional.[57] There is a strong argument that, without paying just compensation to the oceanfront property owner, the town could not condemn or claim an easement for emergency or other purposes across the portion of the property owner's land fronting on the public road.[58] The oceanfront property owner holds the same fee title to the dry sand beach as she does to land fronting on the public road, the only difference being that it is a title encumbered by public trust use rights. Even if emergency and other essential services are part of the package of customary public use rights,[59] that does not entitle the town to claim the exclusive right to use any portion of the dry sand beach to which an oceanfront property owner holds title. The public right of use is a shared right. The oceanfront property owner continues to have the right to make any use of the area that does not unreasonably interfere with the public's right.[60] Coastal municipalities have historically provided emergency services to beach users without needing or making any claim to exclusive use of a strip of dry sand beach.[61] Municipal convenience is likely not a sufficient justification for stripping the oceanfront property owner of her right to use any area to which she holds title.

2. Nourished Dry Sand Beaches

If the adjacent beach was the subject of a beach nourishment project, however, the issue gets dicier. In that situation, again there will be easement agreements to consider. The agreement may limit the rights of the oceanfront property owner to use that part of her land subject to the easement. The extent to which such use is limited depends on the exact language of the easement agreement.

Two of the plaintiffs in *Nies* signed easement agreements prior to the town's 2005 beach nourishment project. Those easement agreements grant the town an "easement and right-of-way" to allow the town "to … patrol, protect, [and] maintain … the public beach."[62] The issue then is whether these words mean that the town can claim the right to use an unobstructed, 20-foot-wide strip of the oceanfront property owner's land so that police, emergency vehicles, trash pickup equipment, and other town workers can move up and down the beach strand. One argument against such an interpretation is that the agreement should be read in light of practices existing at the time it was

[57] *See* Nollan v. California Coastal Commission, 483 U.S. 825 (1987); Dolan v. City of Tigard, 512 U.S. 374 (1994) (in which the U.S. Supreme Court set forth a test to establish whether a permit condition would survive a Fifth Amendment takings challenge. To survive such a challenge, an essential nexus must exist between the permit condition and a legitimate state interest, and there also must be a rough proportionality between the permit condition and the impact of the development to the public).

[58] *See id*.

[59] Some evidence of the fact that such a "right" is not part of the public's rights to use the dry sand beach is that the first time the Town (or any N.C. town) asserted such a right was five years after the beach nourishment project was completed.

[60] *See supra* notes 49-52 and accompanying text.

[61] Email from Gregory Rudolph, Shore Protection Manager, Carteret Cnty., N.C., to Joseph J. Kalo (Aug. 13, 2013, 2:34 PM EST) (on file with authors).

[62] *Nies Complaint*, *supra* note 11, at 11–12. This wording is common in easement agreements and appears in some form in both the Topsail Island and Emerald Isle agreements. *See Topsail Easement*, *supra* note 54, ¶ 1; *Nies Complaint*, *supra* note 11, at 11–12. The difference between the Topsail Island easement agreement and the Emerald Isle one is the Topsail Island agreement contains language preserving the rights of littoral owners. *See* Topsail Easement, *supra* note 54, ¶ 3.

signed because it should be assumed, absent any clear language in the agreement itself, that was what the parties intended.[63] In addition, the practices followed immediately after the completion of the beach nourishment project would be further evidence of what rights the agreement was intended to convey to the town.[64]

At the time the easement agreement went into effect, four-wheel drive pick-up trucks moved along the dune line emptying trash containers in the early hours of the morning before beachgoers reached the beaches in Emerald Isle.[65] As the beaches became more populated later in the day, beach patrolling and other municipal activities required police, emergency personnel, and other municipal workers to move around oceanfront property owners' and beach-goers' equipment.[66] In fact, it was not until five years after the completion of the project that the town claimed a right to an unobstructed 20-foot-wide strip. All of this strongly suggests that the easement agreement was not intended to grant the town a right to an unobstructed use of a 20-foot-wide strip of ocean beach, title to which is held by an oceanfront property owner.

Furthermore, in the paragraph establishing and describing the easement being created, immediately following the language about patrolling, protecting, and maintaining, the agreement states that among the specific rights granted are:

> The right to deposit sand together with the right of public use and access over such deposited sand; to accomplish any alterations of contours on said land; to construct berms and dunes; to nourish and renourish periodically; to move, store and remove equipment and supplies; to erect and remove temporary structures, and to perform any other work necessary and incident to the construction, periodic renourishment and maintenance of the [beach nourishment project]; to plant vegetation on said dunes and berms; to erect silt screens and sand fences; to facilitate preservation of the dunes and vegetation through the limitation of access to dune areas; to trim, cut, fill and remove from said land all grass, underbrush, debris, obstructions and any other vegetation, structures, [or] obstacles within the limits of the easement.[67]

Although removal of obstructions is mentioned, it is in the context of what is necessary during the initial beach nourishment project and future maintenance.[68] There is nothing that suggests a broader perpetual exclusive unobstructed easement is being granted.

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[63] *See* Restatement (Third) of Prop.: Servitudes § 4.1(1) (2000) ("A servitude should be interpreted to give effect to the intention of the parties ascertained from the language used in the instrument, or the *circumstances surrounding creation* of the servitude, and to carry out the purpose for which it was created." (emphasis added)); *see also* Town of Newfane v. Walker, 637 A.2d 1074, 1077 (Vt. 1993) (holding that the grantor's intent may be inferred from use of the property prior to and at the time the easement was granted).

[64] *See* Swaim v. Simpson, 463 S.E.2d 785, 786 (N.C. Ct. App. 1995) ("[T]he scope [of an easement] may be determined by reference to the attendant circumstances, the situation of the parties, and by the acts of the parties in the use of the easement immediately following the grant." (quoting 1 PATRICK K. HETRICK & JAMES B. MCLAUGHLIN, JR., WEBSTER'S REAL ESTATE LAW IN NORTH CAROLINA § 15-21 (4th ed. 1994)).

[65] Email from Frank Rush, Town Manager, Town of Emerald Isle, N.C., to Lisa Schiavinato (Oct. 30, 2013, 2:07 PM EST) (on file with authors).

[66] *See id.*

[67] *Nies Complaint*, *supra* note 11, at 12.

[68] *See id.*

F. An Argument for Customary Use and its Limits

To answer the first question posed at the beginning of this article, North Carolina courts likely would recognize a customary right to use dry sand beaches. While the lack of clear case law complicates the issue, there is strong policy support for recognizing this right, e.g., subsection 77-20(d) of the General Statutes, a 1996 Attorney General Advisory Opinion, and CRC rules on shorefront access.[69] In addition to long-standing state policy, customary use is a reality in North Carolina. The question is whether it should be a legally recognized right and under what doctrine.

In the past, some state officials in North Carolina, such as the Attorney General and the CRC, viewed the public trust doctrine as the legal doctrine that supports the public's customary right to the use the dry sand beaches.[70] This view raises the legal question of whether North Carolina's common law public trust doctrine does include a public right of use. However, the only occasion in which a North Carolina court mentions this issue is in *Concerned Citizens of Brunswick County v. Holden Beach*. In this case, the court, without discussing the issue, rejected a lower court's dicta to the effect that no such public right exists.[71] The question of whether the public has a public trust right or a customary right to use the natural dry sand beach was not actually raised in the litigation. Rather, the issue in *Concerned Citizens* was whether the public had acquired a public prescriptive easement to gain access to the beach.[72]

While this case is likewise not directly on-point, the North Carolina Supreme Court's decision in *Gwathmey v. State of North Carolina* undercuts the view that the public trust doctrine supports a customary right of use. In *Gwathmey*, a case involving title to submerged lands, the court appears to limit the public trust doctrine to navigable-in-fact waters and the submerged lands beneath those waters.[73] Therefore, the common law doctrine of custom now appears to be the more appropriate doctrine upon which to rely in support of the public right to use dry sand beaches. A remnant of the earlier thinking by entities such as the CRC and local coastal governments is the continued use of the phrase "public trust area" in CRC rules and local government ordinances to describe the dry sand beach as the area to which the public has a customary right of use.

As explained earlier in this Article, there is nothing in North Carolina common law or legislation that precludes the North Carolina Supreme Court from concluding that a common law customary right

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[69] *See supra* notes 34-38.

[70] *See, e.g.*, Matthews v. Bay Head Improvement Ass'n, 471 A.2d 355 (1984) (the public must be given both access to and use of privately owned dry sand areas as reasonably necessary).

[71] Concerned Citizens of Brunswick Cnty. Taxpayers Ass'n v. State *ex rel.* Rhodes, 404 S.E.2d 677, 688 (N.C. 1991) ("We note dicta in the Court of Appeals opinion to the effect that the public trust doctrine will not secure public access to a public beach across the land of a private property owner. As the statement was not necessary to the Court of Appeals opinion, nor is it clear that in its unqualified form the statement reflects the law of this state, we expressly disavow this comment." (internal citation omitted), reversing Concerned Citizens of Brunswick Cnty. v. Holden Beach Enters., 381 S.E.2d 810 (N.C. Ct. App. 1989).

[72] *Id.* at 679.

[73] *See* Gwathmey v. State of North Carolina, 342 N.C. 287 (1995) (in which the N.C. Supreme Court ruled that the public trust doctrine is a common law right rather than a constitutional right, and that it applies to all navigable-in-fact waters). Under this precedent, it is an open question whether state common law supports an expanded version of the public trust doctrine to include dry sand beaches.

exists as a matter of both historical practice and sound public policy, as well as a reflection of the reasonable expectations of North Carolina oceanfront property owners. Key to establishing a customary right will be evidence that public use of the dry sand beaches meets the elements of custom—which may involve proving that customary use of the dry sand beaches has existed since colonial times.[74] Evidence does exist to allow the State to prove these elements.[75]

If state common law recognizes the doctrine of custom, the next question would be whether the courts would apply it to all natural dry sand beaches or take the Florida route and require establishment of custom on a local basis. North Carolina common law does not recognize local custom[76]; therefore, if the common law recognizes customary right of use, then the courts likely would apply the doctrine to all dry sand beaches.

As to the second question, a governmental entity's right in North Carolina to limit oceanfront property owners' use of the dry sand beach likely will be limited to the takings standards set forth by the U.S. Supreme Court. These standards will apply even if North Carolina courts recognize the doctrine of custom. As previously stated, an oceanfront property owner enjoys use of the dry sand beach as part of her oceanfront property title. Even if the state courts recognize the doctrine of custom, the right to use natural dry sand beaches remains a shared right. While the Town of Emerald Isle may place restrictions on the public's use of the beach area, it's unlikely that it has a right to its claimed easement without paying just compensation. Regardless of how a court would answer the takings question, however, traditional easement law principles still apply. The owner of burdened land is entitled to make any use of the burdened area that does not interfere with the use rights of the easement holder. In order for the town to prevail, it would need to show that the public right includes a dedication of a strip of privately owned beach as an avenue of passage for town garbage trucks, emergency vehicles, and the like.[77]

G. A Cautionary Note

Although beach nourishment projects benefit the oceanfront property owner as much as they do the public, easement agreements, like any other legal document, need to be carefully evaluated by the property owner before signing. Oceanfront property owners should read the proposed easement agreement carefully and consult with a knowledgeable coastal law attorney to make sure that the oceanfront property owners' future rights to use all the dry sand beach and have access to the ocean are adequately protected.

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[74] *See* Kalo, *Changing Face*, *supra* note 5, at 1894.

[75] *See supra* note 49.

[76] *See supra* note 43. *But see* Alice Gibbon Carmichael, Comment, *Sunbathers Versus Property Owners: Public Access to North Carolina Beaches*, 64 N.C. L. REV. 159, 174-75 (asserting that it is unlikely that N.C. courts would accept the doctrine of custom, since it is a minority rule).

[77] However, in 2013, the General Assembly passed a law authorizing cities to enforce ordinances in public trust areas. It remains to be seen to what extent this strengthens the town's legal position. *See* N.C. GEN. STAT. § 160A-203 ("In addition, a city may, in the interest of promoting the health, safety, and welfare of the public, regulate, restrict, or prohibit the placement, maintenance, location, or use of equipment, personal property, or debris upon the State's ocean beaches").

As the wording of beach nourishment easements becomes more complex, oceanfront property owners may have a legitimate concern that by signing an easement agreement they may be inadvertently giving up their rights to use any part of the newly created beach. To ensure that such agreements are not read in a manner as to take away such rights, it may be wise to add language to the agreement such as "any ambiguity in this agreement should be construed in favor of the preservation of the Grantor's littoral rights as they existed prior to the signing of this agreement." Or, perhaps even more broadly: "any ambiguity in this agreement should be construed in favor of the preservation of the Grantor's rights as they existed prior to the signing of this agreement."

III. Post-Storm: Houses on the Beach or in the Water—What can be Done?

The discussion in this section of the Article focuses on: (1) whether a governmental entity may force an oceanfront property owner to remove any structure that ends up on the dry sand beach due to the natural movement of the shoreline; and (2) under what circumstances, if any, a governmental entity may require such removal or remove the structure itself and then assess costs to the owner. After a major storm hits a state's coast, an oceanfront house may end up sitting in ocean waters, the surf zone, or on the dry sand beach. A question that frequently arises is whether the homeowner is legally and financially responsible for the removal of her structure, or parts thereof, from either ocean waters or the dry sand beach. This is more than just an academic question for the owner of the impacted house and for relevant government entities. For the homeowner, the extent of coverage under her homeowner's insurance policy is critical after a storm. After a storm damages a house, the homeowner must contact her insurance company in order to file a claim under her policy, and this involves fully documenting the damage to the home and the value of its contents. Filing a homeowner's insurance claim is already a complex process. However, the issue becomes more complicated with respect to the question of whether insurance would cover the cost to remove a house or parts thereof. Generally, the answer to any insurance question depends on the language of the policy and the particular facts in a specific claim. The insurance the homeowner carries may cover damage or destruction of the house, but not necessarily cover the cost of removing the house or relocating it to a safer upland location.[78] Therefore, if the homeowner must remove or relocate her house, it is likely she will have to pay the

[78] This is generally the case for policies underwritten by the North Carolina Insurance Underwriters Association (NCIUA) for beachfront properties. *See* Email from Bob Eades, Director of Claims Operations, N.C. Joint Underwriting Ass'n/N.C. Ins. Underwriting Ass'n, to Jack Lyman, Research Assistant, N.C. Coastal Res. Law, Planning and Pol'y Ctr. (Aug. 29, 2013, 11:54 EST). NCIUA policies do not cover damage from flooding or erosion. *See id.* As such, oceanfront property owners also typically seek flood insurance policies from the National Flood Insurance Program, which may offer some coverage, again, depending on the language of the policy and the specific facts surrounding the claim. *See id.*; FED. EMERGENCY MGMT. AGENCY, NAT'L FLOOD INS. PROGRAM, DWELLING FORM STANDARD FLOOD INSURANCE POLICY (2010), *available at* http://www.fema.gov/media-library-data/20130726-1730-25045-6388/f122dwellingform0809.pdf. If an NFIP plan would cover removal due to flood damage, beachfront homeowners might have the incentive to simply leave the house and hope the next storm would severely damage or destroy it and the loss would be covered. Finally, aside from insurance, an oceanfront homeowner might also hope that a future beach nourishment project might save the structure and her investment.

cost. On the other hand, if the homeowner does not or cannot pay, then the cost must be paid by the federal, state, or local government.

A. Federal Authority to Remove Houses Lying in Ocean Water

If a house is actually lying in ocean waters, seaward of the MHWM, then it is lying in "navigable waters of the United States."[79] Because "navigable waters of the United States" are subject to the federal navigation servitude,[80] and obstructions to navigation in these waters are prohibited by the Rivers and Harbors Act of 1899 (RHA),[81] the federal government could order the owners of the houses to remove them. If they fail to do so, the federal government could remove them and then recover the costs of removal.

Normally, when the federal government damages or destroys private property, the Fifth Amendment to the U.S. Constitution requires that the federal government pay just compensation to the affected private property owner.[82] However, under the federal navigation servitude doctrine no compensation is required when the federal government destroys or damages any state-permitted structures, such as piers, or unauthorized structures (e.g., a house in the water), when the government is acting to aid navigation.[83] Therefore, the federal navigation servitude is a legal doctrine that insulates the U.S. from liability when it damages or destroys any structures that are hazards or obstructions to navigation. No financial responsibility for the removal of such structures is imposed on the owners, however.

Congress does have the power to regulate activities taking place in or affecting navigable waters of the U.S. One of the oldest statutes through which Congress has exercised this power is the RHA.[84] Section 10 of the RHA prohibits the creation of any obstruction to the navigable capacity of the waters of the U.S.[85] Section 12 authorizes the issuance of an injunction ordering the removal of any structures

[79] *See, e.g.*, Leslie Salt Co v. Froehlke, 578 F.2d 742, 753 (9th Cir. 1978) (holding that, in tidal areas, "navigable waters of the United States" under the federal Rivers and Harbors Act extend to all places covered by the ebb and flow of the tide to the mean high water mark in its unobstructed, natural state); 33 C.F.R. § 329.4 ("Navigable waters of the United States are those waters that are subject to the ebb and flow of the tide."); *id.* § 329.12(a) ("Regulatory jurisdiction [of the U.S. Army Corps of Engineers] in coastal areas extends to the line on the shore reached by the plane of the mean (average) high water.").

[80] *See, e.g.*, United States v. Rands, 389 U.S. 121, 123 (1967) ("This power to regulate navigation [under the Commerce Clause] confers upon the United States a 'dominant servitude,' which extends to the entire stream and the stream bed below ordinary high-water mark." (internal citation omitted)); United States v. Va. Elec. & Power Co., 365 U.S. 624, 627–28 (1978) ("This navigational servitude—sometimes referred to as a dominant servitude or a superior navigation easement—is the privilege to appropriate without compensation which attaches to the exercise of the power of the government to control and regulate navigable waters in the interest of commerce." (internal citations and quotation marks omitted)).

[81] *See* 33 U.S.C. § 403.

[82] *See* U.S. CONST. amend. V.

[83] *See generally* WATERS AND WATER RIGHTS § 35.02(c) (Robert E. Beck & Amy K. Kelley eds., 3d ed. 2004).

[84] 33 U.S.C. § 401 *et. seq.*

[85] *Id.* § 403.

erected in violation of section 10.[86] Although on their face neither sections 10 nor 12 appear applicable in this instance, *United States v. Milner*[87] establishes they are, at least in the Ninth Circuit.

The specific language of the first part of section 10 is directed at the "creation" or "construction" of the obstructions to navigation.[88] When hurricanes and other severe storms result in movement of the ocean shoreline, and homes previously sited on dry land are left sitting in ocean waters, it can be argued that the owner of the houses did not create, construct, or "erect" a structure in ocean waters. In fact, more likely the owner has tried, with sandbags, seawalls, or other protective structures, to protect the house from the ravages of the sea.[89] Section 12 is directed at "structures or parts of structures erected in violation of" section 10.[90] Prior to *Milner*, sections 10 and 12 appeared to be limited to situations in which the defendant had directly or indirectly intended to place the offending structures in navigable waters.[91] However, *Milner* holds that no such intent is necessary.

The particular facts of *Milner* revolve around the Equal Footing Doctrine, Native American treaty rights, coastal Native American uplands that have passed into private hands, the U.S. as trustee of submerged lands for the Native American tribe, and a migrating shoreline. Stripped of some of the non-essential facts, *Milner* can be recast as a situation in which the upland owners constructed seawalls and other shoreline erosion defense structures landward of the MHWM but, due to the natural migration of the shoreline, ocean waters were lapping at the base of the structures when the government brought suit.[92]

The first issue the *Milner* court addressed is the location of the MHWM when a shoreline structure prevents any natural movement further shoreward. According to the court,

> Both the tideland owner and the upland owner have a right to an ambulatory boundary, and each has a vested right in the potential gains that accrue from the movement of the boundary line. The relationship between the tideland and upland owners is reciprocal: any loss experienced by one is a gain made by the other, and it would be inherently unfair to the tideland owner to privilege the forces of accretion over those of erosion.[93]

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[86] *Id.* § 406.
[87] 583 F.3d 1174 (9th Cir. 2009).
[88] 33 U.S.C. § 403.
[89] *See, e.g.*, Jackson Mabry, *Sandbags: Temporary or Permanent? The Riggings Case Study*, LEGAL TIDES, N.C. COASTAL RESOURCES LAW, PLANNING AND POLICY CENTER (Sept. 2009), http://www.nccoastallaw.org/legaltides/lt_summer_09.pdf (describing practice of beachfront property owners in North Carolina using sandbags to protect beachfront structures).
[90] 33 U.S.C. § 406.
[91] *See, e.g.*, U.S. v. Bigan, 274 F.2d 729 (3d Cir. 1960) (holding that, where defendant mining company's deposit of removed earth was washed into the river by a storm, thus creating a bar projecting roughly fifty feet from the shore line, defendant's conduct did not amount to a "building or erecting of a structure" under the RHA); U.S. v. Oak Beach Inn Corp., 744 F. Supp. 439 (S.D.N.Y. 1990) (granting government's application for injunctive relief where defendant's moored ferry and barge obstructed navigation in violation of the RHA); U.S. v. Seda Perez, 825 F. Supp. 447 (D.P.R. 1993) (affirming Army Corps of Engineers' determination that defendants' floating houses constituted "permanently-moored structures and obstructions in the navigable waters" that violated the RHA).
[92] U.S. v. Milner, 583 F.3d 1174, 1181–82 (9th Cir. 2009).
[93] *Id.* at 1188.

The court then rejected the argument of the upland owners that "once the [MHWM] intersects the face of their defense structures, the boundary becomes fixed and remains so unless the tide line overtops the structures or recedes."[94] To the contrary, the court held that "the [upland owners] do not have the right to permanently fix the property boundary absent consent from [the owner of the tidelands]."[95]

The court then turned to the RHA claims, addressing the issue of whether the upland owners' failure to remove their shoreline defenses violated section 10.[96] The court held that it did. "Although § 10 does not explicitly mention the maintenance of structures in navigable waters, in the sense of keeping structures in place, we have interpreted the RHA as making unlawful the failure to remove structures prohibited by § 10, even if they were previously legal."[97] Furthermore, it was not necessary for the federal government to prove that the structures interfered with navigation because "structures violating clauses two and three are presumed to be obstructions under the first clause."[98]

Applying *Milner* to houses or other unpermitted structures lying seaward of the MHWM, even though the natural movement of the shoreline, and not any act of the owner, was responsible for a house or other unpermitted structure being seaward of the MHWM, once the owner is instructed to remove the house or other unpermitted structure but fails to do so, the owner is violating section 10, and the federal government may seek injunctive relief and other penalties.[99] As the *Milner* court observed: "Just as one who develops below the [MHWM] does so at his peril, those who build too close

[94] *Id.*
[95] *Id.* at 1190.
[96] *Id.* at 1191.
[97] *Id.*
[98] *Id.* at 1192 (citation omitted).
[99] There are two other sections of the RHA that arguably might apply to houses left in ocean waters. Section 13, sometimes referred to as the "Refuse Act," makes it illegal to deposit or cause to be deposited any refuse matter of any kind into navigable waters. 33 U.S.C. § 407. There is case authority to support the proposition that the government does not need to prove criminal intent to establish a violation of section 13. *See, e.g.*, U.S. v. White Fuel Corp., 498 F.2d 619, 622 (1st Cir. 1974); U.S. v. U.S. Steel Corp., 328 F. Supp. 354, 356 (N.D. Ind. 1970); U.S. v. Am. Cyanamid Co., 354 F. Supp. 1202, 1205 (S.D.N.Y. 1973). However, an "act of God" may serve as a defense to any violation of this section. *Cf.* 33 U.S.C.§ 1321(f)(1)–(3) (providing a defense to liability for the discharge of oil or hazardous substances into waters of the United States "where an owner or operator [of a vessel, onshore, or offshore facility] can prove that a discharge was caused solely by … an act of God"); 42 U.S.C. § 9607(b)(1) (exempting otherwise liable persons from CERCLA liability "who can establish by a preponderance of the evidence that the release or threat of release of a hazardous substance and the damages resulting therefrom were caused solely by … an act of God"). If a hurricane or other strong storm event causes severe shoreline erosion resulting in a house sitting in the water, then it was not an act or omission of the homeowner that caused the situation, but rather the consequence of an Act of God.

The only other marginally relevant section of the RHA is section 15, which states that:

> It shall not be lawful to … sink, or permit or cause to be sunk, vessels or other craft in navigable channels…. And whenever a vessel, raft or other craft is wrecked and sunk in a navigable channel, it shall be the duty of the owner, lessee, or operator of such sunken craft to … commence the immediate removal of the same and prosecute such removal diligently, and failure to do so shall be considered an abandonment of such craft….

33 U.S.C. § 409. Because section 15 is limited to "vessels or other craft," it would not be applicable to houses that end up in ocean waters as the result of storm shoreline movements.

to the [MHWM] also run the risk that their structures eventually may become obstructions and be subject to the [prohibitions of the RHA]."[100]

Under the law of many states, the MHWM moves with the natural movement of the shoreline when that movement is due to erosion but not avulsion.[101] This distinction exists under the law of the State of Washington,[102] which was applied by the *Milner* court.[103] Thus in *Milner*, if the shoreline defense structures were landward of the MHWM prior to the avulsive event, then legally they would still be considered landward of the MHWM after the event, notwithstanding the shoreline movement. And, if that were the situation, there would be no liability under the RHA. Fortunately, that would not be an issue in North Carolina because under state law the MHWM moves with the natural movement of the shoreline, whether that movement was caused by erosion or avulsion.[104] Therefore, in North Carolina, a violation of section 10 exists whenever the movement of the shoreline leaves houses or structures stranded seaward of the existing MHWM.

B. State Authority to Remove Houses Lying in Ocean Waters

1. State Common Law

If a house or other object is sitting in ocean waters, it is situated on state-owned submerged lands.[105] The natural assumption tends to be that the State has authority to force the homeowner to remove the house and, if the homeowner fails to do so, the State could remove it and recover the costs of removal from the owner.[106] However, both of these assumptions may be incorrect.

If severe shoreline storms cause erosion and move the MHWM landward to such an extent that an oceanfront house is left sitting in ocean waters, or severe storm winds leave the decks, walkways, roofs, or other parts of an oceanfront house floating in the ocean, the house or other objects are no longer

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[100] *Milner,* 583 F.3d at 1193 (footnote omitted) (internal quotation marks omitted).

[101] *See, e.g.*, Coastal Indus. Water Authority v. York, 532 S.W.2d 949, 952 (Tex. 1976) ("The general rule is that a riparian or littoral owner acquires or loses title to the land gradually or imperceptibly added or taken to or from his fast bank or shore. Erosion is the process of wearing away the land. Accretion is the process of gradual enlargement of the fast land. A different rule is usually applied in case of the sudden removal or deposit of land, the rapid or perceptible change being termed avulsion. It is often held that title does not pass by avulsion." (citations omitted)); *see also Milner*, 583 F.3d at 1182 n.5 ("Under the doctrine of avulsion, a sudden and abrupt change in the shoreline—an avulsive event—does not alter the boundary line." (citations omitted)); BLACK'S LAW DICTIONARY 157 (9th ed. 2009) (defining avulsion as "[a] sudden removal of land caused by change in a river's course or by flood," and noting that "[l]and removed by avulsion remains the property of the original owner").

[102] *See* Parker v. Farrell, 445 P.2d 620, 622 (Wash. 1968).

[103] *Milner*, 583 F.3d at 1182 n.5. The trial court held that the doctrine did not apply in this instance, a ruling the upland owners did not appeal. *Id.*

[104] *See* N.C. GEN. STAT. § 77-20(a).

[105] *See, e.g.*, Gwathmey v. State *ex rel.* Dep't of Env't, Health, & Natural Res., 464 S.E. 2d 674, 682 (N.C. 1995) ("[L]ands submerged by waters which are determined to be navigable in law are subject to the public trust doctrine.").

[106] The general common law rule is that the oceanward legal boundary does not change when the shoreline changes due to avulsion. However, N.C. does not follow this common law rule. In N.C., the oceanward legal boundary moves with both ordinary erosion and changes through avulsion. *See* State v. Johnson, 278 N.C. 146 (1971). *See also* Kalo, *supra* note 9, at 1440-41.

real property. Once situated upon state-owned submerged lands or floating in state navigable waters, the house or other objects become an unauthorized structure.[107] In those circumstances, the owner of the house or debris may simply decide that the house or debris has no further value to her and abandon all claims of ownership.[108] When that happens, under traditional common law principles, the former owner no longer has any legal rights or legal responsibilities for the house or other object. Therefore, in the absence of a statute that imposes or creates a continuing liability, the abandoning owner cannot be forced to remove the house or objects from ocean waters and cannot be compelled to pay for such removal.

Although there are no North Carolina cases directly on point, there are cases in which courts in other jurisdictions have applied the traditional common law principles. In *Lisser v. Kelly*,[109] a 1972 Nevada case, the defendant's boathouse and pier were destroyed, floated away, and became lodged along the shore and pier owned by the plaintiff, a neighbor, as a result of a severe storm on Lake Tahoe.[110] Subsequent storms caused the defendant's boathouse to smash into the plaintiff's boathouse and pier, causing substantial damage for which the plaintiff sued.[111] It was clear that the cause of these events were extreme acts of nature (often referred to by courts as "acts of God").[112] However, the plaintiff argued that, after the first storm, the defendant had a duty to remove the boathouse and pier from the plaintiff's property before the force of new storms caused further damage to plaintiff's boathouse and pier.[113] The court rejected this contention.

> The [common] law imposes no duty upon one to retrieve his property, which has been rendered debris and carried away by an act of God.... The destruction of the [defendant's] boathouse and pier and the lodging thereof upon the [plaintiff's] property was caused solely by an act of God. Where, as here, there is no negligence in the first instance, *the sufferer must get rid of the instrument of injury as he may*. The owner may *abandon* the debris, as did [the defendant], and the plaintiff then has his remedy in his own hands by removing it himself.[114]

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[107] *See* Bond v. Wool, 12 S.E. 281, 284 (N.C. 1890) (recognizing the right of littoral and riparian owners "to construct wharves, piers, or landings subject to such general rules and regulations as the legislature, in the exercise of its powers, may prescribe for the protection of public rights in rivers or navigable water"). Under North Carolina law, one needs an easement, license, or valid conveyance to construct or maintain a structure on state-owned submerged lands. *See* N.C. GEN. STAT. §§ 146-10 to -12.

[108] Although one cannot "abandon" real property, it is arguable that the stranded house is not a "fixture" and therefore real property. A "fixture" is personal property attached to the owner's real property. Moore's Ferry Dev. Corp. v. City of Hickory, 601 S.E.2d 900, 903 (N.C. Ct. App. 2004) (citing BLACK'S LAW DICTIONARY 669 (8th ed. 2004)). But if the house is not attached to land owned by its owner, it does not meet the definition of a "fixture." It is just "personal property," and personal property may be abandoned. *See, e.g.*, Kitchen v. Wachovia Bank & Trust Co., N.A., 260 S.E.2d 772, 774 (N.C. Ct. App. 1979) ("[P]ersonal property may be abandoned.").

[109] 502 P.2d 108 (Nev. 1972).

[110] *Id.* at 109.

[111] *Id.*

[112] *Id.* at 109–10.

[113] *Id.* at 110.

[114] *Id.* (emphasis added) (citations omitted).

Therefore, if the owner of the wayward house or other object expressly or implicitly gives up all attempts to recover the house or other objects, that is abandonment, and she no longer has a common law legal responsibility for the house or other objects. They have become "unowned property."

On the other hand, if the owner continues to make a claim to it, then the owner and her house or other structure is trespassing upon the lands of another—in this case, submerged lands owned by the State. According to the Restatement (Second) of Torts, an action for trespass lies when a person "intentionally … causes a thing [to enter the lands of another,] *or fails to remove from the land a thing which he is under a duty to remove*.[115] As the *Milner* court observed:

> Although the shore defense structures may have been legal as they were initially erected, this is not a defense against the trespass action.... [To be liable for trespass, i]t is enough that the [upland owners] caused the structures to be erected and that the structures subsequently rested on the tidelands.[116]

In addition, a wayward house or other structure may constitute a common law obstruction of navigation.[117] In both instances, the State may seek a court order directing the owner to remove the structure that is continuing to trespass on state lands or constitutes an obstruction of navigation.[118]

2. State Statutes

By legislation, a state obviously can change or modify the common law and could make owners of such houses or debris financially responsible for the removal of such things. To answer the question of whether North Carolina has done so requires careful examination of three statutes.

The first is section 104B-1, which states:

> Whenever the house … or any part thereof, or other property of a person … shall be deposited on the land of another by any hurricane … tidal wave, flood or other act of nature and is not removed from said land within 30 days after the deposit, the owner of such land may notify in writing the owner of the house … or other property of such deposit and may require [the] owner to remove the property so deposited within 60 days after receipt of the notice. If the owner of the deposited property fails to remove it within 60 days after receipt of the notice, the owner of the land may remove the deposited property and destroy it or may use it as he sees fit without incurring liability to the owner of the deposited property, or may sell it and retain the proceeds for his own use; provided, the amount by which the proceeds of any such sale exceed the cost

[115] RESTATEMENT (SECOND) OF TORTS § 158 (1965) (emphasis added).
[116] *Milner*, 583 F.3d at 1190–91 (citation omitted).
[117] *See, e.g.*, State v. Baum, 38 S.E. 900 (N.C. 1901) (holding that defendant's placing of posts in a navigable stream constituted an unlawful obstruction of navigation); State v. Narrows Island Club, 5 S.E. 411 (N.C. 1888) (holding that defendant's placing of iron pipes in a navigable stream constituted an unlawful obstruction of navigation).
[118] *See* Roanoke Rapids Power Co. v. Roanoke Navigation & Water Power Co., 68 S.E. 190, 200 (N.C. 1910) (instructing trial court to "issue an injunction against the defendant, restraining it from maintaining" a later addition to a dam that obstructed river flow beyond that which was allowed by the defendant's original charter).

> of removal and sale shall be paid to the owner of the deposited property or held for his account.[119]

Although the statute contains the language "may require [the] owner to remove the property so deposited within 60 days," it is unlikely the General Assembly intended to impose an affirmative financial obligation on the owner. The statute should be read against the background of the pre-existing common law.[120] Under the common law, if abandoned property is left on someone else's land, the owner of that land may remove, destroy, or claim it for himself.[121] However, the common law rules as to what constitutes "abandonment" can leave room for dispute as to whether, under the particular circumstances, a person intended to abandon the property or intended to reclaim it.[122] The uncertainty poses a legal dilemma for the owner of land upon which the other person's property comes to rest after a storm. If it is abandoned, one can destroy it; but, if it is not, then the person who destroys the property may be liable for damages.

The probable purpose of section 104B-1 is to establish a set of clear rules to avoid any misunderstandings and eliminate the legal dilemma. The statute requires notice to the owner of the property and provides an opportunity to remove it before it is destroyed or taken by the owner of the land on which it has been "deposited."[123] In essence, if the notice is given and the owner of the property does not remove it within 60 days after receiving the notice, it is deemed abandoned. The statute does not create a basis for imposing a financial removal obligation on the owner of the abandoned property. Therefore, the State, as owner of the submerged land upon which the house is situated after a storm, may destroy or remove it, but section 104B-1 would not enable the State to impose the costs of such action upon the prior owner of the abandoned property.

The fact that an abandoned house, roof, or deck also is an obstruction to navigation should not change the result. It is true that the general common law rule is that all unauthorized material obstructions to navigation are public nuisances.[124] However, a general principle of the law of public nuisance is that "one cannot be said to create or maintain a nuisance where the condition or state of affairs complained of is due solely to natural causes, and he has not by his or her own act contributed to bring about the alleged nuisance."[125]

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[119] N.C. GEN. STAT. § 104B-1.

[120] *See* Samantar v. Yusuf, 130 S. Ct. 2278, 2289 n.13 (2010) ("The canon of construction that statutes should be interpreted consistently with the common law helps us interpret a statute that clearly covers a field formerly governed by the common law.").

[121] *See, e.g.*, Patty Gerstenblith, *Identity and Cultural Property: The Protection of Cultural Property in the United States*, 73 B.U. L. REV. 559, 590 (1995) ("[Abandoned property] is property to which the original owner has relinquished all right, title, claim, and possession with the intention of terminating ownership but without vesting ownership in any other person and without any intention of reclaiming it in the future … Courts consider such property to have returned to a "state of nature" and thus, as unowned property, subject to appropriation by the first person who reduces it to possession. Thus, … the finder of abandoned property who appropriates its possession acquires absolute title to it, with no duties to the original owner." (internal citations omitted)).

[122] *See, e.g.*, Columbus-America Discovery Grp. v. Atl. Mut. Ins. Co., 974 F.2d 450 (4th Cir. 1992) (discussing difficulties of showing intent to abandon "in the lost property at sea context").

[123] N.C. GEN. STAT. § 104B-1.

[124] Gaither v. Albemarle Hospital, Inc., 70 S.E.2d 680, 692 (N.C. 1952) (citations omitted).

[125] 66 C.J.S. *Nuisances*, § 14 (2013).

Consequently, based on this principle, the owner of a house or other parts of a house sitting or floating in state waters would not be liable for the costs of removal of the structure or other objects when the cause was a violent storm, series of storms, or other natural events. Although the State certainly has the power to declare what constitutes a public nuisance and the circumstances under which a person would be liable for the costs of abatement, any legislation must be read against the backdrop of this general common law principle.

In its exercise of the power to declare nuisances and impose liabilities, the State has enacted three sets of statutes. However, none of the statutes would impose liability upon the unfortunate homeowner whose house or parts of it end up in ocean waters. According to subsection 76-40(a) of the North Carolina General Statutes, it is "unlawful for any person … to place, deposit, leave or cause to be placed, deposited or left, either temporarily or permanently, any … debris … or other similar waste material in or upon any body of navigable water in this State."[126]

This statute is not applicable in this setting. First, the statute is a criminal statute and makes a violation a misdemeanor.[127] Normally, criminal statutes require that the person act with a specific intent.[128] The language of this statute should be read consistent with this traditional interpretation of criminal statutes. Second, the statute is directed at affirmative conduct of a person who places, deposits, or leaves debris in the navigable waters of the State.[129] It can hardly be said that a person's now-abandoned home that lies in ocean waters, was placed, deposited, or left there by that person. This is consistent with the traditional idea that one is not liable for the consequences of uncontrollable natural events.[130] Third, part (a) of section 76-40 does not impose an obligation to remove or create liability for removal costs for the listed violations.[131] Other parts of section 76-40 do create removal liabilities but those other parts are not applicable to houses or related debris left in ocean waters following a storm.[132]

A second statute, subsection 113-131(c), does permit the Department of Environment and Natural Resources to seek an injunction when "any person … has unlawfully encroached upon, usurped, or

[126] N.C. GEN. STAT. § 76-40(a).
[127] *Id.*
[128] *See, e.g.*, Cheek v. U.S., 498 U.S. 192, 199–200 (1991) ("The proliferation of statutes and regulations has sometimes made it difficult for the average citizen to know and comprehend the extent of the duties and obligations imposed by the tax laws. Congress has accordingly softened the impact of the common-law presumption by making specific intent to violate the law an element of certain federal criminal tax offenses."); State v. Nobles, 404 S.E.2d 668, 671 (N.C. 1991) ("There is a common law principle that the existence of guilty knowledge on the part of the defendant is essential to criminality although it is not required by the statute in express terms." (citations omitted)).
[129] N.C. GEN. STAT. § 76-40(a).
[130] *See supra* note 119 and accompanying text; Tuthill v. Norfolk & S. R.R. Co., 93 S.E. 446, 446 (N.C. 1917) (noting that where personal property held by a common carrier was "destroyed and lost by reason of a wind and rain storm of such unusual violence and proportions that it amounted to 'an act of God,'" the carrier may be relieved of liability for the loss).
[131] N.C. GEN. STAT. § 76-40(a).
[132] *See id.* § 76-40(a1) (depositing of medical waste in navigable waters); § 76-40(b) (erecting structures in navigable waters without a permit); § 76-40(c) (abandonment of lawfully erected structures by the owner). None of these situations exists when storm forces move the shoreline or otherwise result in houses and parts of houses being left in ocean waters.

otherwise violated the public trust rights of the people of the State."[133] Because ocean waters are public trust waters subject to public trust use rights and ocean submerged lands are public trust lands subject to similar public trust use rights, the Director of Marine Fisheries has the power to seek a mandatory injunction directing the removal of any unlawful structure.[134] However, the key words in the statute are "unlawfully encroached." In the context of abandoned houses and parts thereof ending up in ocean waters following a storm, there is no conduct of any person that could reasonably be identified as being "unlawful." If the reason for the present location of a house or parts of a house is a storm event, then abandonment of the structure or parts where they may lie is lawful under the common law and sanctioned by section 104B-1.[135]

Finally, the possibility of municipal or county governments having the authority to order removal of such houses, and parts of houses, must be considered. The granting of such jurisdiction over ocean waters to North Carolina's municipalities has not been done in any consistent or uniform manner.[136] Some have jurisdiction over ocean waters; others do not.[137] Even among those that do, they do not necessarily have the same offshore jurisdictional authority.[138]

Assuming that a municipality has local jurisdiction over ocean waters in which a house or parts of a house are left after a storm, the question that arises is whether the municipality has the power to order the removal of the house or parts of the house at the owner's expense. The General Assembly has granted municipalities powers to remove or order the removal of unsafe and dangerous buildings. For example, section 160A-426 of the North Carolina General Statutes authorizes municipalities to condemn unsafe buildings, and section 160A-432 authorizes enforcement of municipal orders to correct or otherwise abate such conditions by judicial orders.[139] However, if a derelict house or parts of it are lying in ocean waters, and the owner has abandoned any claim to it, there is no longer an "owner" under the statutes to whom such an order may be properly directed.

In the absence of an express statement by the General Assembly, these various state statutes should be read both in a consistent manner and in light of traditional common law.[140] Read in such a manner, it seems clear that owners of wayward houses or parts of houses who choose to abandon their property rights in these things cannot be forced to remove or be liable for their removal.

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[133] N.C. GEN. STAT. § 113-131(c).
[134] *See id.*
[135] *See id.* § 104B-1; *supra* notes 117-123 and accompanying text.
[136] *See* OCEAN JURISDICTION DATA, N.C. COASTAL RESOURCES LAW, PLANNING AND POLICY CENTER (on file with authors).
[137] *See id.*
[138] *See id.*
[139] N.C. GEN. STAT. § 160A-426; § 160A-432.
[140] *See* Samantar v. Yusuf, 130 S.Ct. 2278, 2289 n.13 ("[Legislatures are] understood to legislate against a background of common-law … principles, and when a statute covers an issue previously governed by the common law, [courts] interpret the statute with the presumption that [the legislature] intended to retain the substance of the common law." (omission in original) (citations omitted)); Victory Cab Co. v. City of Charlotte, 68 S.E.2d 433-437 (N.C. 1951) ("[I]n respect to related statutes, ordinarily they should be construed, if possible by reasonable interpretation, so as to give full force and effect to each of them, it being a cardinal rule of construction that where it is possible to do so, it is the duty of the courts to reconcile laws and adopt that construction of a statute which harmonizes it with other statutory provisions." (citations omitted)).

3. Municipal Authority to Remove Houses on the Dry Sand Beach

Town of Nags Head v. Cherry is part of the continuing battle between the Town of Nags Head and owners of oceanfront houses that are lying on the dry sand beach.[141] Many of these houses no longer have any approved means of sewage disposal, are disconnected from utilities, and are unable to be relocated to a safer landward area.[142] Some are damaged and deteriorating.[143] All of these structures interfere with the public's ability to use the dry sand beach, and to move up and down the beach strand.

In November 2009, following a severe storm, the town declared a somewhat damaged[144] beachfront cottage, owned by defendant Cherry and at that time located on the public trust beach,[145] to be a public nuisance pursuant to a relatively new ordinance, and directed that the cottage be demolished.[146] In April 2010, the town filed a compliant seeking an order of abatement directing Cherry

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[141] *See* Russ Lay, *A Long Legal Road to Cleaning Up the Shoreline*, OUTER BANKS VOICE (Apr. 16, 2010), http://outerbanksvoice.com/2010/04/16/a-long-legal-road-to-cleaning-up-the-beach/ [hereinafter Lay, *Long Legal Road*] (describing competing views of what constitutes the public trust beach in Nags Head); Russ Lay, *Owners Continue to Battle against Beach Easements*, OUTER BANKS VOICE (July 7, 2011), http://outerbanksvoice.com/2011/07/07/owners-continue-battle-against-beach-easements/ (describing legal challenges brought by beachfront property owners against the Town of Nags Head's efforts to obtain easements for its 2011 beach nourishment project); Russ Lay, *Supreme Court Puts Local Beach Rules in Limbo*, OUTER BANKS VOICE (Oct. 25, 2012), http://outerbanksvoice.com/2012/10/25/supreme-court-puts-local-beach-rules-in-limbo/ [hereinafter Lay, *Beach Rules in Limbo*] (reporting on the North Carolina Supreme Court's denial of discretionary review in *Cherry* and the impacts of that decision for the Town of Nags Head). The Town of Kitty Hawk, just north of Nags Head, had similar difficulty addressing homes that had succumbed to the forces of erosion. The unincorporated beach area of Currituck County, north of Kitty Hawk and known locally as Corolla, is also facing similar problems.

[142] *Id.*

[143] *Id.*

[144] The Town's building inspector inspected the cottage several times following the November 2009 storm, and determined, at the time of inspection:

> a. That the Dwelling was in a deteriorated and damaged condition;
> b. That the Dwelling was disconnected from utilities;
> c. That the Dwelling was disconnected from approved means of sewage disposal;
> d. That components of the Dwelling's on-site sewage disposal system were visibly damaged or missing; [and]
> ...
> h. That the Dwelling had incurred storm and/or erosion damage.

Nags Head v. Cherry, 723 S.E.2d 156, 157 (N.C. Ct. App. 2012).

[145] The inspector also determined during, at the time of inspection:

> e. That the Dwelling was located in its entirety on the wet sand beach as evidenced by the high tide swash line and tidal pools located westward of the Dwelling;
> f. That the Dwelling restricted vehicle access along the public trust beach area;
> g. That the Dwelling restricted pedestrian access along the public trust beach area; [and]
> ...
> i. That the Dwelling was located wholly or partially on land subject to the public trust and within the public trust beach area.

Id.

[146] *Id.* at 157, 163. The inspector had also determined "that there did not appear to be an opportunity for relocation of the Dwelling on its lot in a manner complying with relevant federal, state and local laws and regulations." *Id.* at 157.

to demolish the cottage.[147] In January 2011, the trial court granted partial summary judgment for the town as to its claim for public nuisance and the order of abatement, and ordered that Cherry, "at its sole expense, abate the public nuisance … by demolishing or removing the structure."[148] Cherry appealed, and on February 21, 2012, the North Carolina Court of Appeals reversed and remanded the case back to the trial court.[149]

No one disputed the fact that, if the town could establish that a particular structure was a nuisance under traditional nuisance law, the town had the necessary authority under state law to abate the nuisance and require that the structure be repaired or removed. However, under the pertinent Town ordinance, "[a]ny structure, regardless of condition, or any debris from damaged structure which is located in whole or in part in a public trust area or public land" was also deemed to be a public nuisance.[150] Therefore, even those in a relatively sound condition, but uninhabitable for lack of services, were subject to the Town's order.

For coastal municipalities, the critical issue in *Cherry* was whether a municipality had the legal right to enforce the State's public trust doctrine. The Court of Appeals held in this case that a municipality has no such right under existing State law.[151] According to the Court of Appeals, only the State, acting through the North Carolina Attorney General, can bring an action *affirmatively* enforcing the State's public trust rights.[152] While this ruling came as a surprise to some coastal local governments and some in the legal community, one must remember that North Carolina is not a home rule state. Therefore, local governments in the state do not have a broad delegation of authority, but rather authority is delegated through subject-specific general statutes and local acts.[153] The Court of Appeals decision in *Cherry* reinforces this limit on the ability of municipalities to enforce public rights through nuisance ordinances and to effectively monitor and regulate activities on natural dry sand beaches of the State. Even if the litigation had properly characterized the issue as a question of which entity had the power to

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[147] *Id.*

[148] *Id.* at 158.

[149] *Id.* at 164. The court determined that summary judgment was improper in this circumstance, since the primary issue was whether the structure's condition constituted a "reasonable likelihood" of "personal or property injury," a question typically reserved for a factfinder. *Id.* (citing NAGS HEAD, N.C., CODE OF ORDINANCES § 16–31(6)(b) (2007), *available at* http://library.municode.com/index.aspx?clientId=13763).

[150] *Id.* at 158 (citing NAGS HEAD, N.C., CODE OF ORDINANCES § 16–31(6)). The town ordinance uses the term "public trust beach." *See id.* However, perhaps it would better to define the area in the same manner as subsections 77-20(d) and (e) of the North Carolina General Statutes.

[151] *Id.* at 161. Note that the *Cherry* court did not address whether the provisions of N.C. Gen. Stat. 160A-426 (unsafe buildings in condemned areas) or 160A-432 (enforcement and removal of unsafe buildings) would apply in this case. However, the court held that those provisions could apply. "Viewing the evidence in the light most favorable to defendant, as we must for purposes of summary judgment, it appears that the main defects in the dwelling are the lack of connections to a septic tank, electricity, and water and some exterior damage to stairs, but it is structurally sound and in need of relatively minor repairs, which defendant would have promptly performed if plaintiff had not refused to issue the required permits." Town of Nags Head v. Cherry, Inc., 723 S.E.2d 156, 164 (N.C. Ct. App. 2012). Therefore, N.C. Gen. Stat.160A-426 and 160A-432 likely would not have applied in this case, because it was not confirmed that the structure at issue was deemed unsafe.

[152] *Id.*

[153] *See* N.C. Const. art. VII, § 1 and § 3. "North Carolina is one of only a few non-home rule states." *See* Frayda S. Bluestein, *Do North Carolina Local Governments Need Home Rule?*, 84 N.C. L. REV. 1983, 2003 (2006). "There are provisions in the state constitution that relate to local governments, but they either authorize the legislature to enact laws relating to local governments or provide limitations on local government actions." *Id.*

enforce the public's customary rights, the result would probably have been the same. Fortunately, during the 2013 General Session, the General Assembly overturned the *Cherry* decision and provided municipalities with the necessary authority.[154]

Leaving aside the issue of which governmental entity has the authority to enforce the public's customary rights, the central question is under what circumstances, if any, may the owner of a house or other structure be compelled to remove it from the dry sand beach area when that house or structure ends up there due to the natural movement of the shoreline? Statements by the Court of Appeals in *Cherry* suggest that if the court were to decide this question, it would get it wrong. The *Cherry* court stated that:

> This is a case where a governmental agency is attempting to take private property from an individual, destroy the Dwelling, and claim the land on the basis that it currently lies within a public trust area … Plaintiff does not contest that the dwelling was originally lawfully constructed in its current location and that the mean high water line has changed to some extent since it was constructed …[155]

First of all, the court fails to give sufficient consideration that a risk of building on the oceanfront is that the shoreline and MHWM may move, and if that happens then there are legal consequences that follow. Second, the "government agency" is not claiming the land, it is claiming that the public's customary right to use the dry sand beach is an ambulatory right, in that it moves just as the oceanfront owner's ambulatory oceanfront boundary moves. Surely the court does not believe that, if a house, lawfully constructed landward of the MHWM but due to the natural movement of the shoreline ends up seaward of the new MHWM and the State sought the removal of the house, that the State would be making an unconstitutional claim to the submerged lands lying under the house and could not require the trespassing structure to be removed. If one accepts the concepts of ambulatory waterward property boundary lines and of a public customary right to use natural dry sand beaches, then the boundaries of that right are, and should be, as ambulatory as any other oceanfront coastal property line.[156]

The central test for determining whether a house or other structure must be removed should be the same as used for other easement conflict cases; that is, whether the particular structure unreasonably interferes with the public's ability to traverse the dry sand beach and use it for appropriate beach activities.[157] Whether there is an unreasonable interference would be fact-specific.[158] Arguably, a house,

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[154] *See* N.C. GEN. STAT. § 160A-203 ("Notwithstanding the provisions of G.S. 113-131 or any other provision of law, a city may, by ordinance, define, prohibit or abate any unreasonable restriction of the public's right to use the State's ocean beaches").

[155] *Cherry*, 723 S.E.2d at 160–61.

[156] In the end, the central issue is whether that customary right exists as a matter of N.C. common law.

[157] *See, e.g.*, Strickland v. Shew, 134 S.E.2d 137 (N.C. 1964) ("One, who by his deed has specifically granted to another an easement of access, may not obstruct the easement in such manner as to prevent or to interfere with its reasonable enjoyment by his grantee. The grantor is obligated to refrain from doing, or permitting anything to be done, which results in the impairment of the easement." (citing 17A AM. JUR. *Easements* § 137 (2013)).

[158] *See, e.g.*, Sidney F. Ansbacher, Kristen G. Juras & Robert K. Lincoln, *Stop the Beach Nourishment Stops Private Beachowners' Right to Exclude the Public*, 12 VT. J. ENVTL. L. 43, 72 (2010) (comparing two Florida appellate decisions for the proposition that establishment of access rights is fact-specific in nature).

such as the famous one from the movie "Nights in Rodanthe," which sat on a remote section of the beach and people could freely pass around and use large stretches of the surrounding beach, does not.[159] On the other hand, a set of houses, clustered together and leaving little space for the public to pass or only to pass under the houses' pilings do interfere with the public rights.

IV. Conclusion—Court Resolution Needed

Whether the public has the customary right to use the State's dry sand beaches and, if that right exists, how that will affect the rights of oceanfront property owners are critical questions that will shape the character and economy of coastal North Carolina. *Nies* will test the limits of the state's coastal municipalities to restrict the activities of oceanfront property owners on the dry sand beach to which they hold title, while situations like the one in *Cherry* raise the question of whether an oceanfront property owner must remove any part of their structure that ends up on the dry sand beach due to shoreline erosion.

Local governments in coastal North Carolina rely on tourism to fuel their economies, with many owners of oceanfront houses renting their properties to vacationers during the summer months. It is, therefore, in a coastal local government's economic interest to maintain public beach areas and to help maintain such a market. At the same time, however, property owners want to protect their valuable investments and personal memories. While the interests of coastal local governments and oceanfront property owners are often mutual, conflicts may arise that will require involvement from, and resolution by, the courts. North Carolina is in a quandary. There is ample policy support from the General Assembly and the CRC on customary use, but according to state law, "these public trust rights in the ocean beaches are established in the common law as interpreted and applied by the courts of this State."[160] The problem is that there is no state common law that directly addresses customary right of use of the dry sand beaches. Legal resolution from the courts is needed at this point to provide clarity and structure, for the government and the public.

As the courts, property owners, and local governments have recognized, striking a balance between protecting property rights and the public's use of ocean beaches is a challenge. There are no easy answers from either a legal or a policy standpoint, as both sets of rights are important to American law and culture. Given the added complexities of shoreline erosion and the potential for storms and flooding along the coast, situations similar to *Cherry* likely will become more common in North Carolina and other coastal states. Local and state governments will need to plan for future scenarios and determine legally how they can respond in a way that meets the needs of both property owners and the public.

There is not any one legal rule or policy solution that will fit all coastal states. While federal case law provides some insight through *Milner* when houses or other structures are lying in navigable waters of the U.S., that case is limited to the Ninth Circuit, and resolution of the legal issues is trickier at the state level. The answers to legal questions will turn on whether a coastal state is a mean high water or low

[159] *See* NIGHTS IN RODANTHE (Warner Bros. 2008); *see also The Inn from "Nights in Rodanthe:" Rescued and Renovated*, HOOKED ON HOUSES (July 25, 2011), http://hookedonhouses.net/2011/07/25/the-inn-from-nights-in-rodanthe-rescued-and-renovated/.

[160] N.C. GEN. STAT. § 77-20(e).

mean water state, whether a state recognizes customary right of use, and how it defines abandonment. *Cherry* tested how far North Carolina is willing and able to go to protect its public trust use areas,[161] and the case will be instructive as to how far other coastal states may go. Public enjoyment of ocean beaches is not just a law, policy, or economic issue. Regardless of each state's unique rules and policies regarding public use of ocean beaches, it is in one form or another, a fact of life for a coastal state. In North Carolina, protecting public enjoyment of ocean beaches has been long considered important by the State and an expectation by the public. What is before the state courts, then, is the continuing challenge of how to balance public use and enjoyment without sacrificing private property rights. The opportunity for the North Carolina courts to take up the question of customary right of use is likely to arise again, and the authors welcome them tackling this question to provide clarity and resolution of whether the doctrine of custom is a part of the state's common law and the precise nature of those rights.

[161] However, the question of customary right of use of ocean beaches remains unsettled.

Climate Resiliency on Dauphin Island, Alabama

Catherine Janasie, J.D., LL.M.[1]

Abstract: The Southeast Region of the United States and Dauphin Island, Alabama have already began to feel the impacts of a changing climate, and projections suggest that these changes and impacts will continue into the future. Changes in climate could greatly affect Dauphin Island, but the town has the opportunity to proactively plan for these future impacts and make the island more climate resilient. The Mississippi-Alabama Sea Grant Legal Program (MASGLP) is working with Dauphin Island on a two-year climate resiliency study to help with the town's climate adaptation efforts. Because the daunting threats of climate change can result in inert local governments, MASGLP is trying to identify smaller actions the town and other entities could take to address climate impacts, as well as considering larger issues facing the island.

I. Introduction

Across the United States and throughout the world, climate change has become apparent with rising sea levels; increasing temperatures; more frequent, intense rain storms; and decreasing snow and ice levels, which impact the timing and amounts of river flows. These changes and their impacts are projected to continue to grow in the future; depending on the climate model, however, the projected effects of climate change vary due to the uncertainty of future global emission levels of heat-trapping gases and the climate's reaction to those emissions. As a result of this uncertainty, climate models use different emission scenarios to predict the potential impacts of climatic changes.

Although climate change is occurring throughout the world and the United States, regions will experience a changing climate differently. For example, the Eastern United States is experiencing

[1] Ocean and Coastal Law Fellow, Mississippi-Alabama Sea Grant Legal Program at The University of Mississippi School of Law. Research for this Article was made possible by funding for the Mississippi-Alabama Sea Grant Legal Program under award number NA10OAR4170078 from the Mississippi-Alabama Sea Grant Consortium and the U.S. Department of Commerce, National Oceanic and Atmospheric Administration. The statements, findings, conclusions, and recommendations are those of the author and do not necessarily reflect the views of the U.S. Department of Commerce or NOAA.

increased forest growth, while forest growth is decreasing in the western part of the country. Likewise, the Southeast and Gulf Coast region have and will experience different climate impacts than other regions in the United States. Some current and projected climate changes for the Gulf Coast include:

- Rising sea levels;
- Ocean acidification that threatens coral and shellfish growth;
- More severe weather events;
- Heavy downpours;
- More frequent droughts;
- More intense and frequent heat waves; and
- Increasing demands on water supply.[2]

In particular, the Gulf Coast is particularly vulnerable to sea level rise and coastal storms because of its long, low-lying coastline. Rising sea levels are threatening coastal communities, barrier islands, coastal marshes, and wetlands, and will cause Gulf Coast shorelines to retreat.[3] Because the Gulf Coast is sinking due to land subsidence, the region's relative sea level rise has been significantly higher than the global average rate over the last 50 years, and this trend is expected to continue into the future. The region is also experiencing land loss. For example, the Mississippi-Alabama Barrier-Island Chain has experienced accelerated rates of land loss since the mid-1800s.[4]

In particular, because of its location and geography, Dauphin Island, Alabama has already felt some climate change impacts. Dauphin Island (the island) is a low-lying barrier island with an average elevation of only 7.2 feet, located five miles south of Mobile, Alabama. It is a narrow island, only a mile across at its widest point, and is approximately fifteen miles long. According to the 2010 Census, the Town has 1,238 residents, most of whom live on the more stable eastern seven miles of the island.[5]

Dauphin Island has been in a net erosional phase since the late 1950s, and in 2007, the island was 16% smaller than it was in 1958.[6] Like the rest of the Gulf Coast region, Dauphin Island is particularly vulnerable to sea level rise. Sea level rise will make barrier islands more susceptible to coastal storms and related storm surges, including weaker, seasonal storms. These factors could have a strong impact on barrier islands by increasing erosion, permanently inundating some areas, and leading to higher salinity levels in estuaries and freshwater aquifers. These climate stressors will likely impact the island's natural resources, as well as access to and transportation on Dauphin Island. These stressors could also have a potential economic impact on the island. Storms could destroy homes, which would reduce the

[2] *See Southeast*, GLOBAL CLIMATE CHANGE IMPACTS IN THE UNITED STATES: 2009 REPORT, U.S. CLIMATE CHANGE RESEARCH PROGRAM, http://nca2009.globalchange.gov/southeast (last visited Mar. 24, 2014).
[3] U.S. GLOBAL CHANGE RESEARCH PROGRAM, GLOBAL CLIMATE CHANGE IMPACTS IN THE UNITED STATES 114 (Thomas R. Karl, Jerry M. Melillo, & Thomas C. Peterson EDS., 2009), *available at* http://downloads.globalchange.gov/usimpacts/pdfs/climate-impacts-report.pdf [hereinafter 2009 CLIMATE IMPACT REPORT].
[4] *See* Robert A. Morton, *Historical Changes in the Mississippi-Alabama Barrier-Island Chain and the Roles of Extreme Storms, Sea Level, and Human Activities*, 24 J. OF COASTAL RESEARCH 1587 (2008).
[5] *2010 Census Interactive Population Search*, U.S. CENSUS 2010, http://www.census.gov/2010census/popmap/ipmtext.php?fl=01 (last visited Mar. 24, 2014).
[6] *See* Morton, *supra* note 4.

town's property tax revenue. With fewer rental homes, less tourists could visit the island, which would result in lower sales, gas, and lodging tax revenue and could adversely affect the Town's businesses and restaurants. Increases in population and the amount of development in many coastal areas are amplifying these effects.

The Town of Dauphin Island (Town) was incorporated in 1988.[7] A mayor and a five-member town council govern the Town, establish policy, and provide governmental services for such things as public safety, land use, and solid waste disposal. A planning commission assists the Mayor and Town Council in preparing, maintaining, and implementing plans, regulations, and ordinances for the orderly development of the Town. The Dauphin Island Water and Sewer Authority, which operates independently from the Town, provides water and sewer services. The Dauphin Island Park and Beach Board manages the island's public parks, beaches, campgrounds, and other recreational facilities. Like the Water and Sewer Authority, the Park and Beach Board operates independently from the Town under the leadership of an executive director and board.

In 2007, Dauphin Island completed a Strategic Plan that laid-out a 20-year vision for the Town. The plan was a community-driven process developed with the input of over 1,000 Dauphin Island stakeholders over eight months.[8] The plan identified important focus areas and actions, including community development, environmental protection, economic improvement, coordinated governance, and capitalizing on the island's recreational resources and cultural assets. The stakeholders identified the desire to make the town economically viable and sustainable, while maintaining Dauphin Island's small-town feel, affordability, and valuable natural and cultural assets, as well as balancing the needs of tourists with the island's full-time residents.[9] The stakeholders shaped a shared community vision that states: "On behalf of the people of Dauphin Island, the Town will lead this small island community through the 21st century by preserving the island's history, culture, and environmental assets, while planning for a future that capitalizes on its natural resources to promote economic well-being."[10]

Since 2007, Dauphin Island has continued to feel the effects of storms and other climate events, including storm surge and flooding that damages property and natural resources. The Town also continues to engage in coastal management projects, such as constructing berms along its beaches. Because coastal management is an ongoing process, Dauphin Island has decided to build on the ideas in its Strategic Plan and work towards making the island more storm and climate resilient. In doing so, the town will ensure the island's future economic and environmental viability.

To assist with this effort, the Mississippi-Alabama Sea Grant Consortium (MASGC) has been working on a two-year climate resiliency study for Dauphin Island. In 2013, the first year of this study, the Mississippi-Alabama Sea Grant Legal Program (MASGLP), which is part of the MASGC's Outreach Program, prepared a report on the anticipated regional changes in climate variables and how these

[7] *See* TOWN OF DAUPHIN ISLAND, http://www.townofdauphinisland.org/home.asp?ID=2 (last visited Mar. 24, 2014).
[8] FIVE E'S UNLIMITED, DAUPHIN ISLAND STRATEGIC PLAN: A 20 YEAR VISION, FINAL REPORT AND FIRST FIVE YEARS OF IMPLEMENTATION RECOMMENDATIONS (2007), *available at* http://www.townofdauphinisland.org/wide.asp?action=search&ID=71&searchin=category&keyword=&keyword2=&keyword3=6&submit=Search.
[9] *Id.* at iii-iv.
[10] *Id.* at iii.

changes can impact Dauphin Island's natural and built resources.[11] MASGLP also organized, with financial assistance from the Mobile Bay National Estuary Program, a Vulnerability-Consequence Adaptation Planning Scenarios (VCAPS) workshop for the Town. Following the VCAPS workshop and release of the scoping document, MASGLP has been working with the Town and Park and Beach Board to address issues associated with sea level rise and flooding, as well as the island's ecologic and economic health.

Part II of this Article reviews the experienced and projected climate impacts the MASGLP identified in its Scoping Document for Dauphin Island. Part III discusses the VCAPS process generally and examines the experience on Dauphin Island. Part IV considers the potential impacts of these changes in climate on Dauphin Island and possible policy responses.

II. MASGLP's Scoping Document: Experienced and Projected Climate Impacts

As mentioned above, as part of its climate resiliency study, MASGLP prepared a scoping document on the anticipated regional changes in climate variables and how these changes can impact Dauphin Island's natural and built resources. A summary of this report is provided below. The Southeast region of the United States has already experienced climatic changes and impacts associated with these changes, including land loss and sea level rise, storms, temperature, and precipitation.

A. Land Loss

A 2008 U.S. Geological Survey Study looked at the historical changes to the Mississippi-Alabama Barrier-Island Chain (MS-AL Barrier Islands) and found that since the mid-1800s, the island chain has sustained accelerated rates of land loss.[12] Specifically, Dauphin Island has been eroding since 1958. From 1958-2007, the island decreased by 16%.[13]

The study found that storm cycles and sand supply were combining with rising sea levels to cause land loss on the MS-AL Barrier Islands. While sea level rise can change landmasses over longer time periods like centuries and millennia, storms have more short-term effects over briefer time periods like years and decades. For example, Hurricane Katrina had a significant effect on the more recent land loss rate of Dauphin Island. From 1958-1996, the island's land loss rate averaged -6.1 hectare/year.[14] However, due in part to how Hurricane Katrina redistributed sand on the island's West End, the land loss rate decreased to -2.2 hectare/year from 1996-2007.[15] Figure 1 below, which is taken from this study, shows how Dauphin Island has changed over time.[16]

Reduced amounts of sand supply also exacerbate land loss. Since the late 1800s, the MS-AL Barrier Islands have experienced a reduction in the volume of sand supply due to the dredging of navigation

[11] The Mississippi- Alabama Sea Grant Legal Program's Scoping Document, *Climate Impacts for the Southeastern U.S. and Dauphin Island, AL*, is available at http://masglp.olemiss.edu/Advisory/dauphin_island_scoping_document.pdf.
[12] Morton, *supra* note 4.
[13] *Id.* at 1599.
[14] *Id.* at 1593.
[15] *Id.* at 1599.
[16] *Id.* at 1589.

channels in the area. Since that time, sand has been trapped in the navigation channels and removed by dredging, making it unavailable for barrier-island nourishment.[17] However, the 2008 U.S. Geological Survey Study concluded that Dauphin Island is probably the least affected of the MS-AL Barrier Islands by sand supply reduction because of sand stored in an ebb-tidal delta.[18]

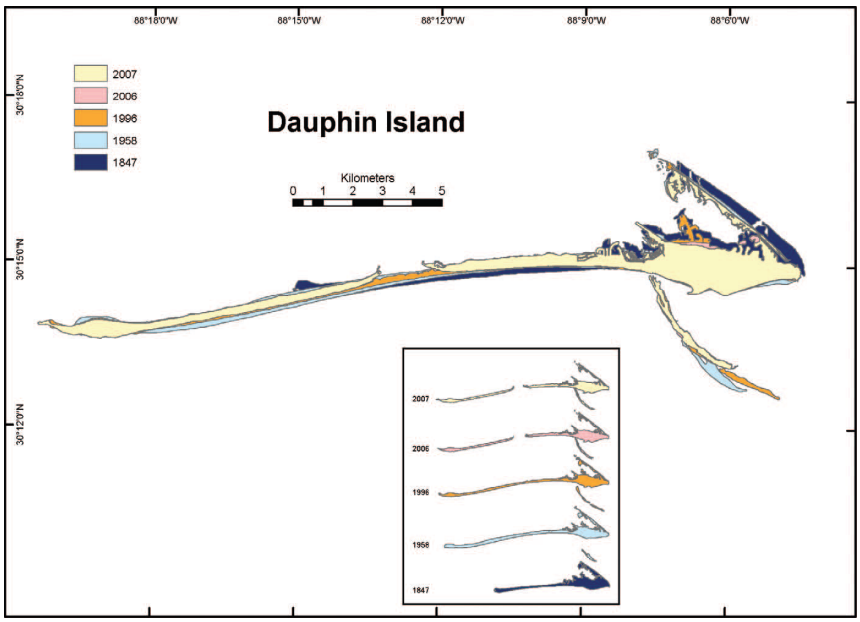

Figure 1. Morphological and spatial changes in Dauphin Island between 1847 and 2007. (Morton 2008).

Specific factors have made the West End of Dauphin Island more susceptible to land loss than the East End, which is relatively stable due in part to riprap and groins around Fort Gaines and bulkheads constructed on the island's sound-side shores. In comparison, the West End is susceptible to storm overwash and erosion on the Gulf beaches. This area of the island is also vulnerable to barrier breaching and island segmentation that exposes more of the island's shores to erosive processes.

Hurricane Katrina and subsequent tropical storms severely impacted the low-lying beaches on the West End, and the flooding conditions and wave action exacerbated by these storms accelerated and worsened the effects of erosion throughout the island. The relatively undeveloped western end of the island has been particularly susceptible to the effects of erosion, with over 350 feet of beach destroyed to date. Hurricanes Ivan and Katrina also caused the island to lose over 300 homes.[19]

In August 2011, Dauphin Island completed a three-phase study that looked at ways to address chronic beach erosion on the island and preserve the barrier island and beaches for future generations. The study found that while the shoreline on the East End of the island was receding at a rate of 9.0

[17] *Id.* at p. 1597.
[18] *Id.*
[19] Justin Gillis & Felicity Barringer, *As Coasts Rebuild and U.S. Pays, Repeatedly, the Critics Ask Why*, N.Y. TIMES, Nov. 18, 2012, http://www.nytimes.com/2012/11/19/science/earth/as-coasts-rebuild-and-us-pays-again-critics-stop-to-ask-why.html?pagewanted=all&_r=0.

feet/year, the shoreline on the West End of Dauphin Island was receding at a faster rate of 12.7 feet/year.[20]

B. Sea Level Rise

Although there were large swings in sea level throughout the last 20,000 years, sea levels reached a state of equilibrium with coastlines around 6,000 years ago, which allowed coastal landforms, including barrier islands, estuaries, and coastal wetlands, to develop. For the last 2,000 years, sea levels have remained mostly constant, and the sea level history of the northern Gulf Coast and Florida has closely followed this trend.[21] However, this trend began to change over the past 100 years, as global sea level rose around 8 inches during the 20th century. This rate is projected to increase throughout the 21st century.[22]

Warmer global temperatures cause sea level to rise in two ways. First, water molecules expand when they are warmer, causing the warmer water to take up more space.[23] Since temperatures are expected to continue to rise, water molecules are likely to continue to expand. Second, warmer temperatures cause ice sheets and glaciers to melt, which adds more water to the oceans and makes sea levels rise.[24] Currently, Arctic ice is melting at unprecedented rates, creating a vicious cycle. Ice reflects sunlight, while the darker ocean water absorbs heat. As more ice melts, more of the dark ocean is uncovered and the exposed water absorbs heat. This leads to increased heat in the air, which results in more ice loss.

The National Weather Service reported in August 2012 that the ice sheet covering the North Pole had melted to the smallest size ever recorded, shattering the previous record from 2007.[25] During the summer of 2007, the Arctic experienced almost ideal weather to melt ice with heat-trapping water vapor in the air, unusually sunny skies, and warm winds.[26] In comparison, the summer of 2012 had unremarkable weather for melting ice, providing strong evidence of the earth's long-term warming.[27]

Factors other than average global sea level rise will affect the rate of sea level rise in a particular location, including the location's proximity to melting ice sheets. An area's relative sea level rise will also depend on whether the area is rising or sinking. While some areas along the U.S. coastline are rising, a process referred to as uplift, most areas are sinking, a process referred to as subsidence. In the U.S., this subsidence has ranged from as little as a few inches to more than 2 feet per century. Because

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[20] TOWN OF DAUPHIN ISLAND, BEACH AND BARRIER ISLAND RESTORATION EFFORTS UPDATE (2011).

[21] *See generally* Joseph F. Donoghue, *Sea Level History of the Northern Gulf of Mexico Coast and Sea Level Rise Scenarios for the Near Future*, 107 CLIMATIC CHANGE 17 (2011).

[22] 2009 CLIMATE IMPACTS REPORT, *supra* note 3, at 114.

[23] NATIONAL CLIMATE ASSESSMENT AND DEVELOPMENT ADVISORY COMMITTEE, 2013 DRAFT FOR PUBLIC COMMENT 4 (2013), *available at* http://ncadac.globalchange.gov/download/NCAJan11-2013-publicreviewdraft-fulldraft.pdf [hereinafter 2013 DRAFT CLIMATE ASSESSMENT].

[24] 2009 CLIMATE IMPACT REPORT, *supra* note 3, at 18.

[25] Terrell Johnson, *Arctic Sea Ice Shrinks to Record Low*, THE WEATHER CHANNEL, Sept. 12, 2012, http://www.weather.com/news/arctic-sea-ice-record-low-20120911?fb_ref=local-fb-activity&cm_ven=Email&cm_cat=article_share.

[26] Andrew C. Revkin, *Artic Melts Unnerves the Experts*, THE N.Y. TIMES, Oct. 2, 2007, http://www.nytimes.com/2007/10/02/science/earth/02arct.html.

[27] *Johnson*, supra note 25.

the Gulf Coast is sinking, the region's relative sea level rise has been significantly higher than the global average rate over the last 50 years, and this trend is expected to continue into the future.[28]

Globally, sea levels have risen an average of about 1.7 mm/year over the past 100 years, but this rate has increased in the past 15 years to around 3.1 mm/year.[29] Table 1 shows how sea levels have risen in different parts of the Gulf Coast. From 1966-1997, Dauphin Island experienced a rise in sea level of 2.98 mm/year, which is comparable to Pensacola's sea-level rise (2.1 mm/year) and greater than the rise in global sea level.

Table 1. Long-term tide-gauge data for all Northern Gulf of Mexico stations with more than 40 years of record.[30]

Station Location	Mean Sea-Level Rise (Mm/Yr)	+/-	Earliest Record
Key West, FL	2.24	0.16	1913
Naples, FL	2.02	0.60	1965
Fort Meyers, FL	2.40	0.65	1965
St. Petersburg, FL	2.36	0.29	1947
Cedar Key, FL	1.80	0.19	1914
Pensacola, FL	2.10	0.26	1923
Dauphin Island, AL	**2.98**	**0.87**	**1966**
Grand Isle, LA	9.24	0.59	1947
Sabine Pass, TX	5.66	1.07	1958
Galveston Pier, TX	6.39	0.28	1908
Freeport, TX	4.35	1.12	1954
Rockport, TX	5.16	0.67	1948
Port Mansfield, TX	1.93	0.97	1963
Port Isabel, TX	3.64	0.44	1944
Padre Island, TX	3.84	0.75	1958

Although sea levels are expected to continue to rise, models differ as to the extent of the rise.[31] While climate models often vary due to different emission scenarios, the uncertainty in how ice sheets affect sea level rise also influences sea level projections. Ice sheets, also known as continental glaciers, are glacier ice that cover terrain and are larger than 20,000 square miles. While scientists understand how melting glaciers and the thermal expansion of water will affect sea level, they do not fully understand how ice sheets will contribute to sea level rise.[32] Because of this uncertainty, the Intergovernmental Panel on Climate Change's (IPCC) earlier reports did not account for changes in sea level due to ice sheet dynamics and projected that by the end of the century the world's oceans would rise anywhere from 8 inches to 2 feet.

[28] 2009 CLIMATE IMPACT REPORT, *supra* note 3, at 37.
[29] Donoghue, *supra* note 21, at 18.
[30] *Id.*
[31] 2009 CLIMATE IMPACTS REPORT, *supra* note 3, at 25.
[32] *Id.*

More recent studies, however, have tried to quantify how melting ice sheets will contribute to rising sea levels, and these recent studies have suggested that the IPCC's earlier projections for sea level rise were too conservative.[33] These more recent studies exceed the IPCC's predictions, with average estimates of a 3- to 4-foot sea level rise this century under higher emissions scenarios.[34] Most recently, the 2013 Draft Report on Global Climate Change Impacts in the United States found that sea levels would rise an additional 1 to 4 feet during this current century, depending on the emissions scenario.[35] Although few studies have looked at what the maximum amount of sea level rise could be, there is evidence suggesting that a sea level rise greater than 6.5 feet by the end of this century would be almost impossible.[36]

With an average elevation of only 7.2 feet, Dauphin Island is highly susceptible to rising sea levels, which are expected to result in coastal inundation and retreating shorelines. Wetlands are also expected to erode, with some ecosystems and areas becoming permanently lost. As discussed above, there are various projections as to the extent of sea level rise that the island may face. However, because of the small size and relatively low elevation of the island, a slight vertical increase in sea level can force the shoreline to move significantly inland, particularly in the low-lying areas of the island already threatened by erosion and shoreline retreat. Sea level rise will therefore serve as a threat to property in these parts of the island.

Sea level rise may also affect the mainland highway that provides access to Dauphin Island, as well as other infrastructure on the island. For example, Dauphin Island's wastewater treatment plant is currently only about 2 feet from the water, making it very vulnerable to sea level rise. As shorelines erode and the island loses both dunes and vegetation on the dunes, the island will become more susceptible to storms. Higher sea levels will also increase the possibility of saltwater intrusion in the region's porous aquifers, threatening the Town's drinking water supply.

C. Storms

In the last 100 or so years, the number of hurricanes based in the Atlantic Ocean has increased. Since 1970 the Southeast has experienced an increased number of Category 4 and 5 hurricanes, and this increase is thought to have been caused by both changes in climate and natural variability.[37] Although projections differ as to how storms will be affected by climate change, many believe the region will face stronger hurricanes since hurricanes gain strength over warmer water. Some projections also suggest that while the number of tropical storms will decrease globally, there will be an increase in stronger Category 4 and 5 storms. Stronger hurricanes could further stress infrastructure, ecosystems, and threaten human safety.

Storms can erode large quantities of sand from the area's beaches. From the spring through fall, wave energy is low, allowing some sand from offshore sandbars to be added to the shoreline. During storms, wave energy increases, and these waves can remove sand from the beach and deposit the sand

[33] *Id.*
[34] *Id.* at 150.
[35] 2013 DRAFT CLIMATE ASSESSMENT, *supra* note 23, at 26.
[36] 2009 CLIMATE IMPACTS REPORT, *supra* note 3, at 25.
[37] 2013 DRAFT CLIMATE ASSESSMENT, *supra* note 23, at 586.

offshore. When wave and wind action return to normal, this sand may redeposit on the area's beaches.[38] However, strong storms have the potential to remove a significant amount of sand from the beach very quickly. Therefore, if the area is expected to face stronger storms in the future, these storms could have a large effect on the amount of sand eroded from Dauphin Island's and the region's beaches.

Less intense seasonal storms could also adversely affect Dauphin Island. Coastal storms and associated surge flooding, combined with sea level rise, may increase erosion and inundate some areas, causing low areas on the island to be permanently lost.[39] The loss of land and marshes will reduce Dauphin Island's storm resiliency. The island will also face the cumulative impact of heavier storms in the fall, when sea levels are already at their highest. Dauphin Island has already become less resilient due to repetitive storms, allowing weaker storms to have a larger impact on the island. With these weaker, seasonal storms, areas of the island are expected to become flooded, and rising sea levels, land subsidence, and erosion could magnify this flooding.

Coastal storms can also lead to increased salinity in estuaries and freshwater aquifers.[40] This shift in salinity can kill native species and allow invasive species to take over an area. In addition, the salt spray from storms can weaken or kill trees on the island, which can lead to erosion. Further, the loss of trees will mean that the island will lose the protection of the trees against storm winds. Previous storms have also caused the loss of vegetated dunes on the island, which makes the island more susceptible to future storms.

Other potential storm impacts include the loss of shoreline, the rollover of sand into the Mississippi Sound, and a loss of elevation. Storms can also inundate docks, and the overtopping of bulkheads during storms could lead to additional erosion. Further, the island could be susceptible to further breaches as water rolls over or actually cuts through the island. While storms can erode sand from the area's beaches, storms surge and winds can also push sand onto property and the island's roads. For example, Hurricane Isaac caused the roads on the West End of Dauphin Island to be blocked by sand, which limited access to that part of the island.

Because Town employees will evacuate the island along with the Town's other residents before a dangerous storm, there are also limited resources on the island during and after a storm. Storms could also lead to a loss of infrastructure on the island, including the loss of sewers and roads, which would make these services unavailable to residents for periods of time.

D. Temperature

Globally, temperatures have increased during the last fifty years. In the Southeast, the average annual temperature has increased around 2° F since 1970, with the region experiencing the largest increase in the summer. In addition, most of the Southeast has experienced a decline of four to seven freezing days a year since the mid-1970s. There have also been more days above 95° F and nights above 75° F.[41]

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[38] *See Causes of Erosion,* TEXAS GENERAL LAND OFFICE, http://www.glo.texas.gov/what-we-do/caring-for-the-coast/coastal-erosion/causes-of-erosion.html (last visited Mar. 24, 2014).
[39] 2009 CLIMATE IMPACTS REPORT, *supra* note 3, at 114.
[40] *Id.*
[41] 2013 DRAFT CLIMATE ASSESSMENT, *supra* note 23, at 586.

Globally, temperatures are expected to rise, though the extent of the increase varies among the various climate scenarios. In the Southeast, rates for projected temperature increases are more than twice the rate that has already occurred in the Southeast since 1975.[42] Overall, on average, temperatures in the region are expected to increase between 2° F and 6° F. The Southeast is expected to experience the greatest temperature increases during the summer.[43] The region will continue to experience an increase in the number of days over 95° F and a decrease in the number of freezing events. Further, the Southeast is projected to experience the country's highest increase in heat index, which is a measure of comfort that combines relative humidity and temperature.[44]

Higher temperatures are expected to adversely affect the natural environment in various ways. Specifically, higher temperatures will lead to increased rates of evaporation and plant water loss that will in turn alter the amount of water available for groundwater recharge into aquifers.[45] In coastal areas, this may also lead to saltwater intrusion in shallow aquifers because there will be less freshwater available to flow into and recharge the aquifers. Temperature increases will also stress agricultural crops and may lead to degraded water quality in coastal waterbodies. Warmer waters are susceptible to algal blooms and the growth of bacteria that affect shellfish, both of which could be harmful to human health. Warming is also expected to influence the range of species, including allowing invasive species to enter an area. Further, higher temperatures will heighten the risk of forest fires.

Warming can also have numerous impacts on the built and human environment. Increased temperatures can have negative effects on infrastructure, such as causing pavement and railways to buckle.[46] Humans will also feel the effects of increased temperatures. As stated above, changes to groundwater recharge and saltwater intrusion could stress water resources. Warmer summers could also lead to greater energy demands and higher power bills. Heat-related deaths are also expected to increase, due to more frequent heat waves. Hotter temperatures can also lead to poor air quality, which may cause more respiratory problems. Because the Southeast is expected to experience the United States' greatest increase in heat index, the quality of life in the region could also decrease.[47]

E. Precipitation

The Southeast has also seen changes to the amount of rainfall. Since 1901, the amount of precipitation in the region has increased by 30% during the fall months.[48] During this same time period though, the extent of drought in the region increased by 9%.[49] In the spring and summer, the region has experienced more moderate to severe droughts, with an increase of 12-14% since the mid-1970s.[50] The fact that overall precipitation has increased while the number of droughts has also increased is because

[42] *Southeast*, *supra* note 2.
[43] *Id.*
[44] 2013 DRAFT CLIMATE ASSESSMENT, *supra* note 23, at 595.
[45] *Southeast*, *supra* note 2.
[46] *Id.*
[47] 2013 DRAFT CLIMATE ASSESSMENT, *supra* note 23, at 595.
[48] *Id.*
[49] *Southeast*, *supra* note 2.
[50] *Id.*

rain events have occurred in more intense storms, with longer periods of dryness between precipitation events.

The projections for precipitation patterns in the region are less certain than the region's temperature projections. During the winter and spring, Gulf Coast states are projected to have less rainfall.[51] The U.S. Environmental Protection Agency states that although precipitation is projected to decrease in Florida, climate models are unclear as to whether precipitation will increase or decrease in the rest of the Southeast region. However, models do suggest that rain will be in heavier downpours, with longer periods of dryness between storms and an increased number of droughts that are longer and more intense.[52]

The region will have to adapt to longer, more intense, and more frequent droughts. Decreased precipitation could also make areas more susceptible to fires that could damage both property and ecosystems. However, because precipitation is expected to come in heavier downpours, the region is also expected to experience increased flooding. Flooding can have many negative impacts, including interfering with roads and other transportation infrastructure and damaging property and natural resources. Strong storms that suddenly increase water flow, and the related run-off can also impede an ecosystem's ability to process pollutants by reducing the time the ecosystem has to filter pollutants and washing away pollutant-removing plants and microbes.

These stressors will likely also impact stormwater systems. Where communities use combined stormwater overflows, greater rainfall and sudden storm events can lead to sewer overflows that jeopardize water quality and human safety. These events can present risks to human health and could trigger boil water notices and beach closures in coastal areas. For example, on September 5, 2012, there was a sanitary sewer overflow into Salt Creek on Dauphin Island of around 2,360 gallons.[53] The overflow was due to heavy rainfall and a partially blocked sewer main. As a result, the Mobile County Health Department advised residents to thoroughly wash their hands and clothing if they came into contact with untreated sewage. The health department also advised residents to fully wash and cook seafood harvested in the affected areas. A similar sanitary sewer overflow of an estimated 1,800 gallons into Salt Creek occurred on May 2, 2013, once again due to heavy rainfall.[54]

III. The VCAPS Process

As part of its climate resiliency study, MASGLP in collaboration with the Mobile Bay National Estuary Program organized a Vulnerability-Consequence Adaptation Planning Scenarios (VCAPS) workshop for the Town. VCAPS is a facilitated, scenario-building process that uses an interactive, computer-based program to create a diagram with causal pathways that link climate stressors,

[51] *Id.*
[52] *Id.*
[53] Cassandra Andrews, *More than 2,000 Gallons of Sewer Spilled into Dauphin Island's Salt Creek*, PRESS-REGISTER, Sept. 7, 2012, http://blog.al.com/live/2012/09/more_than_2000_gallons_of_sewe.html.
[54] News Release, Mobile County Health Department, Sanitary Sewer Overflows Reported on Dauphin Island and in Bayou La Batre (May 3, 2013) (on file with author).

vulnerabilities, and consequences with appropriate local adaptation options.[55] North and South Carolina Sea Grant, the Social and Environmental Research Institute (SERI), and the University of South Carolina developed VCAPS as a way for local decision makers to "clarify their understandings and assumptions about [the] climate change adaptation challenges their communities will face in the future."[56]

SERI has facilitated VCAPS meetings throughout the Northeast and Southeast regions of the United States, including in:

- South Thomaston, Maine;
- Boston, Plymouth, New Bedford, and Fair Haven, Massachusetts;
- Plymouth, North Carolina;
- Sullivan's Island and McClellanville, South Carolina; and
- Orange Beach, Alabama.[57]

SERI also provides training information on its website if individuals would like to facilitate their own meeting.

At a VCAPS session, participants from the community are provided with a locally relevant climate scenario, such as increased rainfall, and then the participants go through a diagramming process to define the potential climate implications for the area. The VCAPS facilitator leads the participants through choosing a management context, selecting applicable climate stressors, and asking participants for the outcomes and consequences of these stressors and how the stressors might affect management decisions. The facilitator will also ask the group for actions that private individuals and public institutions could take to manage these consequences, as well as any factors that make the town unique, which VCAPS refers to as contextual factors.[58]

VCAPS was designed as way for communities to gather and use the specialized knowledge and experience of its community members in identifying future climate stressors, what makes the town unique in regards to these stressors, and how the town might adapt. Through this process, local leaders can potentially identify and integrate adaptation measures into their existing planning activities and resource allocations. VCAPS provides an opportunity for participants to work together on how to best manage the consequences of these climate events by collecting information and creating diagrams that can be used as sources of information in future decision-making.

In preparation for the VCAPS workshop on Dauphin Island, MASGLP attended and observed the June 2012 VCAPS meeting in Orange Beach, AL. The participants in Orange Beach chose to examine the effects of heavy rainfall and severe coastal storms on the community. After finishing the discussion of these climate stressors, the SERI facilitators asked the group to look at management actions that the town of Orange Beach and its residents could take to address some of the impacts discussed during the

[55] For more information on the VCAPS process, *see Overview and Purposes,* VULNERABILITY, CONSEQUENCES, AND ADAPTATION PLANNING SCENARIOS, https://sites.google.com/site/vcapsprojects/home (last visited Mar. 24, 2014).

[56] SOCIAL AND ENVIRONMENTAL RESEARCH INSTITUTE, DIAGRAMMING CLIMATE CHANGE-RELATED VULNERABILITY-CONSEQUENCE ADAPTATION PLANNING SCENARIOS (VCAPS)- A FACILITATION GUIDE AND TUTORIAL (2011), *available at* http://www.seri-us.org/sites/default/files/VCAPS%20UserGuide.15July11.pdf.

[57] *Cases,* VULNERABILITY, CONSEQUENCES, AND ADAPTATION PLANNING SCENARIOS, https://sites.google.com/site/vcapsprojects/cases (last visited Feb. 14, 2014).

[58] *Tutorials and Resources,* VULNERABILITY, CONSEQUENCES, AND ADAPTATION PLANNING SCENARIOS, https://sites.google.com/site/vcapsprojects/tutorials-and-resources (last visited Mar. 24, 2014).

meeting. Although time was limited, the meeting's participants were able to identify some potential management actions. For example, the participants discussed developing an information system to keep evacuated residents updated on the status of the town and their property after coastal storms, since one of the major reasons people try to re-enter neighborhoods after storms is to see the condition of their properties.[59]

For the December 2012 VCAPS meeting on Dauphin Island, MASGLP and the Town invited a wide-variety of stakeholders to attend the meeting.[60] To encourage participation, MASGLP created a short brochure to help explain the VCAPS process to the invitees. By inviting a wide array of participants, MASGLP and the Town aimed to take advantage of the individual knowledge and expertise of the island's community members. In addition, MASGLP and the Town wanted to ensure that all of the interests and resources of the island were represented in the VCAPS process so that the Town would be able to identify areas where it has knowledge gaps. The process also aimed to identify how the Town's different governing entities are currently working together and how this coordination could be improved in the future.

In addition to representatives from SERI, the Mobile Bay NEP, and Mississippi-Alabama Sea Grant, representatives from the Town, Park and Beach Board, Water and Sewer Authority, Dauphin Island Planning Commission, Dauphin Island Sea Lab, and the Dauphin Island Property Owners Association were among the attendees of the Dauphin Island VCAPS workshop. To start the meeting, MASGLP gave a short presentation on the changes in climate facing the Southeast region of the U.S. After this presentation, the workshop's participants decided to focus on severe coastal storms and the effect of storms in connection to sea level rise.

The discussion of these two climate stressors highlighted two issues currently facing the island. First, the meeting reinforced the differences between the island's more stable East End and more vulnerable West End and further elucidated the difficulty in deciding how to manage the West End in the future. In addition, the meeting emphasized the problem of identifying small actions that could help ameliorate some of the larger, long-term climate impacts facing the island.

The discussion regarding rebuilding and repairing the island's West End after storms was particularly tense. Since many of the island's permanent residents live on the East End, some of these residents feel like they are repeatedly financing the rebuilding of the West End for the benefit of rental homeowners and tourists with little benefit to themselves. As a result, some participants advocated a gradual retreat from the West End by allowing that area of the island to slowly become undeveloped property by not rebuilding homes and roads damaged by storms. It was then suggested that this part of the island could be used in the future solely as recreational property. However, the participants who

[59] *See* SOCIAL AND ENVIRONMENTAL RESEARCH INSTITUTE, RESULTS FROM A VCAPS PLANNING WORKSHOP FOR EXTREME WEATHER IN ORANGE BEACH, ALABAMA: FINAL REPORT (2012), *available at* https://docs.google.com/file/d/0By5enT3tgjj4azVJQ1F3eVIxWlk/edit.

[60] MASGLP worked with the Town to create an invite list with representatives from the: Dauphin Island Park and Beach Board; Dauphin Island Water and Sewer Authority; Dauphin Island Foundation; Dauphin Island Chamber of Commerce; Dauphin Island Property Owners Association; Dauphin Island Sea Lab; Dauphin Island Elementary School; Federal Food and Drug Administration; Dauphin Island Department of Conservation; Town of Dauphin Island Planning Commission; Town of Dauphin Island Police Department; Town of Dauphin Island Volunteer Fire and Rescue; and Audubon Bird Sanctuary.

support sustaining the West End indefinitely resisted these suggestions and emphasized the economic activity generated by the West End and how this activity boosts the economy of the entire island.

Further, while most of the participants agreed that the island was vulnerable to climate stressors and impacts, the SERI facilitators struggled to get the VCAPS participants to generate management solutions for these stressors and impacts. Most of the meeting's discussion focused on problems, while the discussion of solutions often stalled. During the VCAPS session, participants from Dauphin Island struggled to identify small actions that the town could take to help mitigate some of the consequences of climate stressors affecting the island. Instead, participants often focused on barriers to potential solutions, such as lack of funding or support for an action.

However, Dauphin Island is not unique in this regard. It is much easier for a community to identify its vulnerabilities to changes in climate than to make decisions on the best way to move forward. In addition, as discussed above, VCAPS did help identify some of the climate impacts facing the island, some of which are discussed in Part IV below.

IV. Potential Impacts and Solutions

The climate change impacts facing Dauphin Island could affect the island in multiple ways. These potential effects include negative impacts on the island's natural resources, ecosystems, and economy, as well as transportation and access to, from, and around the island. Each of these potential effects is discussed in turn below, as well as some potential policy responses.

A. Natural Resources and Ecosystems

Climate change impacts will negatively affect the natural resources of Dauphin Island. As discussed above, higher temperatures can lead to the introduction of nonnative invasive species, as well as increase the risk of wildfires. Increases in temperature will also alter groundwater recharge, which can lead to saltwater intrusion in shallow aquifers. Rising sea levels and saltwater storm surge can also lead to increased salinity levels in estuaries and freshwater aquifers.

Although it is a global issue, ocean acidification could impact the region and Dauphin Island. Ocean acidification is the change to the carbon chemistry of the ocean due to increased amounts of carbon dioxide in the atmosphere. Ocean waters absorb the carbon dioxide, which acidifies the water by reducing the water's pH. Globally, the pH of the world's oceans has been reduced by 0.1, which is an increase of acidity of around 30%.[61] Projections expect pH to be reduced by another 0.3 over the next 100 years if global carbon emissions are not significantly reduced. Scientists believe that this change would be at a minimum 10 times faster than any other change over the last 50 million years. Certain factors will affect the amount of ocean acidification that a region experiences, including the amount of nutrients and hypoxia in the area.[62]

[61] National Oceanic and Atmospheric Administration, State of the Science Fact Sheet: Ocean Acidification (2013), *available at* http://www.noaa.gov/factsheets/new%20version/SoS%20Fact%20Sheet_Ocean%20Acidification%20201303 06%20Final.pdf.

[62] *Id.*

Ocean acidification causes there to be less carbonate in the water, and carbonate is important to coral reef and shell formation. As a result, ocean acidification is a significant threat to both coral reefs and shellfish populations. Since coral reefs provide habitat for a multitude of species, as well as coastal protection, food, and income for people, the loss of coral reefs due to ocean acidification could have adverse impacts on an area.[63] Likewise, shellfish represents a large portion of the nation's seafood revenue, including a large amount of revenue in the Gulf. Due to ocean acidification, the region could also lose the ecosystem services of shellfish reefs.

Increased salinity levels could also threaten the marine resources of Dauphin Island, such as by threatening oyster beds that cannot tolerate large changes in salinity. A shift in salinity could also kill native species and allow invasive species to take over an area. For example, according to participants of the 2012 VCAPS workshop on Dauphin Island, the island experienced a shift in tree species after Hurricane Frederick in 1979 with the introduction of popcorn trees.

In addition, climate impacts such as salt spray from storms can also weaken or kill trees on the island, which can lead to erosion and a loss of protection from strong winds. Climate stressors like storms and fires also occur over short time frames, making it hard for local plants to adapt. Trees that are weakened will become more susceptible to disease and pests, and the loss of trees can cause erosion that can weaken the soil and destroy the island's canopy, which serves as wildlife habitat. This loss of habitat could serve as an additional threat to the island's bird watching and other tourist activities.

Climate impacts can also lead to a loss of habitat for other species on the island. The island's wildlife habitat could face a constant state of disruption as the shape of the island changes and dunes shift inland. Sea level rise will also threaten important coastal wetland ecosystems, which serve as both wildlife habitat and protection for inland areas from the effects of storms.

Potential Solution: Outreach to the Birding Community and Town Maintenance Workers

During the second year of the project, MASGLP met with the Park and Beach Board to discuss the issues facing the island's ecosystems and its bird sanctuary in particular. In terms of public outreach on these issues, there is the potential to reach out to both the island's birding community and the Town's maintenance workers. The birding community likely has a strong interest in enhancing Dauphin Island's wildlife habitat; therefore, they may be interested in workshops on invasive species, rain barrels, or other related topics. Similarly, the Town's maintenance workers could benefit from a workshop on the invasive species that pose a threat to the island's ecosystems, like popcorn trees. Further, a workshop could provide information on native species that would flourish on the island.

In addition, at the VCAPS meeting, there was some discussion on how rainwater could be captured and re-used on the island, since predictions show that the island may face more intense rainstorms with longer periods of drought between storms. In this way, the use of rain barrels on the island could be helpful to the sustainability of the island's ecosystems.

[63] *Id.*

B. Transportation and Access

Sea level rise and flooding will affect transportation systems and access to and around Dauphin Island. For example, storms make the causeway to the island impassable, and rocks that are used to protect the highway often end up in the road, blocking passage until the rocks can be removed. The Town also faces issues with evacuation and re-entry of the island before and after a storm, including having limited access to the causeway. As a result of these access issues, more and more people have been choosing to stay on the island during storms. This could have disastrous consequences for those who stay if a storm intensifies after it is no longer feasible to leave the island. Because re-entry to the island can be delayed after storms, utility and emergency workers have difficulty getting back onto the island, which makes it difficult for the Town to get up and running after a storm.

With sea level rise and increased flooding, Dauphin Island may also face access problems with its docks, as well as the ramps and roads to those docks. When the causeway and bridge to the island are inaccessible due to flooding, the ferry to Dauphin Island has been used as backup access to the island. However, if sea level rise and increased flooding inundate the ferry docks, this mode of transportation may be impaired in the future as well.

Finally, increased temperatures could stress the roads to and on Dauphin Island. Extreme heat for long periods of time can soften asphalt, leading to damage on roadways.[64] Further, storms can cause roadways to be covered by sand, impeding the use of these roads around the island.

Potential Solutions: Rain Barrels and Ordinance Review

At the VCAPS meeting there was some concern with the vulnerability of the access ramps to the island's docks to flooding. As a result, there is the opportunity to make the island's marinas, docks, and roads more climate resilient, and the opportunity exists for public outreach on steps private property owners could take to reduce flooding. For example, as discussed above, the use of rain barrels could help alleviate some of the flooding on the island after storms.

In addition, MASGLP is considering a review of the Town's current flood ordinance, as well as research on other regulatory steps the Town could take in regards to flooding. Recognizing the ability of zoning to address climate hazards, the Georgetown Climate Center developed a model sea level rise ordinance to help local communities manage increased flooding events.[65] The model ordinance addresses sea level rise in two ways. In order to protect development, the ordinance expands the areas protected by floodplain regulations. The model law also creates two new sea level rise zones that will be subject to more rigorous regulations: a Conservation Zone, which aims to facilitate retreat, and an Accommodation Zone, which allows continued development in an area, but requires more resilient structures.[66] The model ordinance also provides language for standards to be applied in both of these

[64] 2013 DRAFT CLIMATE ASSESSMENT, *supra* note 23, at 598.

[65] *See Zoning for Sea Level Rise*, GEORGETOWN CLIMATE CENTER, http://www.georgetownclimate.org/zoning-for-sea-level-rise (last visited Mar. 24, 2014).

[66] JESSICA GRANNIS, GEORGETOWN CLIMATE CENTER & HARRISON INSTITUTE FOR PUBLIC LAW, ZONING FOR SEA LEVEL RISE: A MODEL SEA-LEVEL RISE ORDINANCE AND CASE STUDY OF IMPLEMENTATION BARRIERS IN MARYLAND, EXECUTIVE SUMMARY 2-3 (pre-publication draft 2012), *available at*

zones. The Georgetown Climate Center then compared the model language to existing Maryland and federal laws to see if there would be any barriers to implementing the model ordinance in the state.[67] MASGLP is planning on doing a similar exercise to see what type of sea level rise zoning ordinances would be allowed in Alabama and what potential language the Town could use in such an ordinance.

C. Economic Effects

Many climate change impacts could have an adverse economic effect on the island. The degradation of ecosystems that help protect the island from storms may lead to more property loss on the island when storm events occur. Storms have also led to a loss of residential and rental property on the island. For instance, due to Hurricanes Ivan and Katrina, the Town lost over 300 homes. Because storms have the potential to destroy houses, the Town will likely lose property tax revenue in the future, as the homes cannot be rebuilt if the property remains under water. In addition, due to a loss of rental properties, fewer people may visit the island, which results in lower sales tax, gas tax, and lodging tax revenue. Fewer tourists will also adversely affect the Town's businesses and restaurants.

Hurricanes and more common winter storms have led to homes becoming uninhabitable when water and sewer lines are broken or turned off. Since the electric company will turn off power if a house is under water, properties that become permanently flooded will also permanently lose power. Storms can lead to a loss of infrastructure on the island, including the loss of sewers and roads, and the Town faces the cost of repairing this infrastructure after storms. For example, this past fall, Hurricane Isaac pushed sand onto the island, blocking roads on the West End. The Town had to expend both time and resources to clear the roads and make this part of the island accessible to the Town's residents.

The Town and property owners on the island could also face increased insurance costs or the prospect of self-insuring their property due to storms. With the release of new Alabama Flood Insurance Rate Maps (FIRMs), the town may face increased requirements for building codes and elevation standards.[68] These insurance issues and building requirements may cause people to move from Dauphin Island, further reducing the island's economic activity.

Climate impacts could also affect people's decisions to live on or visit the island. By 2100 the Southeast is expected to face a large increase to its heat index,[69] and this could lead to a decreased quality of life on the island. Stressed water resources could also contribute to this decreased quality of life.

Climate impacts could also impose a constant state of disruption on the island's wildlife habitat. This disruption will affect vegetation on the island, imposing a cost on the Town, Park and Beach Board, or property owners to replant damaged vegetation. Tree loss could also reduce property values, and property owners will have to pay to remove dead trees. Dead or weakened trees can also pose a public

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http://www.georgetownclimate.org/sites/default/files/Zoning%20for%20Sea-Level%20Rise%20Executive%20Summary%20Final.pdf.

[67] *Id.* at 4.

[68] The Federal Emergency Management Agency has begun the process of updating the flood maps for coastal Alabama. According to the Alabama Department of Economic and Community Affairs, the revised FIRMs will be effective sometime in 2016. *See County Status,* AL. DEP'T OF ECONOMIC AND COMMUNITY AFFAIRS, http://www.adeca.alabama.gov/Divisions/owr/floodplain/Pages/County-Status.aspx (last visited Mar. 24, 2014).

[69] 2013 DRAFT CLIMATE ASSESSMENT, *supra* note 23, at 595.

safety problem, as they can fall on property or people. Invasive species entering the area can have a negative economic impact as well. The Town will have to expend resources to eradicate the introduction of invasive species on the island. Changes to wildlife habitat because of invasive species can also affect tourist revenue, as the island relies on revenue created from its bird-watching habitat.

Finally, climate impacts could threaten the economic health of the entire region. With erosion causing the beaches to recede along the western portion of Dauphin Island, a significant amount of Alabama's coastal marshes have been destroyed, which in turn could present a substantial threat to the state's seafood industry. Ocean acidification could also threaten the region's shellfish industry. Because most of the Gulf Coast is low-lying, its transportation infrastructure is susceptible to sea level rise. This area sees a great deal of commercial transportation with large ports, freight gateways, and United States operations of the oil and gas industry. Further, about two-thirds of the nation's oil imports travel through the region. Sea level rise could affect this transportation network that is valued in the hundreds of billions of dollars.[70] Finally, the energy facilities located on the Gulf Coast are considered to be very vulnerable to rising sea levels, and the area could face having to repair or raise damaged equipment or build new inland facilities.[71]

Potential Solutions: Beach Nourishment and Working Waterfronts

Since the island relies on its tourist economy, the Town is interested in preserving the island's beaches and rental properties. One way to do this would be through beach nourishment projects. In meetings with MASGLP, the Town expressed concern with the status of the current boundary between private and public property on the island's Gulf side. MASGLP has been working on legal research on how property lines along the island's Gulf coast can change due to gradual or sudden and natural or man-made changes to the beach.

Further, in its 2013 Comprehensive Plan, Dauphin Island established a working waterfront district on the island as a way to promote water-related industries, such as charter fishing boats. In developing this district, the Town will have to consider what uses it wishes to protect or promote. In its regulations, Alabama has defined a water dependent use as a use "that must, under normal operating conditions, be located on or in or immediately adjacent to coastal waters in order to be physically and economically practicable."[72] The state has also defined a water dependent activity as "an activity which can only be conducted on, in, over, or adjacent to water areas because the activity requires direct access to the water body or state owned submerged lands for transportation, recreation, energy production or transmission, or source of waters, and where the use of the water or state owned submerged lands is an integral part of the activity."[73]

In developing the uses in this new district, Dauphin Island will have to work through what uses and activities it wants to allow in the area. For example, a restaurant or hotel may not fit in to the state's definition of water dependent use, but the Town may want to allow for these uses in its working waterfront. Similarly, non-water dependent uses may exist in the area that the Town will allow to

[70] 2009 CLIMATE IMPACTS REPORT, *supra* note 3, at 595.
[71] *Id.*
[72] AL. ADMIN. CODE r. 335-8-1-.02.
[73] AL. ADMIN. CODE r. 220-4-.09.

continue as non-conforming uses. Moreover, the Town should work to make the working waterfront district climate resilient.

V. Conclusion

The southeast region of the United States and Dauphin Island have already experienced impacts from changes to climate, and these changes and impacts are expected to continue into the future. As discussed above, these impacts could have potentially large effects on the island. Because of this, the Town currently has the opportunity to proactively plan for these future impacts and make the island more climate resilient. As a next step, the Town can continue working to help focus its climate change adaptation efforts. As part of this process, MASGLP is trying to identify smaller actions the Town and other entities can take to address climate impacts, as well as considering larger issues facing the island.

Working Waterfront Legislative Committees: Do they Instigate Change?

Nicole Faghin, MCP, JD, LEED AP[1]

Abstract: Between 2001 and 2010, five state legislatures created special study committees to evaluate problems facing their working waterfronts. These committees, in Alabama, Maine, Maryland, North Carolina, and Rhode Island, came up with strategies for land use planning, property taxation, funding, and education, among other ideas. The earliest committee in Maine successfully implemented a majority of the committee recommendations. The other states had mixed results primarily due to lack of funding during the recession starting in 2008. However, as the economy improves, these states have blueprints for action. This Article discusses the purpose and structure of these committees, summarizes the key committee recommendations, and examines progress toward implementation in each state.

[1] Nicole Faghin is a Coastal Management Specialist at Washington Sea Grant based at the University of Washington. Nicole received her masters in Urban Planning from MIT and her law degree from Northeastern University School of Law in Boston, MA.

I. Introduction and Summary

In the last 10 to 15 years, waterfront communities in a number of states on the East and Gulf coasts have faced major crises. Land prices have escalated as demand for waterfront property increases, pressuring property owners to sell or convert their property. Such sales and conversions often result in the loss of waterfront access for traditional fishing and maritime users. A decline in the fishing industry has compounded these pressures.

This Article examines state efforts to address the problems of working waterfronts in a specific way – through the establishment of legislative committees and their recommendation reports. It focuses on five states—Alabama, Maine, Maryland, North Carolina, and Rhode Island—that recognized the importance of working waterfronts to their economies. Each established a legislative committee, via a joint order, joint resolution, session law, or senate bill, to recommend strategies to protect them. These committees ranged in size from ten to twenty-eight members. Between 2001 and 2012 the committees met over the course of one to three years to develop specific recommendations and reported back to their legislatures.

Although similar issues drove the creation of all these committees, each state responded uniquely to particular challenges. In Maine, escalating waterfront property values compounded the impact of a significant decline in the fishing industry. In North Carolina, Maryland, and Alabama, rising land prices and development pressures, and the resulting reduced waterfront access for both commercial and recreational uses, provided the basis for the legislatures to take action. Rhode Island recognized a need to enhance economic opportunities for its ports.

Each state proposed recommendations specific to its needs, but some common themes and strategies ran through all of them. This Article discusses the mechanisms recommended for land use planning, taxation, submerged lands, direct funding, indirect or incentive-based funding, the transfer and purchase of development rights, and educational activities. In addition, some of the states recommended creating new committees to carry out some of the actions proposed in their reports.

The Article concludes by following up on the outcomes for each state's recommendations. The recession of 2007 and 2008 slowed the implementation of most of the states' recommendations. Maine was an exception; it completed its work earlier than most other states and had enough resources to implement its recommendations.

It is important to note the scope of this Article. Significant accomplishments have been made in all five states associated with working waterfronts over the years. This report only tracks those efforts directly related to the legislative committee recommendations.

II. Background on Working Waterfront Legislative Committees

State legislatures can initiate action on issues of statewide significance in many different ways. Although legislatures most often act by enacting new laws, they can also take action by passing resolutions creating committees to research and evaluate issues of pressing, critical concern. Unlike standing legislative committees, which consider bills in a particular subject area for recommendation

to one house or the other, study (or sometimes called select or interim) committees are usually established by resolutions of both houses, with specific directives as to their composition and the tasks they will accomplish.

Legislatures traditionally establish interim committees "to study or investigate certain matters between annual or biennial legislative sessions and to report to the next regular session."[2] Typically, interim committees are formed during the legislative session. At that time, the House and Senate leadership decides on who will be on the interim committees, with members of the interim committees usually serving one term. The committees often invite experts to present information to them. Members of the public also get a chance to have their say. Legislators will then use what they learn from the interim studies to make decisions about what bills to consider during the next session.

With respect to working waterfronts, some states created study committees, such as the Maine Committee to Study the Loss of Commercial Fishing Waterfront Access and Other Economic Development Issues.[3] Maryland used the term Working Waterfront *Commission*.[4] A similar process occurred in both cases where the legislature authorized creation of the group and provided direction as to what would be studied during the term of the committee or commission. Even though there may be different titles for the groups, their functions were the same. This Article will use the term "committee" to refer to all these committees and commissions, as their functions are essentially the same.

Providing a consistent definition of working waterfronts is important in all states as they search for solutions to address impacts to working waterfronts. Over the years there have been a wide array of definitions which has lead to sometimes conflicting results and recommendations. The starting point for a definition can be found in the 1972 Coastal Zone Management Act which recognized the need to plan for and give priority to coastal-dependent uses such as fisheries, recreation, ports and transportation, and industrial development relying upon access to the coast.[5]

Clarifying what type of development depends upon access to the water has been the source of numerous debates over the years.[6] What activities should be considered part of the "family" of working waterfronts and thereby the subject of focus for such efforts as these working waterfront committees and the subject of recommendations? Only North Carolina and Alabama actually include definitions of terms in their final legislative report. The North Carolina report from 2006 contains the following definition for working waterfronts:

> **Working Waterfronts** – are commercial facilities that require direct access to or a location on, over or adjacent to North Carolina's coastal public trust waters and submerged lands. The

[2] *Glossary of Legislative Terms*, NATIONAL CONFERENCE OF STATE LEGISLATURES, http://www.ncsl.org/research/about-state-legislatures/glossary-of-legislative-terms.aspx (last visited Jan. 31, 2014).

[3] Maine Legislature, H. P. 1384, Joint Study Order Establishing the Committee to Study the Loss of Commercial Fishing Waterfront Access and Other Economic Development Issues Affecting Commercial Fishing (June 21, 2001) [hereinafter Maine H.P. 1384].

[4] *See* Maryland Legislature, S.B. 414, Chapter 30 (April 10, 2007) [hereinafter Maryland S.B. 414].

[5] 16 U.S.C. § 1452(2)(D).

[6] For an in-depth discussion on defining "working waterfront," see TERRA BOWLING, WORKING WATERFRONTS AND THE CZMA: DEFINING WATER-DEPENDENT USE (2013), *available at* http://www.wateraccessus.com/toolkit.html; MICHAEL DIXON, TAX-BASED OPPORTUNITIES AND CHALLENGES FOR WORKING WATERFRONT PROTECTION (2010) *available at* http://www.accessingthemainecoast.com/coastal_access_toolkit/DixonMemo_final.pdf.

> term includes water-dependent facilities that may be open to the public, offer access by vessels to State waters and lands or that support facilities for recreational, commercial, research or government vessels.
>
> Examples include, but are not limited to: commercial fishing facilities, including fish houses; wet and dry marinas available for public use; boat construction facilities; boat haul-out and repair facilities; recreational fishing facilities, including fishing piers; facilities engaged in or offering boating for hire (e.g. charter/headboats); and aquaculture facilities that require direct use/flow of coastal waters and/or wharf areas for marine aquaculture operations and product transport. [7]

This definition focuses on the commercial fishing industry and is also used in the Alabama report.

In 2007, the Maine legislature adopted "An Act Regarding Working Waterfront Projects" and defined both working waterfront activities and working waterfront land.

> "Working waterfront activity" means an activity that qualifies a parcel of land as working waterfront land. "Working waterfront activity" includes commercial fishing activities; boat building and repair; hauling, launching, storage and berthing of boats; and other similar commercial activities that are dependent on the waterfront.[8]

The definitions from Maine, North Carolina, and Alabama are relatively similar as to what activities and uses they encompass with an emphasis on the fishing industry. Recommendations from the state committees subsequently reflected the need to provide protection for this defined set of users.[9]

III. Issues Driving Creation of Working Waterfront Committees

While all these legislative committees were established to focus on the general issue of working waterfronts, each state had its own key issues to address. Similar themes emerged related to declining fishing industries, rising land values due to population growth, demand for prime waterfront locations for residential and non-water dependent commercial purposes, effects on industries dependent upon waterfront access, and the impact on economic development in each state.

In **Maine,** a decline in fish stocks compounded by the rising costs of waterfront properties and the resulting impacts on the fishing industry drove the committee to focus on strategies to ensure waterfront access and help commercial fisheries remain viable. In addition, Maine focused on economic development strategies to support the workforce affected by the loss of jobs in the fishing industry.[10]

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[7] NORTH CAROLINA WATERFRONT ACCESS STUDY COMMITTEE, FINAL REPORT 13 (2007) [hereinafter N.C. REPORT].
[8] MAINE REV. STAT. tit. 38, §480-B(11).
[9] By contrast, the Florida legislature adopted a much broader definition that included hotels and resorts. *See* FLA. STAT. §§ 342.07, 342.201.
[10] *See* Maine H.P. 1384, *supra* note 3.

In 2008, **Maryland** identified the important role waterfronts play in the economy, heritage, culture, and history of Maryland.[11] The legislature noted development pressures increasingly eliminate commercial working waterfronts. And the state needed to take a role in the protection and preservation of access for the commercial fishing industry to public trust waters.[12]

North Carolina and **Alabama** broadened the scope of their reviews beyond impacts on the fishing industry. Both their legislative committees were tasked with evaluating the degree of loss in the diversity of uses along their shorelines.[13] The North Carolina legislature directed the committee to "study the degree of loss and potential loss of the diversity of uses along the coastal shoreline…."[14] The Alabama legislature patterned their bill and its purpose off of the North Carolina law.[15]

Rhode Island's legislative committee focused on its ports and wanted to ensure growth in all types of maritime industries, not just fishing.[16] The legislature stated that the purpose of the commission would be to "study potential economic opportunities in the development of port facilities in the State of Rhode Island.[17] As one analysis of the need for the study explained:

> This gentrification of Providence's working waterfront is extremely shortsighted. While condos, hotels, and marinas may increase the city's property tax revenues, they will come at the expense of existing successful taxpaying businesses, good blue-collar jobs, and a regional economic resource that will never be rebuilt. The costs to the region could be immense, as thousands of port-related jobs could be lost and heating and energy costs would increase due to the expense of transporting these resources from other ports.[18]

In each of the five states reviewed in this report, a joint resolution of the legislature established a committee to evaluate working waterfront issues. Table 1 provides the name and the session law creating each committee.

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[11] *See* Maryland S.B. 414, *supra* note 4.
[12] *Id.*
[13] *See* General Assembly of North Carolina, Session Law 2006-248, H.B. 1723, § 45.3 (Aug. 16, 2006) [hereinafter North Carolina H.B. 1723]; ALABAMA WATERFRONT ACCESS STUDY COMMITTEE, FINAL REPORT TO THE LEGISLATURE OF ALABAMA 3 (2012) [hereinafter ALABAMA REPORT].
[14] North Carolina H.B. 1723, *supra* note 13.
[15] Alabama Legislature, House Joint Resolution 656, Senate Joint Resolution 42 (2008) [hereinafter Alabama Joint Resolution].
[16] *See generally*, SPECIAL LEGISLATIVE COMMISSION TO STUDY POTENTIAL ECONOMIC OPPORTUNITIES IN THE DEVELOPMENT OF PORT FACILITIES IN RHODE ISLAND, FINAL REPORT (2012) [hereinafter RI REPORT].
[17] Rhode Island General Assembly, H. 5084, Joint Resolution creating a Special Legislative Commission to Study Potential Economic Opportunities in the Development of Port Facilities in Rhode Island (2009) [hereinafter Rhode Island H. 5084].
[18] Joel Cohen, *Your View: Pulse of the Ports: Protect Providence's Working Waterfront,* SOUTH COAST TODAY, Sept. 26, 2008, http://www.southcoasttoday.com/apps/pbcs.dll/article?AID=/20080926/OPINION/809260303/-1/NEWS10.

Table 1. State Committee Names and Resolution Number.

State	Year	Title of Committee	Resolution
Maine	2001	Committee to Study the Loss of Commercial Fishing Waterfront Access and Other Economic Development Issues Affecting Commercial Fishing	Joint Order HP 1384
North Carolina	2006	Waterfront Access Study Committee	Session Law 2006-248, HB 1723
Maryland	2007	Working Waterfront Commission	Chapter 30 of 2007, Senate Bill 414
Alabama	2008	Alabama Waterfront Access Study Committee	House Joint Resolution 656, Senate Joint Resolution 42
Rhode Island	2009	Special Legislative Commission to Study Potential Economic Opportunities in the Development of Port Facilities in State of Rhode Island	Joint Resolutions 2009 H. 5084 and 2009 S. 0017

The committees' structures and duties varied according to state. Committee sizes ranged from 10 members in Maine to 28 in Alabama. Each resolution provided guidelines for membership, ensuring a cross-section of stakeholders associated with working waterfronts. In addition to house and senate members, the committees included representatives of state agencies such as those representing the fishing industry, coastal management divisions, marine resources divisions, and parks and recreation departments, as well as local governments. From the private sector, members included representatives of the commercial and recreational fishing industries, seafood industry, marine trades, real estate and residential building industries, and environmental community. The size and composition of each committee, detailed in Table 2, indicate the range of interests identified by each state.

Table 2. Composition of committees by state.

State	Size of Committee	Composition of Committee Members
Maine	10	(1) One senator appointed by the president of the Senate; (2) Three members of the House of Representatives, at least one of whom serves on the Joint Standing Committee on Marine Resources; (3) Two members representing the fishing industry; (4) Two members of the general public; and (5) Two members representing state agencies that regulate the fishing industry.
North Carolina	21	(1) The Director of the Sea Grant College Program; (2) the Senate co-chair of the Joint Legislative Commission on Seafood and Aquaculture; (3) the House co-chair of the Joint Legislative Commission on Seafood and Aquaculture; (4) the Chair of the Marine Fisheries Commission; (5) the Chair of the Coastal Resources Commission; (6) the Chair of the Wildlife Resources Commission; (7) the Director of the Division of Marine Fisheries; (8) the Director of the Division of Coastal Management; (9) the President of the North Carolina Recreation and Parks Association; (10) a representative of a local government in the Northeast Coastal Region; (11) a representative of a local government in the Central Coastal Region; (12) a representative of a local government in the Southeast Coastal Region; (13) an economist; (14) a representative of the residential building industry who builds in a coastal region; (15) a realtor; (16) an individual involved in economic development in a coastal region; (17) a representative of the marine trades industry; (18) a representative of the commercial fishing industry; (19) a representative of the recreational fishing industry; (20) a social scientist; and (21) a representative of the environmental community.
Maryland	15	(1) One member from the Senate, (2) one member from the House of Delegates, (3) the secretary of the Department of Natural Resources, (4) the secretary of Planning, (5) the secretary of Economic Development, (6) the director of the Association of Counties, (7) the director of the Maryland Municipal league, (8) the director of the Maryland Agricultural and Resource-Based Industry Development Corporation, (9) the director of the Coastal Bay Association, (10) the director of the Chesapeake Bay Seafood Industries Association, (10) the director of the Maryland Sea Grant Program, (11) the director of the Maryland Waterman's Association, (12) the director of the Saltwater Sport Fishermen's Association, (13) a representative of coastal bay residents, (14) a representative of lower bay residents, and (15) a representative of upper bay residents.
Rhode Island	12	12 members from the General Assembly, six from the House, and six from the Senate.
Alabama	28	(1) The director of the Mississippi-Alabama Sea Grant Program, (2) a representative of the Alabama Department of Conservation and Natural Resources, (3) a representative of the Alabama Department of Conservation and Natural Resources, Marine Resources Division, (4) a representative of the Alabama Working Waterfront Coalition, (5) a representative of the Alabama Port Authority, (6) a representative of the commercial fishing industry, (7) a representative of the recreational fishing industry (8) a representative of the U.S. Army Corps of Engineers, (9) an economist, (10) a social scientist, (11) a representative of the Alabama Home Builders Association, (12) a representative of the Alabama Association of Realtors, (13) a representative of the marine trades and manufacturing industry, (14) a representative of the Alabama Bureau of Tourism and Travel, (15) a representative of the commercial fishing support industry, (16) a local government representative from each congressional district, (17) the chair of the Senate Agriculture, Conservation and Forestry Committee, (18) the chair of the House Agriculture and Forestry Committee, (19) members of the House of Representatives representing house districts 95 and 105, (20) senators representing senate districts 32 and 35.

The focus and responsibilities of these committees varied broadly depending upon state. In Maine, the joint resolution merely stated that the committee should "Review current policy regarding [the] state's fishing industry and make recommendations to preserve the fishing industry."[19] During the course of four meetings, the Maine committee met and heard testimony on the decline of the fishing industry. The key issues to be addressed by the committee, as established by the Joint Order, included:

- Waterfront access for commercial fisheries, including zoning restrictions, municipal comprehensive plans, current–use taxation, smart growth and set-asides.
- Economic development including incentives and disincentives, taxation policies, promotion and marketing issues, financing and workforce development.

Like Maine, Maryland focused on commercial fishing; its legislation provided a very simple direction for the committee to "study and make recommendations regarding protecting and preserving Maryland's commercial fishing industry's access to public trust waters."[20] The committee broke into three workgroups to explore ideas and develop recommendations regarding working waterfront access. These three groups reviewed other states' working waterfront programs, considered establishing working waterfront or maritime enterprise zones, and identified critical working waterfront sites in Maryland. [21]

By contrast, North Carolina's legislation contained explicit directions. It instructed the state's working waterfront committee to study "the degree of loss and potential loss of the diversity of uses along the coastal shoreline of North Carolina and how these losses impact access to the public trust waters of the State."[22] The specific duties spelled out in the law included:

- Gather information about local land-use management and zoning, current shoreline development trends, and local tax rates, including tax assessment trends for shoreline properties.
- Collect research and information from North Carolina and other states and jurisdictions regarding incentive-based techniques and management tools used to preserve waterfront diversity.
- Assess the applicability of such tools and techniques to the coastal shorelines of North Carolina.
- Prepare a draft report with a statement of the issues, a summary of the research, and recommendations to address issues of diversity of waterfront use and access in North Carolina.

[19] Maine H.P. 1384, *supra* note 3, at § 5.
[20] Maryland S.B. 414, *supra* note 4, at § 1(f).
[21] MARYLAND WORKING WATERFRONT COMMISSION, FINAL REPORT 10-11 (2008), *available at* http://www.dnr.maryland.gov/fisheries/commercial/wwc/MWWC120208finalversion2.pdf [hereinafter MARYLAND REPORT].
[22] North Carolina H.B. 1723, *supra* note 13.

- Hold three public meetings to present the draft report and recommendations to the public and user groups. One public meeting shall be held in each of … three coastal regions….[23]

The North Carolina committee members heard testimony by a range of stakeholders related to land use and taxation, natural resource issues, impact on the seafood industry, and public access. These discussions provided a basis for developing recommendations. Alabama followed North Carolina's lead, using exactly the same language to describe the tasks for its committee.

Port facilities were the focus of the Rhode Island legislation, in contrast to the other four legislative committees. In Joint Resolutions 2009 H. 5084 and 2009 S. 0017, the legislature declared that "the purpose of the commission shall be to study potential economic opportunities in the development of port facilities in the State of Rhode Island and to make recommendations to the General Assembly as to the feasibility and desirability of such port-facility development within this State."[24] Over the next three years the Rhode Island committee heard more than forty hours of testimony from more than twenty-five individuals representing government entities, port operators, logistics providers, and many other maritime sectors. Committee members held eleven meetings and toured three in-state port facilities.[25]

IV. Recommendations and Progress towards Implementation

The most important contrasts between these legislative committees lie in the actions recommended in their final reports, which are organized into various categories. Each state used different categories:

- The **Maine** report contains 23 recommendations in two categories: waterfront access issues and economic development issues.[26]

- The **North Carolina** report's 27 recommendations concern: (1) retaining and enhancing working waterfronts, (2) enhancing public access to coastal waters, (3) planning and zoning approaches to waterfront and access issues, (4) purchase or transfer of development rights, (5) fishing piers, a North Carolina heritage, (6) fees for public trust submerged lands and easements, (7) meeting environmental compliance costs, (8) the need for a comprehensive socioeconomic study, (9) cooperative state-local partnerships and approaches, (10) educational outreach, and (11) further study and oversight.[27]

- **Maryland's** 14 recommendations deal with: (1) tax abatement, (2) infrastructure preservation and development, (3) working waterfront conservations easements, (4) local planning and zoning assistance, (5) education, research and outreach, and (6) federal legislation.[28]

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[23] *Id.*
[24] Rhode Island H. 5084, *supra* note 17.
[25] RI Report, *supra* note 16, at 4.
[26] COMMITTEE TO STUDY THE LOSS OF COMMERCIAL FISHING WATERFRONT ACCESS AND OTHER ECONOMIC DEVELOPMENT ISSUES AFFECTING COMMERCIAL FISHING, FINAL REPORT 8-14 (2001) [hereinafter MAINE REPORT].
[27] N.C. REPORT, *supra* note 7, at 3-6.
[28] MARYLAND REPORT, *supra* note 21, at 27-32.

- The **Rhode Island** report included 15 recommendations organized around six topics: (1) Port Economic Policy Ombudsman, (2) lack of coordination between stakeholders regarding marketing and infrastructure development, (3) development of marine highway hubs, (4) exploration of public/private partnerships, (5) development of non-federally funded dredging project, and (6) revision of Rhode Island Master Guide Plan.[29]

- The **Alabama** report sorted its 13 recommendations into the following four categories while also identifying them as Tier I, II, or III priorities: (1) planning and zoning issues, (2) financial incentive issues, (3) socioeconomic issues, and (4) infrastructure issues.[30]

For the purposes of this Article and for ease of comparison, the recommendations have been grouped into six general categories:

- Land Use Planning
- Taxation
- Submerged Lands
- Funding (direct and indirect)
- Transfer of development rights, purchase of development rights, and easements
- Education

The extent and details of recommendations varied widely by state, and not all the state committees addressed these specific categories. Some focused on initiatives aimed at improving land use planning, while others focused primarily on methods to finance construction of new infrastructure in support of working waterfronts. However, it is interesting to note the similarities in their approaches.

As stated at the beginning, this Article only focuses on recommendations directly resulting from these five legislative committees.

A. Land Use Planning and Zoning

All the committees recognized the importance of the state land use planning process in addressing working waterfront issues. The strategies recommended were slightly different in each state, depending on the extent or effectiveness of a state's planning scheme to address the issues of planning for and assisting with the implementation of water access. Land use planning can encompass detailed mapping, classification of land, strategic plans, and specific management plans designed to guide development.[31] The implementation of each of these strategies may take on various forms including physical plans, policy documents, regulations, and laws. The wide range of tools available within the land use planning category is evidenced by the various recommendations contained in the five state legislative reports.

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[29] RI REPORT, *supra* note 16, at 8-21.

[30] ALABAMA REPORT, *supra* note 13, at 7-10.

[31] *See generally*, Edward J. Kaiser & David R. Godschalk, *Twentieth Century Land Use Planning: A Stalwart Family Tree*, 61 J. AM. PLANNING ASS'N 365 (1995).

1. Maine

Maine's legislative committee recommended a range of land use planning efforts. These included some very specific and focused efforts to use planning and regulatory tools to address loss of land for working waterfronts, including:

- Evaluate the effectiveness of the Coastal Zone Management program;
- Collect baseline data regarding loss of waterfront access for commercial fishing, update the port facilities database each year, and create an interagency workgroup to collect and share data on water access;
- Hold community dialogues to determine local interest in the issues and in pursuing working waterfront strategies;
- Provide incentives for community planning;
- Model ordinance development; and
- Review how a three-port strategy addresses commercial fishing access.

Maine has made solid progress toward implementing these recommendations. The State of Maine has put significant effort into mapping and inventory work in order to provide the baseline data for further analysis.[32] The state planning office issued a comprehensive analysis of current conditions and threats to commercial fishing access in 25 communities that provided a basis for further policy and planning.[33] Detailed descriptions of potential land use planning techniques are listed on the website *Accessing the Maine Coast*.[34]

No model ordinances for working waterfronts were developed, although the Coastal Management Program has issued guidance and recommendations as part of their Working Waterfront Initiative.[35] In 2010, Portland, Maine adopted a sweeping new waterfront-zoning

[32] *See, i.e.,* Island Institute, MAPPING MAINE'S WORKING WATERFRONT: A STATEWIDE INVENTORY (2007), *available at* http://www.islandinstitute.org/publications/Mapping-Maines-Working-Waterfront/12270/; *Working Waterfront Mapping, Geographic Information Systems (GIS) Services*, ISLAND INSTITUTE, http://www.islandinstitute.org/working_waterfront_mapping.php (last visited Jan. 31, 2014).

[33] ELIZABETH SHEEHAN & HUGH COWPERTHWAITE, COASTAL ENTERPRISES, INC., PRESERVING COMMERCIAL FISHING ACCESS: A STUDY OF WORKING WATERFRONTS IN 25 MAINE COMMUNITIES (2002), *available at* http://www.maine.gov/dacf/mcp/downloads/workingwaterfront/preservingcommercialfishing.pdf.

[34] *Plan and Regulate for Access*, ACCESSING THE MAINE COAST, http://www.accessingthemainecoast.com/coastal_access_toolkit/plan_and_regulate_for_access.shtml (last visited Jan. 31, 2014).

[35] *See Case Study: Zoning for a Vital Waterfront*, MAINE COASTAL PROGRAM, http://www.maine.gov/dacf/mcp/wwi/casestudies/casestudy_zoning.htm (last visited Jan. 31, 2014).

ordinance to address pressures faced by the working waterfront from non-water dependent uses. The planning department engaged in extensive analysis to justify the need for this protective zoning.[36]

2. North Carolina

The North Carolina committee found that several land use-related efforts were already underway in numerous jurisdictions to address working waterfront issues.[37] To strengthen those efforts, it recommended focusing primarily on planning guidelines and policies. The committee recommended that the North Carolina Coastal Resources Commission (CRC) amend its land use planning guidelines to include a requirement that local governments inventory, assess, and develop policies for working waterfronts. To assist local government in these efforts the committee recommended awarding grants to develop public access inventories and plans, and to enable local governments to inventory their working waterfronts and plan for their retention and enhancement. Finally, the North Carolina committee recommended exploring special zoning techniques, including the use of conditional zoning as a regulatory method to provide some measure of control over the loss of land used for working waterfronts.[38]

North Carolina's implementation progress has been mixed. The North Carolina Division of Coastal Management has engaged in mapping of working waterfront facilities. Some of this mapping of public access sites began in 2005, which was prior to the work of the legislative committee. The mapping following the Committee's report included new efforts to map locations of docks, piers, and bulkheads. Some of this work has been completed, although more needs to be done to complete the entire coastline of the state.[39] As to the North Carolina recommendations for Land Use Planning Guidelines to incorporate policies concerning working waterfronts, although the state guidelines include requirements for public access, no additional requirements were adopted for working waterfronts as part of the state Coastal Area Management Plan.[40]

3. Alabama

Alabama's committee recommended the state complete a comprehensive working waterfront plan. To facilitate implementation of the plan the committee recommended creating a Waterfront Alabama Partnership Program that would assist regional planning commissions, state agencies,

[36] *See* City of Portland, Code of Ordinance, Article III, Chapter 14, §§14-305-14-315. Additional background information is available at *WCZ Policy and Zoning Process*, PORTLAND MAINE PLANNING DIVISION, http://www.portlandmaine.gov/planning/wcz.asp (last visited Jan. 31, 2014). The city has now conducted two inventories demonstrating the use trends. The most recent inventory is dated June 2013. *See* JEFF LEVIN, ALEX JAEGERMAN, & BILL NEEDELMAN, DEPARTMENT OF URBAN PLANNING AND DEVELOPMENT, 2012 WATERFRONT ZONING USE INVENTORY: JUNE 2013, REPORT TO CITY OF PORTLAND MAINE CITY COUNCIL (2013), *available at* http://www.portlandmaine.gov/planning/wczinventory.pdf.

[37] N.C. REPORT, *supra* note 7, at 21.

[38] *Id.* at 24.

[39] Personal communication with Lisa Schiavinato, Director of Law and Policy, N.C. Coastal Res. L. & Pol'y Ctr (Sept. 24, 2013).

[40] *See* 15A N.C. ADMIN. CODE 7B.0702; Personal conversation with John Thayer, Manager of Planning, North Carolina Division of Coastal Management (Nov. 20, 2013).

municipal planning organizations, counties and municipalities in incorporating working waterfront and water access issues into their comprehensive plans.[41]

Following the issuance of the committee's report, Alabama has engaged in extensive mapping efforts to identify working waterfront businesses and is planning to use the information to develop a socio-economic survey of the state's working waterfronts.[42] The City of Gulf Shores, Alabama, with legal research and technical assistance from the Mississippi-Alabama Sea Grant Consortium (MASGC) as part of its working waterfront outreach programming, developed a waterfront plan and adopted a Waterway Village Overlay District to protect and preserve working waterfronts. [43] In addition, the Auburn University, MASGC, and the Northern Gulf Institute have pursued funding for an economic inventory and GIS mapping of working waterfronts in coastal Alabama and Mississippi.[44]

4. Maryland

The Maryland committee examined ways the state Coastal Program might work with local jurisdictions to address preservation of working waterfronts. It recommended evaluating the potential use of special area management plans (SAMPs), which are resource-management plans authorized under the U.S. Coastal Zone Management Act.[45] It also recommended enactment of state legislation to require inclusion of working waterfront provisions in local comprehensive plans.[46]

In 2012, the state of Maryland passed legislation requiring planning commissions in counties located along tidal waters to designate "areas on or near the tidal waters for: (1) loading, unloading, and processing finfish and shellfish; and (2) docking and mooring commercial fishing boats and vessels."[47] These designated areas are to be geographically located to "(1) facilitate the commercial harvesting of finfish and shellfish; and (2) ensure reasonable access to the waterways of the State by commercial watermen."[48] The Committee's other land use recommendations were not adopted.

5. Rhode Island

The Rhode Island committee focused its recommendations on a state-level planning initiative. The report recommended a revision of the statewide master guide plan to specifically identify and maintain vital water-dependent commercial operations and ensure the viability of Rhode Island's marine economy.[49]

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[41] ALABAMA REPORT, *supra* note 13, at 8.
[42] *See* Jody Thompson, *Alabama's Working Waterfronts: Preserving Vital Economies*, presentation at 2013 National Working Waterfronts & Waterways Symposium, Tacoma, WA, Mar. 27, 2013, *available at* http://wsg.washington.edu/mas/pdfs/nwwws/F2/F2_Thompson.pdf.
[43] City of Gulf Shores, Zoning Ordinance for the City of Gulf Shores, *Waterway Village Overlay District*, §10-9 (2013), *available at* www.gulfshoresal.gov/documentcenter/view/56.
[44] ALABAMA REPORT, *supra* note 13, at 9.
[45] MARYLAND REPORT, *supra* at note 21, at 21.
[46] *Id.* at 30.
[47] MD. CODE, LAND USE § 3-113(a).
[48] *Id.* § 3-113(b).
[49] RI REPORT, *supra* note 16, at 19.

The state of Rhode Island is currently engaged in state-wide planning efforts to revise its Master Guide Plan and planners hope to include more protective language for working waterfronts.[50] Another related planning effort involves working towards the inclusion of Rhode Island in the Marine Highway System, which "consists of over 29,000 nautical miles of navigable waterways including rivers, bays, channels, the Great Lakes, the Saint Lawrence Seaway System, coastal, and open-ocean routes."[51] The U.S. Department of Transportation's Marine Highway Program works to include these waterways into the greater U.S. transportation system and recent concept plans for a major East Coast transportation corridor include reference to the Port of Providence.[52]

B. Property Taxes

As property values of coastal properties continue to rise, one of the primary impacts felt by the commercial working waterfront industry has been an increase in property taxes.[53] Three states, Maryland, North Carolina, and Maine, recommended using property tax-related mechanisms to address this issue for working waterfront properties.

1. Maine

The State of Maine has recognized the importance of reducing the tax impacts on working waterfronts. In 2000, the state legislature passed a constitutional resolution to amend the state constitution to allow the assessment of waterfront land used for commercial fishing purposes based upon the current use of the property instead of using the "highest and best use" standard. Unfortunately, Maine voters defeated the proposal when placed on the ballot in November 2000. In response to this defeat, the legislative committee avoided any specific recommendation for a tax-related initiative. It was noted that there was a lack of empirical data demonstrating the loss of access.[54] Thus the legislative committee focused recommendations on developing additional data.

Although Maine voters rejected the constitutional amendment in 2000, proponents tried again five years later. This time voters approve a current use tax program for working waterfront properties. In 2006, the Maine legislature passed the enabling act authorizing current use

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[50] Personal communications with Ames Colt, Rhode Island Bays, Rivers, and Watersheds Coordination Team Chair, Office of Governor, Rhode Island Department of Environmental Management (Nov. 19, 2013).

[51] *America's Marine Highway Program*, U.S. DEP'T OF TRANSPORTATION MARITIME ADMIN., http://www.marad.dot.gov/ships_shipping_landing_page/mhi_home/mhi_home.htm (last visited Jan. 31, 2014).

[52] Personal communications with Ames Colt, *supra* note 50.

[53] *See, i.e.,* MARYLAND REPORT, *supra* note 21, at 42. For an in-depth analysis of different types of tax-related solutions available to address impacts to working waterfronts, *see* KRISTEN GRANT, AMANDA LABELLE, & CATHERINE SCHMIDT, WORKING WATERFRONT PRESERVATION: OPPORTUNITIES POSED BY TAX POLICY – EXECUTIVE SUMMARY (2010), *available at* http://www.accessingthemainecoast.com/coastal_access_toolkit/WWFTax1PGExecSum.pdf.

[54] MAINE REPORT, *supra* note 26, at 2.

assessments.[55] As of 2012, over 81 working waterfront properties have been enrolled in the program.[56]

2. Maryland

In Maryland high taxes on waterfront properties made it difficult for waterfront businesses to compete for space and retain their sites. To address these concerns, the Maryland committee recommended granting commercial waterfront properties an exemption from the inheritance tax, or evaluating an alternative payment schedule to make tax payments more manageable.[57]

In 2008, the State of Maryland enacted a provision for a special use tax assessment for commercial waterfronts. This measure provides a tax credit for working waterfronts in situations where the new assessment exceeds the old one by 20%.[58]

3. North Carolina

The North Carolina committee also recommended evaluating current use taxation for working waterfront properties, referred to as present-use value taxation in North Carolina. A present-use value tax program was initiated in North Carolina in 1974 to address the burdens created by taxing certain types of property, such as forest and agricultural land, at market value. The committee recommended extending eligibility for present-use value taxation to working waterfront property, and to private fishing piers providing public access.[59]

In 2009, in response to the Committee's report, the North Carolina state legislature approved creation of a property tax exemption, or deferred tax program, for working waterfronts. This present-use tax law grants relief from increases in property taxes to working waterfront properties and was an extension of the state's existing present-use tax law.[60]

C. Submerged Lands

Both Maine and North Carolina recommended actions related to submerged lands, a term defined on a state-by-state basis. In Maine, "submerged lands" are those seaward of the low-water mark out to the three-nautical mile territorial state marine boundary.[61] In North Carolina "submerged

[55] *See* 36 ME REV. STAT. §§ 1131-1140-B.
[56] *See* Hugh Cowperthwaite, *Maine's Working Waterfront Coalition: Coalition Building – Strategies for Engaging the Public in Working Waterfronts*, presentation at 2013 National Working Waterfronts & Waterways Symposium, Tacoma, WA, March 27, 2013, *available at* http://wsg.washington.edu/mas/pdfs/nwwws/F2/F2_Cowperthwaite.pdf.
[57] MARYLAND REPORT, *supra* note 21, at 27.
[58] MD. CODE ANN. TAX-PROP. § 9-249. For more information on this legislation, *see* Terra Bowling, National Sea Grant Law Center, Working Waterfront Legislation (2012), *available at* http://nsglc.olemiss.edu/Advisory/WWF-LEGISLATION.10-12%5B28%5D.pdf.
[59] N.C. REPORT, *supra* note 7, at 27.
[60] N.C. GEN. STAT. §105-277.14.
[61] *See* 12 ME. REV. STAT. §1801.

lands" are those from the normal high-water mark to the three-nautical mile territorial state marine boundary.[62]

1. Maine

In Maine, small fishing piers are subject to high fees for easements or leases from the State on submerged lands. To address this issue the Maine legislative committee recommended that fees for easements on publicly owned submerged lands be adjusted to accommodate working waterfront uses, with a cap of 1% of upland value compared to the 2% to 4% charged for other uses.[63]

The State of Maine had an existing exception for commercial fishing facilities occupying less than 2,000 square feet of submerged land.[64] For commercial fishing facilities over 2,000 square feet, the Department of Commerce proposed in 2008 that the state change its fee rate to 2.5% per square foot plus 0.01% of the upland square foot value.[65] The stated purpose for changing the fee structure in 2009 was to "significantly improve the fairness and equity for existing and future leaseholders, lower overall lease rates, and will, over time, provide sufficient revenues for the Bureau to meet its obligation to fairly compensate the public for the private use of submerged land held in the public trust."[66] The current fee structure for the leasing of submerged lands for commercial fishing activities occupying more than 2,000 square feet, as set forth by the Legislature, requires the Department to "charge the lessee a rent that practically approximates the fair market rental value of the submerged land," but authorizes reduction factors and base rates for some use categories.[67] For instance, commercial fishing uses of renewable aquatic resources qualify for "a reduction factor of 0.1% plus a base rate of $0.025 per square foot."[68]

2. North Carolina

The North Carolina legislative committee recommended evaluating the use of income from submerged land easements to fund public access projects. It also recommended evaluating whether to redesign the fee structure for submerged lands so as to create an annual fee or surcharge to be applied towards working waterfronts and public access development. Finally, it also recommended that the state examine the legality of long-term leases and private sales of docks on submerged lands. Evidence showed that this "privatization" of docking space had increased the value of such facilities and thus created incentives for more conversion of traditional working waterfront facilities to private marinas.[69]

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[62] N.C. GEN. STAT. §146-64(7).
[63] MAINE REPORT, *supra* note 26, at 6, 11.
[64] *See* 04-509 ME. CODE R. § 1.5.
[65] MAINE DEPARTMENT OF CONSERVATION, REPORT TO AGRICULTURE, CONSERVATION AND FORESTRY COMMITTEE SUBMERGED LANDS PROGRAM PROPOSED LEASE RENT SCHEDULE 4 (2008), *available at* http://www.maine.gov/dacf/parks/get_involved/planning_and_acquisition/docs/submergedlandsfeereport.pdf.
[66] *Id.* at 2.
[67] 12 ME. REV. STAT. § 1862(2)(A)(1).
[68] *Id.* § 1862(2)(A)(1)(b).
[69] N.C. REPORT, *supra* note 7, at 28.

No changes have been made to the North Carolina law to date.[70] While articles and attention were given to the issue of "dockominiums", no changes have been made to North Carolina law.[71]

D. Funding of Infrastructure

All five states' committees addressed the need for greater public funding of infrastructure in one form or another to support the working waterfront industry. In addition to identifying sources of funding, some recommended ways to create linkages between project planning, construction programs, and access projects. Funding recommendations are divided into direct and indirect funding sources. Direct funding looked to the states to find sources of funds for grants. Four of the states recommended funding of this sort. And three of the states identified a need to find ways to leverage funding through indirect means.

1. North Carolina

North Carolina's committee recommended the greatest number of strategies for directly funding working waterfront facilities and access projects, including the following:

- Create a working waterfront trust fund or some other set-aside of state funds to help retain and enhance working waterfront uses;
- Increase funding for the state Boating Infrastructure Program;
- Fund public beach and coastal waterfront access programs at higher levels;
- Use funding from coastal recreational fishing licenses to fund public coastal fishing access enhancements;
- Explore funding sources to help private fishing piers providing public access to repair storm damage, such as setting aside funds to finance low-interest loans; and
- Use aquariums to fund pilot projects to design and operate three public fishing piers for angling access and public education.[72]

In 2007, the North Carolina Legislature authorized $20 million to purchase working waterfront property for public access, and repair and expand access. This program, called the North Carolina Waterfront Access and Marine Industry Fund (WAMI), managed through the Division of Marine Fisheries, identified projects through a request for proposal (RFP) process. The program was patterned after the success of the Maine Working Waterfront Access Pilot Program (WWAPP) discussed below. The overall goal for the use of the WAMI Fund was to retain and enhance working waterfronts and public access to coastal waters through cooperative state and local partnerships. Four priority-funding areas were established: (1) public docking facilities; (2) public boat ramps; (3) fishing access; and (4) other marine industry facilities. The fund was a one-year allocation administered through a competitive grants process. Thirteen different projects received funding

[70] Personal communication with Lisa Schiavinato, *supra* note 39.
[71] *Id.*
[72] *See generally*, N.C. REPORT, *supra* note 7, at 3-6.

throughout the state.[73] Funding also went toward implementing the recommendation to work with aquariums to design and operate three public fishing piers for angling access and public education. The first of these piers is now complete at Nag's Head, North Carolina.[74]

In addition to the funding for the WAMI program, the state authorized the Wildlife Recreation Commission to increase boater license fees so as to increase funds dedicated towards public access projects.[75] Over the years, many access projects have been funded through these two different programs.[76]

The North Carolina committee also looked at indirect sources of funding for working waterfronts. The North Carolina report recommended that the state's Water Resources Development Project Grant Program and Clean Water Management Trust Fund give higher priority to projects that provide public access. It also suggested working with the state Department of Transportation, power companies, local governments, nonprofits, and other state agencies to proactively and cooperatively promote public access. Since the release of the report the Department of Transportation entered into a written agreement with the North Carolina boating program to improve access areas at bridge crossings.[77]

2. Maine

The Maine committee recommended two specific funding options: (1) provide bond funding for the Small Harbor Improvement Program; and (2) encourage use of the Shore and Harbor Management Fund to open water access for commercial fishing.[78] In addition to providing funding for infrastructure, the Maine committee recommended creating a seafood innovation, marketing, and research fund to support value-added processing and enhance economic development.

In 2005, the Maine legislature created the Maine Working Waterfront Access Pilot Program (WWAPP).[79] Maine voters approved a $33 million bond issue, of which $3 million was dedicated to working waterfront projects. The Department of Marine Resources and Land for Maine's Future board (within the Maine Department of Agriculture, Conservation and Forestry) administers the program providing grants to help purchase access easements, rights of way, or development rights on properties entirely dedicated to commercial fisheries uses.[80] In 2007 Maine voters approved an additional $2 million bond for the program and in 2010 the Maine legislature approved an additional $1.75 million. In 2012, a portion of a $5 million bond was allocated for the WWAPP Program. This

[73] *See* WATERFRONT ACCESS AND MARINE INDUSTRY FUND: 2009 ANNUAL REPORT (2009) (on file with author).
[74] *See* JENETTE'S PIER IN NAGS HEAD, http://www.jennettespier.net/.
[75] Personal communication with Chris Dillon, North Carolina Wildlife Resource Commission (Nov. 19, 2013).
[76] For more information on the results of the North Carolina efforts, see *North Carolina Water Access Study Committee Yields Major Results in Water Access Protection,* NATIONAL WORKING WATERFRONT NETWORK, http://www.wateraccessus.com/case_study.cfm?ID=46 (last visited Jan. 31, 2014).
[77] Press Release, North Carolina Wildlife Resources Commission, *Wildlife Commission Receives National Boating Access Award,* Nov. 7, 2012, http://www.ncwildlife.org/News/NewsArticle/tabid/416/IndexId/8332/Default.aspx.
[78] MAINE REPORT, *supra* note 26, at 10-12.
[79] 12 ME. REV. STAT. § 61-73-A.
[80] Coastal Enterprises, Inc., Maine's Department of Resources Working Waterfront Access Pilot Program, *available at* http://www.ceimaine.org/Resources/Documents/Overview%20process%20and%20timeline%20WWAPP%202011.pdf.

program has resulted in 19 waterfront properties totaling 35 acres placed in permanent status as working waterfronts as of 2012.[81]

3. Alabama

Alabama's committee recommended establishing a fund to acquire property for working waterfront uses and waterfront access. It also recommended identifying high priority working waterfront areas and encouraging the development of suitable infrastructure using Coastal Impact Assistance Program or other federal funding mechanisms.[82] The state of Alabama has not yet funded a program to acquire or protect working waterfront uses and public access.[83]

The Alabama committee also considered indirect sources of funding and recommended that state agencies expand public access in project planning and construction, but identified no funding sources. Although the committee had no authority over federal and local agencies, it "encouraged" them to incorporate public boat access and bank fishing into project design. It also recommended creating incentives for working waterfront businesses but provided no details. This recommendation has not been pursued by the state.[84]

4. Rhode Island

Rhode Island's committee took a different approach. It recommended encouraging the creation of public/private partnerships that would explore opportunities to develop port facilities. It also recommended using state revenue bonds to dredge critical harbor facilities, in order to be competitive with other East Coast ports. One major effort undertaken by the state of Rhode Island as a direct result of the legislative committee report was maintenance dredging of the Port of Davisville's berths and turn basin. This dredging effort was a partnership between the Rhode Island Economic Development Corporation and the Quonset Development Corporation including $7.5 million bond funding from the state.[85]

After the release of the legislative report, the federal Economic Development Commission took a greater interest in port and maritime issues. The Rhode Island Bays, Rivers and Watershed Coordination Team began funding the port and maritime component of the U.S. Department of Transportation's Moving Ahead for Progress in the 21st Century Program (MAP 21). These same interests have entered into conversations with U.S Department of Transportation Maritime Administration and White House staff about what more can be done to support port efforts in Rhode Island.[86]

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[81] MAINE DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY, LAND FOR MAINE'S FUTURE PROGRAM BIENNIAL REPORT JANUARY 2011 – DECEMBER 2012 (2013), *available at* www.maine.gov/dacf/lmf/docs/ACF_BiennialReport2013.pdf.

[82] ALABAMA REPORT, supra note 13, at note 9.

[83] Thompson, *supra* note 42.

[84] Personal communication with Jody Thompson, Environmental Extension Associate, Auburn University and Mississippi-Alabama Sea Grant Consortium (Nov. 19, 2013).

[85] Press Release, State of Rhode Island, *Davisville Port Dredging Bond Bills Head to Governor,* June 6, 2012, http://www.makingbusinesseasyri.com/news/files/aabdac842dcc34efe182569b1ce1667b-55.html.

[86] Personal communication with Jennifer McCann, Director of U.S. Coastal Programs and Extension Programs, Rhode Island Sea Grant College Program (Oct. 1, 2013).

5. Maryland

The Maryland committee focused on how existing programs could be leveraged to encourage public access projects and infrastructure improvements and recommended giving greater weight in the project-scoring criteria for its Waterway Improvement Program to projects that provided access to commercial fishermen.This recommendation for a change in project scoring criteria has not been implemented at this time. [87]

E. Acquisition and Transfer of Property Rights

Three of the state committees evaluated market-based approaches to preserving working waterfront or public access. These approaches involve either the voluntary transfer of value from one property to another (transfer of development rights or TDR) or the public purchase of the development rights for one property for use at another (purchase of development rights or PDR).[88] The intent behind both programs, which are used elsewhere to preserve farmland and historic landmarks, is to transfer the potential development value of a working waterfront site to a non-waterfront parcel, enhancing the second property's development opportunities. In return for accepting restrictions on use, the waterfront owner receives the fair value of the lost development potential. The TDR program is a private market transaction where development rights are "purchased" by a second landowner. The PDR program involves a governmental purchase of development rights that places permanent restrictions on future uses of the property. In both TDR and PDR, property values are manipulated to ensure the economic viability of working waterfront uses. Another market-based approach discussed is the acquisition of a conservation easement permanently restricting a property to use as a working waterfront.

1. Maine

The Maine committee recognized that land acquisition could be an important tool for supporting the fishing industry. It recommended investigating the use of a nonprofit organization or program to purchase vulnerable waterfront lands and development rights, hold title to property and development rights, and lease the lands to towns or businesses.[89]

The specific mechanism of using TDRs for working waterfronts was never adopted in Maine. The state legislature adopted TDR language in 2001.[90] However, there has never been a specific program created to address working waterfronts with an actual transfer of development rights from one parcel to another. The Working Waterfront Access Pilot Program, working with the Maine Lands for Maine's

[87] Personal communication with Sarah Widman, Maryland Department of Natural Resource (Nov. 19, 2013).
[88] For a full discussion on TDR, *see* KATHARINE OTTO, SMART GROWTH THROUGH THE TRANSFER OF DEVELOPMENT RIGHTS: A SELECTION OF TDR CASE STUDIES WITH RELEVANCE FOR THE PRESERVATION OF FARMLAND, OPEN SPACE AND OTHER NATURAL RESOURCES IN NEW JERSEY (2010), *available at* http://www.njfuture.org/wp-content/uploads/2011/07/Case-Studies-in-Transfer-of-Development-Rights-8-10-Intern-report.pdf. The North Carolina report included a good analysis of how to apply TDR for working waterfronts. *See* N.C. REPORT, *supra* note 7, at 24-26.
[89] MAINE REPORT, *supra* note 26, at ii.
[90] *See* 30-A ME. REV. STAT. §4328.

Future (LMF), does include restrictive covenants on properties to limit development rights on properties. This program operates like a PDR through its use of government funding.[91] Funds from the Working Waterfront Access Protection Fund may be "applied and expended to acquire property or interests in property that are designed to protect access to working waterfront property,"[92] including fee simple acquisition, permanent conservation easements, access easements, working waterfront covenants, and other permanent interests in land.

2. North Carolina

The North Carolina committee took a more direct approach. It recommended state legislation authorizing both PDR and TDR programs at the local government level to facilitate the retention and enhancement of working waterfronts and public access. A 1987 North Carolina statute allows the severance of development rights,[93] a form of transferring development rights, but a program specifically oriented to working waterfronts has not been developed to date.

3. Alabama

The Alabama committee recommended encouraging the use of business improvement districts, industrial parks, and the transfer of development rights to promote waterfront access. Alabama does not have a state statute authorizing transfer of development rights. However, existing land trusts provide opportunities for transfers of property into conservation easements. These programs can protect public access to waterfronts as well as preserving working waterfront sites.[94] For example, in 1997 the Weeks Bay Foundation, with funding from a local land trust and state agencies, purchased a private boat launch and marina adjacent to the Weeks Bay National Estuarine Research Reserve (NERR) in Alabama in 1997.[95] The Weeks Bay NERR later purchased the properties from the Foundation, which had converted the boat ramp to a public facility. The purchase and transfer of these properties provided the public with an additional water access site along the Alabama coast.

F. Education and Outreach

Four of the five state committees identified the need for education and outreach to the general public.

[91] DIXON, *supra* note 6.
[92] 5 ME. REV. STAT. § 6203-B(3).
[93] N.C. GEN. STAT. § 136-66 11.
[94] *Acquiring & Transferring Access*, ACCESSING THE ALABAMA COAST, http://accessingthealcoast.masgc.org/coastal_access_toolkit/acquiring_access_case_studies.html (last visited Jan. 31, 2014).
[95] *Id.*

1. Maine

Maine's committee recommended developing mechanisms for improving relations with the public, media, and financial community.[96] Extensive outreach and education has occurred in Maine as a direct result of the recommendations of the legislative committee. The Maine Working Waterfront Initiative is implemented by the Maine Coastal Program which is located within the Department of Agriculture, Conservation and Forestry, Bureau of Resource Information and Land Use Planning. The state also facilitated the creation and coordination of the Working Waterfront Coalition. Since 2003 the Coalition has facilitated numerous workshops along the coast of Maine on a wide range of working waterfront issues. The Working Waterfront Initiative website provides a wide range of resources on working waterfront issues.[97]

Another important outcome of the Maine legislative committee was the effort to consolidate information in one location. In 2007, Maine Sea Grant and its partners Maine Coastal Program, The Center for Law and Innovation of University of Maine School of Law, and Island Institute received funding from the National Sea Grant Law Center to develop an online coastal access resource for private waterfront landowners, government and public entities, and waterfront users. The resulting website, "Accessing the Maine Coast," has become a model for the dissemination of information about waterfront access issues and has been adapted for use in a number of other states, including Alabama.[98]

2. Maryland

The Maryland committee recognized a need to bring commercial fishermen and local stakeholders together and to focus education, research, and outreach on working waterfront needs through the Chesapeake Bay NERR's Coastal Training Program and other training organizations.[99] No education or outreach recommendations were implemented in Maryland because of lack of funding for programs.[100] However, there are new efforts underway through the Maryland Coastal Program to begin to address working waterfront issues.[101]

3. North Carolina

North Carolina's committee recommended endorsing and financially supporting outreach programs to improve retention and enhancement of working waterfronts and public access.[102] Significant amounts of education and outreach accompanied the efforts in North Carolina as part of the Waterfront Access and Marine Industry Fund (WAMI) program. North Carolina Sea Grant played a

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[96] *Id.*

[97] *Working Waterfront Initiative*, MAINE COASTAL PROGRAM, http://www.maine.gov/dacf/mcp/wwi/community-actions.htm (last visited Jan. 31, 2014).

[98] *See Replicating a National Model: Maine's Accessing the Coast Website*, NATIONAL SEA GRANT LAW CENTER, http://nsglc.olemiss.edu/Coast/Accessing_Coast.html (last visited Jan. 31, 2014).

[99] MARYLAND REPORT, *supra* note 21, at 30.

[100] Personal communication with Sarah Widman, *supra* note 87.

[101] *Id. See also Working Waterfronts Initiative*, MARYLAND DEPT. OF NATURAL RESOURCES, http://dnr.maryland.gov/ccs/workingwaterfronts.asp (last visited Jan. 31, 2014).

[102] N.C. REPORT, *supra* note 7, at 35.

pivotal role in these efforts, particularly through the NC Coastal Resources Law, Policy and Planning Center.[103]

4. Alabama

The Alabama committee recommended that the Alabama Cooperative Extension and Mississippi-Alabama Sea Grant Consortium (MASGC) provide technical assistance and support to waterfront stakeholders in sustainable business practices, and provide public education on the economic, environmental, and societal importance of working waterfronts to the state.[104] In response, the MASGC and the Auburn University Marine Extension and Research Center (AUMERC) have sponsored education and outreach in Alabama as a result of the legislative committee report. In November 2010, a Working Waterfronts Planners Workshop was held for regional, state, county and municipal planners in coastal Alabama and Mississippi. AUMERC and MASGC continue to coordinate and facilitate actions in furtherance of the recommendations of the Waterfront Access Study Committee.[105]

G. Creation of Additional Committees

In addition to the actions outlined above, three states' committees recommended establishing new committees to address working waterfront concerns.

- **North Carolina**'s recommended a formal joint legislative commission to continue the work of the Waterfront Access Study Committee and guide any programs or actions resulting from the study's recommendations or related deliberations.

- **Rhode Island**'s recommended a Port Marketing Collaborative to address the need for further integration between government and nongovernment stakeholders in marketing, port-related infrastructure development, and maritime trade.

- **Maine**'s recommended a legislative task force to study issues related to preserving the commercial fishing industry in Maine.

In North Carolina, the legislation creating the committee included a termination date for the committee.[106] After that date no further committees were created to carry on after the Waterfront Access Study Committee completed its report.[107]

In February 2013, the Rhode Island legislature considered a bill in both the house and senate to create a Port Marketing Collaborative.[108] The bill never made it out of committee during 2013 session.

[103] Personal communication with Lisa Schiavinato, *supra* note 39. *See also Projects*, NORTH CAROLINA COASTAL RESOURCES LAW, PLANNING, AND POLICY CENTER, http://www.nccoastallaw.org/projects.htm (last visited Jan. 31, 2014).
[104] ALABAMA REPORT, *supra* note 13, at 10.
[105] Thompson, *supra* note 42.
[106] North Carolina H.B. 1723, *supra* note 13.
[107] Personal conversation with John Thayer, *supra* note 30.

The intent of the bill was not only to create a Port Marketing Collaborative; it would have initiated a statewide port strategy.

The Maine legislature never followed up on the recommendation to create an ongoing legislative committee. However, in 2003 a coalition of representatives from twelve different organizations representing industry associations, nonprofits, state agencies and individuals led by the Island Institute formed the Maine Working Waterfront Coalition to address concerns over the loss of the state's working waterfronts. This coalition became the driving force behind creation of the Working Waterfront Access Pilot Program and passage of the current use tax law.[109]

H. Comparison of Recommendations

There are consistencies in the approaches recommended by the different states. All recognized the importance of land use strategies to address the challenges facing working waterfronts. All five recommended either direct or indirect funding for infrastructure improvements on working waterfronts. Four states recognized the importance of education about working waterfront issues. An overview of the mechanisms recommended, by state, is shown in Table 4 below. Table 5 summarizes the actions that have been implemented to date in each state by category. The Appendix provides a more detailed summary chart of a majority of the recommendations from the five legislative committee reports and subsequent implementation actions.

Table 4. State committee recommendations by mechanism.

State	Land Use Planning	Taxation	Submerged Lands	Funding: Direct	Funding: Incentives	Transfer of Development Rights, etc.	Education
Maine	X	X	X	X		X	X
North Carolina	X	X	X	X	X	X	X
Maryland	X	X			X		X
Alabama	X				X	X	X
Rhode Island	X			X			

[108] Rhode Island General Assembly, S. 0172, The Rhode Island Port Marketing Collaborative of 2013, introduced Feb. 6, 2013.

[109] *Working Waterfront Initiative*, *supra* note 97.

Table 5. Overview of state implementation measures to date.

State	Land Use Planning	Taxation	Submerged Lands	Funding: Direct	Funding: Incentives	Transfer of Development Rights, etc.	Education
Maine	X	X	X	X		X	X
North Carolina	X	X		X	X		X
Maryland	X	X					
Alabama	X						X
Rhode Island				X			

Addressing the issues faced by working waterfronts requires a broad range of economic development measures. However, only two states' committees recommended preparation of an overall economic development plan. North Carolina's committee recommended a full socioeconomic study of working waterfronts and access to coastal public trust waters. Alabama's committee recommended first conducting an inventory of working waterfronts using current economic census data. The committee further recommended that following the inventory the state conduct an economic impact study of working waterfronts. In its final report, the Alabama committee found that "the State also recognizes that access to coastal and inland waters (waterfront access) is *essential to economic development* and the shared use and enjoyment of public trust waters, submerged lands, and inland streams, rivers, and lakes."[110] The committee ranked the inventory as a top priority. Rhode Island's committee was the only one to recommend establishing an economic policy ombudsperson. The ombudsperson would report directly to the governor on the coordination of port-related economic development and job creation and retention programs.

Alabama has initiated efforts to conduct an inventory of working waterfronts to use in a future economic impact study. However, at this point North Carolina has not initiated the socioeconomic study recommended by its committee nor has Rhode Island established an economic policy ombudsperson.

V. Conclusion

Legislative committees can be an important means to develop policies addressing issues of statewide concern. The creation of the committee by a joint resolution of both the house and senate indicates a broad level of support. Recommendations resulting from such committees represent a balancing of the interests of the participants in the committees.

It is no surprise the major factor influencing success of a legislative committee lies with funding sources. And timing is key. Maine began implementation of its recommendations when property values continued to soar and state funding existed for programs. As a result, Maine initiatives achieved a wide range of successes. North Carolina completed its recommendations in time to secure a significant initial funding source. However, the recession, starting in late 2007 and 2008, put a

[110] ALABAMA REPORT, *supra* note 13, at 6.

damper on further funding for programs and the political will to pursue many of the other recommendations dwindled. Rhode Island, Maryland, and Alabama all completed their legislative reports at the beginning of the economic crisis of 2008 and implementation (or lack of implementation) can be tied to these states shifting focus from protecting one aspect of the economy (working waterfronts) to bolstering the state economy as a whole.

Changes to land use policies and plans appeared in every set of recommendations. However, many of these recommendations failed to be implemented due to lack of funding or political will. Implementing a current use tax program or similar tax relief for working waterfronts appeared to be an important tool and one that was implemented in North Carolina, Maryland, and Maine in one form or another. These programs provide good role models for other states examining this option.

Both Maine and North Carolina created dynamic funding programs with significant impacts. Due to the timing of the initiative (before the recession) and building upon demonstrated successes, the State of Maine continued to leverage its bond-financing program multiple times. By contrast, North Carolina created a successful program with a one-time infusion of funding. However, due to the recession the program received no further funding. Other states recommended a variety of funding options to protect and preserve working waterfronts but these failed due to lack of resources. Had the timing been different, these programs would likely have been funded. And as the economy begins to recover there may well be future opportunities to establish funding programs.

Almost every state report recommended educating the public about the importance of working waterfronts. This reflects a need for wider recognition of the problems faced by coastal communities. Greater understanding would bring support for efforts to change land use laws and tax laws and other measures requiring voter support. And in each case there has been at least some effort, and in some cases significant efforts, to disseminate information about working waterfronts. Again, lack of funding has limited the reach of these efforts. The website created in Maine is an excellent model of how to bring together resources and links to other resources in one location. Many of the original working waterfront web links for state agencies created during the process of preparing the legislative committee reports no longer work. Creating a non-governmental site within each state can be an important resource.

Thanks to the recession, the pressure to convert working waterfront property to other commercial and residential uses slowed. This relieved the immediate impetus to action. As the economy rebuilds and conversion pressures resume, will these committee reports prove to have laid a foundation for the timely action and political support needed to protect working waterfronts?

Appendix

Summary Table of Committee Recommendations and Results

State	Recommendation	Result
Land Use		
Maine	Evaluate effectiveness of CZM program	Implemented
	Collect baseline data re: loss of waterfront access for commercial fishing, update port facilities database each year, create interagency workgroup to collect and share data on water access	Implemented
	Hold community dialogues to determine local interest in issues, interest in pursuing working waterfront strategies	Implemented
	Provide incentives for community planning	Implemented
	Model ordinance development	Not implemented
	Review how three-port strategy addresses commercial fishing access	Not implemented
Maryland	Funding – work with local jurisdictions on access issues, expand existing planning law	Not implemented
North Carolina	Develop GIS based model to identify working lands including working waterfronts.	Implemented in part
	Amend land use planning guidelines to include policies concerning working waterfronts within planning jurisdictions.	Not implemented
	Explore potential use of special zoning techniques including conditional zoning.	Not implemented
Rhode Island	Revise statewide master guide plan to specifically identify and maintain vital water-dependent commercial operations and ensure viability of the Rhode Island marine economy	Pending
Alabama	Complete comprehensive working waterfront plan	Not implemented
	Create waterfront Alabama partnership program to assist regional planning commissions, state agencies, municipal planning organizations, counties and municipalities in incorporating working waterfront and water access issues into comprehensive planning and implementation	Implemented (one jurisdiction)
Taxation		
Maine	Current Use Taxation (not specifically in recommendations)	Implemented
Maryland	Tax abatement	Implemented
	Inheritance tax abatement	Not implemented
North Carolina	Extend eligibility of present use value taxation to working waterfront properties	Implemented
	Extend present use value taxation classification to existing private fishing piers providing public access	Implemented
Submerged Lands		
Maine	Grandfathering in fees, exemptions	Implemented
North Carolina	Dockominiums	Researched, no changes to law

	Examine the nature and legality of long-term or permanent sale of docks or dockominiums that occupy coastal public tryst submerged lands.	Not implemented
	Examine reformulation of state public trust submerged easement fee structure to create more substantive source of revenues. Use for working waterfront and public access retention programs.	Not implemented
Funding: Direct		
Maine	Small Harbor Improvement Program funding each year	Implemented
	Pier and wharf maintenance funding	Implemented
	Inventory critical infrastructure for commercial fishing	Implemented
	When issuing grants for shore and harbor management grants recognize importance of commercial fishing access.	Implemented
North Carolina	Create working waterfront trust fund or some other separate/distinct set-aside of state funds to assist in retention and enhancement of working waterfront land use issues	Implemented
	Increase funding of boating infrastructure program	Not implemented
	Fund public beach and coastal waterfront access program at higher levels	Not implemented
	Use funding from coastal recreational fishing license to public coastal fishing access enhancements	Implemented
	Additional funding to finance conservation and cultural and historic preservation	Not implemented
	Use State Clean Water Management Trust Fund to require public access in awarded projects	Not implemented
	Funding to NC Division of Coastal Management to fund development of public access inventories and plans.	Not implemented
	Amend Coastal Area Management Act to provide grants to local governments to inventory and plan for retention and enhancement of public access grants.	Not implemented
	Explore funding sources to assist private fishing piers providing public access with storm damage repair, set aside fund to finance low–interest loan program.	Not implemented
	Use aquariums to fund pilot projects to design and operate three public fishing piers for angling access and public education.	Implemented
	Funding sources and mechanisms be made available and tapped to assist working waterfront and public access facility developers, pursuant to local government approval, in developing or redeveloping facilities along the waterfront in ways that comply fully with environmental regulations	Not implemented
Rhode Island	Develop public/private partnership opportunities for port facilities	Not implemented
	Create non-federal funded dredging project	Implemented
Alabama	Fund to acquire property for working waterfront access	Not implemented
	Encourage funding from Coastal Impact Assistance Program for high priority working waterfront areas	Not implemented

	Adjust boater registration fees	Not implemented
Funding: Indirect		
Maryland	Greater weight to project scoring criteria for waterway improvement program projects	Not implemented
North Carolina	Address public access by working with DOT, power companies, local government, non-profits and other state agencies to proactively and cooperatively address public access	Implemented
	Give greater priority to grant applications seeking to enhance access to coastal public trust waters.	Not implemented
Alabama	Incentives for working waterfront businesses	Not implemented
	Encourage federal and local agencies to incorporate public waterfront access and facilities in project with access to public trust waters – boating access and bank fishing.	Not implemented
	Direct state agencies to expand public access in project planning and construction programs	Not implemented
TDR, PDR, and Conservational Easements		
Maine	Consider TDR legislation (implemented Conservation Easement Program)	Implemented
North Carolina	Consider legislation to authorize PDR and TDR programs at local government level for working waterfront and public access retention	Not implemented
Alabama	Consider legislation to authorize PDR and TDR programs at local government level for working waterfront and public access retention	Not implemented
Education		
Maine	Mechanisms for improving public relations with public, media and financial community	Implemented
Maryland	Develop planning and education about commercial fishermen rights under state programs affecting access to public trust waters	Not Implemented
	Reduced slip fees for commercial fishermen	Not Implemented
North Carolina	Endorse and financially support educational outreach programs to improve retention and enhancement of working waterfronts and public access	Implemented
Alabama	Provide public education on economics, environmental, and societal importance of working waterfront.	Implemented in part
	Provide technical assistance and support to waterfront stakeholders in sustainable business practices	Not Implemented

"The Time Has Come … To Talk of Many Things": Legal Impediments to the Future of Shellfish Relay in Rhode Island

Melissa R. Chalek, Rhode Island Sea Grant[1]

Abstract: Relay is the process by which shellfish are transferred from closed waters, where harvesting is prohibited, into approved waters, where the shellfish will purge contaminants from their tissues and eventually become safe for human consumption. In some states, management authorities permit harvest of relayed shellfish after just a few weeks, but in Rhode Island the shellfish must remain in approved waters for one year. This Article examines the justifications for this long requirement–consumer protection, lack of enforcement resources, and lack of need for a shorter period–and presents counterarguments for these justifications that are rooted in scientific literature and the policies of other states.

I. Introduction

The Walrus and The Carpenter
Walked on a mile or so,
And then they rested on a rock
Conveniently low:
And all the little Oysters stood
And waited in a row.

[1] Research Assistant, Rhode Island Sea Grant; J.D., Roger Williams University School of Law; Masters of Marine Affairs, University of Rhode Island. This article was funded through NOAA Award No. NA10OAR4170076 to the Rhode Island Sea Grant College Program. Thanks to Julia Wyman and Alan Desbonnet of Rhode Island Sea Grant for their tireless editing and advice.

'The time has come,' The Walrus said,
'To talk of many things …'[2]

The Walrus in Lewis Carroll's *Through the Looking-Glass* did not worry about the quality of the water in which the oysters he dined upon were grown.[3] However, that is not a luxury that can be enjoyed by shellfish consumers or regulators today. Poor water quality can lead to contaminated shellfish and resulting human illness.[4] This Article focuses on a process, known as shellfish relay, in which shellfish are transplanted from closed waters, where harvesting is prohibited due to poor water quality, into approved waters, where the shellfish will purge contaminants from their tissues as they filter the clean waters of the approved area.[5] From there, the shellfish may be harvested for safe human consumption.[6]

This Article examines legal and policy issues regarding the potential use of shellfish relay in Rhode Island. Many states allow transfer of seed from closed waters to approved waters,[7] and some states also allow transfer of market-sized shellfish for a relatively short depuration period, which opens closed waters to shellfish aquaculture.[8] Currently in Rhode Island, shellfish transferred from closed waters must remain in approved waters for one year before they may be harvested.[9] This long depuration requirement significantly limits the economic viability of using closed waters to culture shellfish, and it limits the potential benefits of using seed from closed waters.

This article examines Rhode Island's shellfish relay regulations and compares it with the regulations of neighboring states, federal mandates, and foreign law. Part II provides insight into the need to promote aquaculture expansion. Part III provides greater detail on the relay process. Part IV lays out the national standards regulating shellfish relay. Parts V and VI discuss aquaculture and relay in Rhode Island, and Part VII provides a comparison by examining relay in select states and Canada. Finally, Part VIII argues that the policy and science of shellfish relay provide support for liberalizing Rhode Island's relay regulations and promoting the use of relay to expand the aquaculture industry in the state.

II. The Importance of Shellfish Aquaculture

[2] LEWIS CARROLL & SIR JOHN TENNIEL, THROUGH THE LOOKING-GLASS AND WHAT ALICE FOUND THERE 80 (Henry Altemus Co. ed., 1897).
[3] *See id.* at 82.
[4] BARBARA BRENNESSEL, GOOD TIDINGS: THE HISTORY AND ECOLOGY OF SHELLFISH FARMING IN THE NORTHEAST 113, 115 (2008).
[5] *See* N.Y. COMP. CODES R. & REGS. tit. 6, § 45.1(i).
[6] N.Y. Dept. of Environmental Conservation, *Shellfish Safety*, N.Y. STATE WEBSITE, http://www.dec.ny.gov/outdoor/9161.html (last visited Dec. 6, 2013) [hereinafter *Shellfish Safety]*.
[7] This Article will specifically examine the policies of Rhode Island, Massachusetts, Connecticut, New York, and Washington State, all of which allow shellfish relay in some form. Relay is federally approved by the U.S. Food and Drug Administration through the National Shellfish Sanitation Program.
[8] *See, e.g.*, N.Y. COMP. CODES R. & REGS. tit. 6, § 45.4(e)(1).
[9] 12-080-053 R.I. CODE R. § 8.9.

There is a large demand for shellfish in New England, the United States, and the world at large, but meeting that demand is becoming a greater challenge as wild harvest fisheries are declining.[10] Wild populations are decreasing globally because of overharvesting, disease, pollution, and habitat degradation.[11] As wild sources of shellfish dwindle, global demand continues to increase,[12] leaving a growing gap between supply and demand. Shellfish aquaculture, however, is poised to fill this gap.[13]

Public acceptance of cultured shellfish has been improving, especially with increasing awareness of the need to supplement wild harvest, the ecological benefits that can be gained from increasing shellfish populations through aquaculture, and the sustainability of shellfish aquaculture.[14] However, not everyone is on board with increasing aquaculture. Specifically, some commercial fishermen oppose expansion of shellfish aquaculture, fearing competition for seabed space and market sales.[15] The strong political pulls from aquaculture and wild harvest can leave regulators struggling to accommodate the needs of the various, often conflicting, interest groups, the public, and the environment.

Rhode Island is in a prime position to capitalize on the economic potential of shellfish aquaculture. Today, Canada, specifically Prince Edward Island (PEI), is the major source for mussels in the United States.[16] The current aquaculture industry in PEI provides employment for more than 1,500 people and creates over $100 million in annual sales.[17] However, PEI has met its biological carrying capacity for mussel farming.[18] In contrast, Rhode Island aquaculture has not even approached the carrying capacity of Narragansett Bay ("the Bay"), which is projected to be capable of supporting 625 times the current level of oyster aquaculture.[19] The large detritus pool in the Bay makes it one of the best shellfish production sites in the world,[20] and capitalizing on this capacity would allow Rhode Island to meet the ever increasing demand for shellfish while significantly bolstering the state's economy.

However, a major limitation to the potential of expanding shellfish aquaculture in Rhode Island is water contamination. Many substances present in the water are considered contaminants, including both naturally occurring biotoxins, such as certain species of phytoplankton, bacteria, or viruses,[21] and

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[10] *See* BRENNESSEL, *supra* note 4, at 3; Dorothy Leonard & Sandra Macfarlane, *Best Management Practices for Shellfish Restoration: Prepared for the ISSC Shellfish Restoration Committee* 8 (Oct. 1, 2011), http://www.issc.org/client_resources/publications/final%20draft%20bmps-01-23-12.pdf (citation omitted).

[11] BRENNESSEL, *supra* note 4, at 3.

[12] *Id.*

[13] *Id.* at 183.

[14] Carrie Byron et al., *Calculating Ecological Carrying Capacity of Shellfish Aquaculture Using Mass-Balance Modeling: Narragansett Bay, Rhode Island*, 222 ECOLOGICAL MODELING 1743, 1743 (2011) (noting that "bivalve aquaculture is one of the most ecologically sustainable types of aquaculture").

[15] COASTAL RES. MGMT. COUNCIL, COASTAL RES. MGMT. PROGRAM § 200.4(B)(2) (2012) [hereinafter *Red Book*].

[16] BRENNESSEL, *supra* note 4, at 34. Other shellfish species are also cultured in Canada and could be cultured in Rhode Island, but oysters, quahogs, and mussels are the Rhode Island target species. *Red Book, supra* note 15.

[17] Scott Lindell, R.I. Sea Grant Project Summary: Extending the Capacity and Capability of Longline Mussel Farming in R.I. 2 (2012) (unpublished) (on file with R.I. Sea Grant and author).

[18] Byron et al., *supra* note 14, at 1744 (citations omitted).

[19] *Id.* at 1743. Oysters are currently the dominant cultured shellfish in Rhode Island, representing 99% of all state shellfish aquaculture. *Id.*

[20] *Id.* at 1743, 1752.

[21] Although these organisms can be naturally occurring, they can also be anthropogenic. *See* BRENNESSEL, *supra* note 4, at 118.

anthropogenic contaminants, such as heavy metals, oil, and other pollutants.[22] In Rhode Island, the specific persistent contaminants of concern are bacteria and heavy metals, with periodic problems from others such as toxins produced by dinoflagellates or bacterial contamination from sewer overflows or spills.[23]

Because shellfish are filter feeders, those growing in contaminated waters will siphon in contaminants as they feed,[24] which then accumulate in the shellfish tissue.[25] Contamination generally cannot be detected through taste, smell, or appearance, and cooking may not eliminate it.[26] Therefore, shellfish that have been harvested from contaminated waters have an increased potential to cause illness in consumers.[27] The severity of the illness can range from minor stomach discomfort from consuming low levels of sewage-based bacteria up to fatal illness, such as paralytic shellfish poisoning caused by consuming shellfish tissue tainted with toxins produced by various dinoflagellate species.[28]

To reduce the risk of "shellfish poisoning" and other shellfish-related illnesses, states generally test waters and ban shellfish harvest from any water deemed to contain unsafe levels of contaminants.[29] Many of the "most productive" shellfish beds in the Bay are currently closed to direct market harvesting for a large portion of the year[30] and therefore are incapable of supporting shellfish aquaculture sites under the current regulatory scheme, limiting aquaculture potential in Rhode Island.

Despite the ban on harvesting for market in closed waters, there are two potential methods to culture shellfish in contaminated waters: facility-based depuration and relay depuration.[31] Facility-based depuration requires shipping contaminated shellfish to a land-based depuration facility where the shellfish are intensively cleansed with clean water.[32] However, this process is expensive and causes stress to the shellfish, which may reduce the efficacy of the cleansing process.[33] The alternative – relay depuration – relies on the natural cleansing process that occurs when contaminated shellfish are transferred to approved, clean waters.[34]

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[22] *Id.* at 113, 118, 121, 122. Unless specifically noted, these various pollutants will be referred to throughout this Article broadly as "contaminants."

[23] Telephone Interview with Joe Migliore, Principal Environmental Scientist, RI-DEM, Division of Water Resources (Dec. 18, 2012) [hereafter Migliore Interview].

[24] PRINCE EDWARD ISLAND DEP'T OF AGRICULTURE, FISHERIES AND AQUACULTURE, AQUA INFO: AQUACULTURE NOTES: SANITARY TESTING OF MOLLUSCAN SHELLFISH 1 (2005), *available at* http://www.gov.pe.ca/photos/original/FARD_ain20.2005.pdf [hereinafter PEI FACT SHEET].

[25] BRENNESSEL, *supra* note 4, at 115.

[26] *Id.*

[27] *Id.* at 113.

[28] *See id.* at 115.

[29] This prohibition is mandated by the National Shellfish Sanitation Program, which all states must meet in order to sell their shellfish in interstate commerce. *See* NAT'L SHELLFISH SANITATION PROGRAM MODEL ORDINANCE § II, ch. I, §.01(A)(1) (2007), *available at* http://www.fda.gov/food/guidanceregulation/federalstatefoodprograms/ucm2006754.htm [hereinafter NSSP-MO].

[30] *See Red Book, supra* note 15, at § 200.4(B)(1).

[31] BRENNESSEL, *supra* note 4, at 120.

[32] *Id.*

[33] *Id.* The advantage of depuration is that it can be accomplished in as little as three days. *Id.*

[34] CANADIAN SHELLFISH SANITATION PROGRAM - MANUAL OF OPERATIONS ch. 2 (2012) [hereinafter CSSP]; *Shellfish Safety*, *supra* note 6.

III. The Relay Process and Regulation

Relay involves the transfer of shellfish cultured in, or collected from, closed waters into approved waters where the shellfish will purge contaminants from their tissues by filtering clean water.[35] This process is generally recognized to take from a few days to a week[36] to reduce contaminants to levels safe for human consumption, provided that water temperatures are sufficiently high.[37] Shellfish growers therefore could collect seed from contaminated waters and grow their stock in approved waters, or they could culture shellfish in contaminated waters and then transfer market-sized shellfish to approved waters for a brief depuration period.[38] By employing relay depuration techniques, shellfish growers can utilize otherwise unusable shellfish seed from contaminated waters or submerged bottom located in closed areas.

In addition to expanding the available submerged bottom and seed for production, shellfish relay depuration has the potential to provide environmental benefits. By filtering out particles from the water column, shellfish remove contaminants present in the water and metabolize them, improving water quality.[39] This particulate removal also reduces turbidity, which allows light to penetrate deeper in the water column and encourages growth of plants such as eel grass.[40] Therefore, expansion of aquaculture in areas with poor water quality can improve the water quality by promoting an increase in overall shellfish biomass and therefore increased water filtration. The above mentioned benefits of shellfish aquaculture make enhancing relay capabilities an important component of state shellfish policies to provide "a healthy food source, an economic boon to local economies … and numerous ecosystem services."[41]

Relay can be executed through a public transplant program, which has been carried out in Rhode Island,[42] or through private aquaculture relay, which is the topic of this paper. During private aquaculture relay, a private individual collects seed from or cultures shellfish in restricted waters before

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[35] NSSP-MO, *supra* note 29, at § II, Definitions (2)(88).

[36] As described below, longer periods are needed for depuration of heavy metals.

[37] *See* NSSP-MO, *supra* note 29, at § IV, ch. II, §.06; Michael R. Pietrak et al., *Potential Role of* Mytilus edulis *in Modulating the Infectious Pressure of* Vibrio anguillarum *02β on an Integrated Multi-Trophic Aquaculture Farm,* 326-329 AQUACULTURE 36, 36, 38 (2012); Karin Röder et al., *Accumulation and Depuration of Yessotoxin in Two Bivalves,* 30(1) J. SHELLFISH RESEARCH 167, 171 (2011).

[38] Email from Kristin DeRosia-Banick, Environmental Analyst II, Conn. Dept. of Agriculture, Bureau of Aquaculture, to author (Sept. 18, 2012, 09:00 EST) (on file with author).

[39] EAST COAST SHELLFISH GROWERS ASSOCIATION, DID YOU KNOW? SHELLFISH AQUACULTURE IS GOOD FOR THE ENVIRONMENT!, *available at* http://www.ecsga.org/Pages/Sustainability/BenefitsBrochure.pdf.

[40] Michael A. Rice, *Environmental Impacts of Shellfish Aquaculture: Filter Feeding to Control Eutrophication*, MARINE AQUACULTURE AND THE ENVIRONMENT: A MEETING FOR STAKEHOLDERS IN THE NORTHEAST 77, 79 (2001).

[41] Leonard & Macfarlane, *supra* note 10.

[42] *See Shellfish Transplant Program*, NARRAGANSETT BAY COMMISSION, http://www.narrabay.com/en/About%20Us/CommunityOutreachPrograms/ShellfishTransplantProgram.aspx (last visited Nov. 1, 2013); *see also* R.I. GEN. LAWS § 20-6-26 (1981) (authorizing the public transplant program).

transferring the shellfish to approved waters for the grow-out depuration process.[43] In contrast, a public transplant consists of the state collecting shellfish from restricted waters and transferring them to approved waters.[44] The waters where the shellfish are transferred into are then closed to harvest until the state re-opens the waters because sufficient time has passed that the contaminants in the shellfish will have depurated to a safe level.[45] The physical act of transplant is often carried out by wild harvest shellfishers, as has been the case in Rhode Island.[46] As public transplant is already carried out in Rhode Island, this Article focuses exclusively on private aquaculture relay.

IV. National Shellfish Sanitation Program

The relay process and all other aspects of shellfish management are regulated both by individual states and by the federal government. Federal intervention on shellfish harvest arose out of a 1924 outbreak of typhoid that was traced to shellfish consumption.[47] In response to this outbreak, the U.S. Surgeon General held a conference to compile recommendations for sanitation procedures to avoid similar future shellfish-related outbreaks.[48] The result of this conference was a confirmation that control of shellfish harvesting and distribution was primarily the responsibility of the individual states, but the conference also recognized that there was a role for the federal government in providing support and ensuring uniformity among the states.[49] The Interstate Shellfish Sanitation Conference (ISSC) was formed to meet this coordination need.[50]

Working with the U.S. Food and Drug Administration (FDA), the ISSC put together the National Shellfish Sanitation Program Model Ordinance ("NSSP-MO" or "model ordinance"), which sets the minimum requirements for shellfish sanitation that all states must meet in order to ship their shellfish via interstate commerce.[51] The NSSP-MO is a comprehensive document that addresses the various aspects of shellfish culture and production from water quality requirements, harvest methods, and tagging to storage, preparation, and shipping labels. The purposes of the NSSP-MO are "to promote and improve the sanitation of shellfish" and ensure the health and safety of consumers.[52]

Standards for shellfish relay depuration are among the numerous provisions of the NSSP-MO.[53] The model ordinance recognizes the value of allowing use of "shellstock resource that would otherwise not be available for human consumption."[54] The NSSP-MO requires that state authorities conduct "sanitary surveys" of all state waters and use the results of these surveys to classify the waters into several categories including approved (shellfish can be harvested), restricted (shellfish can be grown but must

[43] *See* NSSP-MO, *supra* note 29, at § II, Definitions (2)(88); BRENNESSEL, *supra* note 4, at 121.
[44] *See* R.I. GEN. LAWS § 20-6-26 (1981).
[45] *See id.* §§ 20-6-26, 20-6-27 (1981, 1988).
[46] *See* Narragansett Bay Commission, *supra* note 42.
[47] NSSP-MO, *supra* note 29, at § III, Introduction.
[48] *Id.*
[49] *Id.* (quoting a 1925 letter from the U.S. Surgeon General).
[50] *Id.*
[51] *Id.* at §§ II, Purpose, ch. I, §.01(E)(2), III, Introduction.
[52] *Id.* at § III, Introduction.
[53] *See id.* at § II, ch. V.
[54] *Id.* at § III, ch. V, §.01.

be relayed for depuration before final harvest), and prohibited (shellfish cannot be harvested at all).[55] States then use these water classifications to regulate harvest of shellfish for both wild harvest and aquaculture.[56]

When shellfish cultured in restricted waters are transferred to approved waters for relay depuration, the NSSP-MO requires that the state set minimum requirements, such as minimum grow-out times, to ensure that the contaminant levels in the shellfish are reduced to levels safe for human consumption.[57] The basic minimum depuration period required by the NSSP-MO is fourteen days.[58] Additionally, a contaminant reduction study is required for each individual project to ensure that fourteen days is sufficient to reduce contamination to safe levels.[59] Projects seeking a grow-out period of less than fourteen days must conduct a "more intensive" contaminant reduction study to show with certainty that the desired grow-out period is sufficiently long.[60]

Recognizing that some projects may not want to incur the costs of the extensive contaminant reduction study, the NSSP-MO allows for relay projects without these studies as long as certain protective requirements are met. Waiver of the contaminant reduction study is only available if the shellfish in question have been exposed exclusively to microbial contaminants.[61] Also, the waters from which the shellfish are being relayed must meet particular bacteriological water quality standards to ensure that the level of contamination is not excessive.[62] Finally, to ensure that the shellfish have sufficient time to purge contaminants from their tissues, a minimum grow-out period of sixty days is required.[63]

In addition to setting minimum grow-out time requirements, the NSSP-MO recognizes that depuration rates of shellfish are impacted by many other factors including level of contamination, water quality parameters like temperature and salinity, and the container in which the shellfish are cultured.[64] The model ordinance's general call for contaminant reduction studies is in response to these various impacts.[65] However, certain parameters have consistent impacts and are directly addressed by the model ordinance. Temperature has a major impact on depuration rate because shellfish filtration

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[55] *See id.* at § II, ch. IV, §.01(A)(1). Classification as prohibited does not require a sanitary survey, although the results of a survey may dictate a prohibited classification. *Id.* at § II, ch. IV, §.01(B)(2). Surveys also require annual review to ensure that they still represent the current water quality. *Id.* at § II, ch. IV, §.01(C)(5).

[56] *Id.* at § II, ch. VI, §.02(G).

[57] *Id.* at §§ II, ch. V, §.01(B), (C).

[58] *Id.* at § II, ch. V, §.02(D).

[59] *Id.* The study must include testing for bacteria as well as every identified contaminant of concern. Testing for bacterial contamination must indicate that post-harvest contamination levels do not exceed bacterial contamination levels in shellfish grown entirely in approved waters. If other contaminants have been identified in the conditional or restricted waters, such as heavy metals, the contaminant reduction study must demonstrate that any remaining levels at harvest time are within established FDA tolerance levels. *Id.* at § II, ch. V, §.02(B).

[60] *Id.* at § II, ch. V, §.02(E).

[61] *Id.* at § II, ch. V, §.02(C)(1). The model ordinance recognizes that contamination with heavy metals or strong chemicals may create too many variables in purification rate and therefore should always be accompanied by a contaminant reduction study. *See id.* at § IV, ch. II, §.06.

[62] *Id.* at § II, ch. V, §.02(C)(2).

[63] *Id.* at § II, ch. V, §.02(C)(3).

[64] *Id.* at § III, ch. V, §.02.

[65] *Id.*

rate slows or stops when water temperatures are too low.[66] Therefore, the model ordinance requires state authorities to determine whether seasonal restrictions are necessary.[67] The NSSP-MO also requires that grow-out requirements be individually set for each project in order to account for these multiple variables that will change the depuration rates for each project.[68] Most states that employ the relay process have incorporated these variables into their regulations.

V. Rhode Island and the Shellfish Industry

Although Rhode Island has significant exports of quahogs and oysters, it imports other shellfish, such as mussels, to supplement its own production and wild harvest.[69] Additionally, wild harvest shellfish landings are decreasing in Rhode Island.[70] Increasing aquaculture production in the state could increase the availability of various shellfish species for both the local market and exports. Relay systems could allow growers to make use of closed waters, providing more jobs, more locally-grown shellfish into the economy, and even potentially improving the water quality of contaminated areas.

However, existing Rhode Island regulations inhibit successful aquaculture relay projects; the current regulations require a purification period that often equals or exceeds the time required for growth to market size.[71] Therefore, aquaculture utilizing relay would require longer grow-out time before harvest than facilities located solely in approved waters, reducing economic viability due to increased maintenance costs.

While other states require a relay depuration period of three months or less,[72] Rhode Island Department of Environmental Management ("RI-DEM") requires a depuration period of twelve months.[73] Engaging in aquaculture relay also requires prior approval from the directors of both RI-DEM and Rhode Island Department of Health ("RI-DOH"), but this mechanism has not yet been used for private aquaculture, perhaps largely because of the financial burden of the one-year grow-out requirement.[74]

While RI-DEM and RI-DOH control the grower's ability to harvest and sell cultured shellfish, the Rhode Island Coastal Resources Management Council ("RI-CRMC") must grant an assent to allow operation of a shellfish farm on leased state bottomlands.[75] Although applications for RI-CRMC assents are addressed on a case-by-case basis, RI-CRMC policy is to deny applications for private shellfish

[66] *Id.* at § IV, ch. II, §.06.
[67] *Id.* at § II, ch. V, §.02(F).
[68] *See id.* at § II, ch. V, §.02(B).
[69] *See* BRENNESSEL, *supra* note 4, at 34; Lindell, *supra* note 17, at 2.
[70] *See Red Book, supra* note 15, at § 200.4(B)(2).
[71] *See* 12-080-053 R.I. CODE R. § 8.9; Lindell, *supra* note 17, at 2 (noting that mussels grown in southern New England waters can grow from seed size to market size in 10-12 months).
[72] Massachusetts requires three months, Connecticut requires fourteen days, and New York requires twenty-one days. Although these purification period lengths all have provisions that will extend them beyond these accepted minimums, the minimum specified length is sufficient for the majority of projects. Email from Wade Carden, Biologist, N.Y. Dep't of Envtl. Conservation, Bureau of Marine Resources, to author (Oct. 15, 2012, 10:00 EST) (on file with author).
[73] 12-080-053 R.I. CODE R. § 8.9.
[74] 12-080-053 R.I. CODE R. §§ 8.9, 8.9.2; Migliore Interview *supra* note 23.
[75] *Red Book, supra* note 15, at § 300.11(C)(2).

aquaculture projects in closed areas that have "significant shellfish stocks potentially available for relay into approved areas for free and common fishery"[76] – i.e., the public transplant programs discussed above. Taken together, these regulations and policies place serious constraints on the potential of expanding shellfish aquaculture in Rhode Island, although RI-DEM's twelve month grow-out requirement is the greatest constraint.

VI. Recent Proposed Changes in Rhode Island Policy

Recognizing the restrictive nature of the regulations surrounding shellfish relay, RI-DEM recently proposed changes to its regulations,[77] seeking to accommodate requests by the state aquaculture industry for shorter grow-out periods. The proposed changes would reduce grow-out time from twelve months to six months.[78] However, RI-DEM has included new restrictions in the revised regulations;[79] shellfish must be transferred as seed and increase in weight by at least ninety percent after transfer before they can be harvested.[80] Any shellfish transferred beyond seed size continue to require special, prior approval by the directors of RI-DEM and RI-DOH.[81]

Although the proposed regulation amendments would lower the minimum grow-out period, the additional growth requirements effectively eliminate any value in the change since RI-DEM anticipates that twelve months is required to achieve the stated size increases.[82] Therefore, even with the new six-month requirement, shellfish growers will still need to employ a longer grow-out period, perhaps even as long as the current twelve-month period.

Election of grow-out regulations and other requirements related to relay involves a complex regulatory process and many policy decisions. RI-DEM partially justifies the additional restrictions in its proposed regulation changes as required to maintain compliance with the federally mandated NSSP-MO.[83] However, less restrictive regulations are sufficient to meet the NSSP-MO requirements. The NSSP-MO sets a minimum grow-out period of fourteen days with verification studies, and even in the absence of these studies, harvest is permitted after sixty days.[84] Neighboring states must also meet the

[76] *Id.* at § 300.11(B)(8). Although, it should be noted that this policy prohibition does not apply to spat collection. *Id.* at § 300.11(B)(8)(a).

[77] Email from Peter A. Duhamel, Principal Planner, RI-DEM, to author (Sept. 11, 2012, 14:58 EST) (on file with author). These regulatory changes have been put on hold while RI-DEM begins drafting its comprehensive shellfish management plan, but the changes will be considered as the planning process proceeds.

[78] Aquaculture of Marine Species in Rhode Island Waters (proposed Aug. 21, 2012) (to be codified at 12-080-053 R.I. CODE R. § 9.9.4); Duhamel, *supra* note 77.

[79] Duhamel, *supra* note 77.

[80] Aquaculture of Marine Species in Rhode Island Waters (proposed Aug. 21, 2012) (to be codified at 12-080-053 R.I. CODE R. § 9.9.3). For oysters and quahog, specific maximum relay sizes and minimum harvest sizes are proposed. All other shellfish will need to meet the ninety percent weight increase standard. *Id.* at §§ 9.9.1, 9.9.2, 9.9.3.

[81] *Id.* at §§ 9.8, 9.11.

[82] Duhamel, *supra* note 77.

[83] *Id.*

[84] NSSP-MO, *supra* note 29, at §§ II, ch. V, §.02(C), (D).

model ordinance requirements, but their grow-out periods are all three months or less.[85] Therefore, even with the proposed changes, Rhode Island's regulations would remain well in excess of national requirements set to protect consumer safety.

VII. Regulations of Other Jurisdictions[86]

A. Massachusetts[87]

Massachusetts does not have a relay program that allows private enterprise. Instead, like Rhode Island, relay in Massachusetts is carried out by government-sponsored programs only,[88] mainly individual municipalities.[89] In Massachusetts, shellfish relayed from restricted areas must remain in approved waters for a minimum of three months, including at least one spawning season, before harvest.[90] As a final protective measure, the shellfish must be tested for contaminants both at the time of relay and before harvest.[91] Although these regulations exceed the minimum requirements of NSSP-MO, they are still less onerous than the Rhode Island regulations.

B. Connecticut[92]

Connecticut has an extensive aquaculture relay program,[93] largely due to its more liberal relay regulations. Private aquaculture relay has been occurring for over two decades in Connecticut, and in

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[85] *See* CONN. GEN. STAT. § 26-192k; N.Y. COMP. CODES R. & REGS. tit. 6, § 45.4(e)(1); Massachusetts Division of Marine Fisheries, *Shellfisheries Management*, EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, http://www.mass.gov/eea/agencies/dfg/dmf/programs-and-projects/shellfisheries-management.html (last visited Dec. 8, 2013) [hereinafter *Shellfisheries Management*].

[86] A table providing a broad overview comparison of the various state regulations and the federal requirements is provided in the Appendix to this Article. The selected states were initially chosen to provide a local comparison for Rhode Island: Massachusetts, Connecticut, and New York. Washington State was added upon recommendation because its relay regulations closely mirror the federal standards. Finally, Canada is included to provide a foreign example – particularly the inclusion of Prince Edward Island, which is one of the world's largest mussel sources.

[87] In Massachusetts, aquaculture is primarily managed by the Department of Fish and Game, Division of Marine Fisheries, which is the agency that manages aquaculture permits. However, permits are required from several other state agencies depending on various aspects of the individual projects. The Department of Food and Agriculture is also highly involved in management of aquaculture. *See generally*, MASSACHUSETTS DEP'T OF FOOD AND AGRICULTURE, MASSACHUSETTS AQUACULTURE PERMITS GUIDANCE DOCUMENT (1998), *available at* http://www.mass.gov/eea/docs/agr/aquaculture/aquaculture-permit-guidance-document.pdf.

[88] Telephone Interview with Gregory Sawyer, Aquatic Biologist II, Mass. Dep't of Fish and Game, Division of Marine Fisheries (Aug. 27, 2012) [hereafter Sawyer Interview]. This restriction may be due less to a concern for protecting public health and more a concern for protecting the wild shellfish industry and a general state dislike for aquaculture. *See Shellfisheries Management, supra* note 85.

[89] Sawyer Interview, *supra* note 88.

[90] *Shellfisheries Management, supra* note 85.

[91] *Id.*

[92] In Connecticut, aquaculture is managed by the Connecticut Department of Agriculture, Bureau of Aquaculture. CONN. GEN. STAT. § 26-192a.

[93] Email from Tessa Getchis, Aquaculture Extension Specialist, Connecticut Sea Grant, to author (Sept. 17, 2012, 12:02 EST) (on file with author).

1989 was already described as "expand[ing] rapidly."[94] Connecticut requires just a fourteen-day grow-out period, yet still complies with the NSSP-MO.[95] However, Connecticut does call for several specific additional requirements to ensure that this short grow-out period is sufficient to reduce contaminants to safe levels for public health protection.

Chief among these extra precautions is a requirement for testing of fecal coliform bacteria levels in the shellfish before they can be harvested.[96] If the results of these tests indicate that the contamination level has not been reduced to safe levels during depuration, the Connecticut Department of Agriculture, Bureau of Aquaculture ("CT-DA/BA") will require a longer grow-out period.[97] However, the fourteen-day minimum is generally sufficient in practice, with most shellfish showing sufficient depuration in just one week.[98] CT-DA/BA rarely has to extend grow-out times; although extensions are often significantly long when they are required.[99] While most relay projects in Connecticut utilize bottom culture, some hold oysters in cages after relay.[100] Testing of cage-cultured oysters has shown a slower depuration rate, therefore mandating post-relay depuration periods several weeks or even months longer than the required minimum.[101]

Another extra protective measure found in Connecticut regulations, which is lacking from the regulations in Rhode Island and Massachusetts, is a minimum temperature requirement of fifty degrees Fahrenheit.[102] This temperature must be maintained throughout the grow-out period in recognition that most shellfish reduce metabolism rate at low temperatures and therefore will experience slower depuration rates.[103] By requiring a minimum temperature throughout the grow-out period, Connecticut regulations ensure that shellfish will be actively undergoing depuration throughout the entire fourteen days. Through detailed regulations of several variables, Connecticut has been able to capitalize on culture potential and has many private aquaculture projects utilizing relay depuration techniques. At the same time, Connecticut stays within the confines of the NSSP-MO, so shellfish are able to be sold via interstate commerce.

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[94] T.C. Visel et al., *Bag Shellfish Relaying Systems in Connecticut* 1, 2 (1989), *available at* http://www.soundschool.com/Sound%20School%20Publications/bagshellfish.pdf.

[95] CONN. GEN. STAT. § 26-192k; *accord* NSSP-MO, *supra* note 29, at § II, ch. V, §.02(D). The Connecticut statute specifically states that all aquaculture employing relay must comply with all NSSP-MO minimum requirements. *Id.* § 26-192k. This compliance is also mandated by the enabling statute that places the Department of Agriculture as the lead agency. *Id.* § 26-192a.

[96] Email from Kristin DeRosia-Banick, Environmental Analyst II, Conn. Dept. of Agriculture, Bureau of Aquaculture, to author (Sept. 18, 2012, 09:00 EST) (on file with author).

[97] *See* CONN. GEN. STAT. § 26-192k.

[98] DeRosia-Banick, *supra* note 96.

[99] *Id.*

[100] *Id.*

[101] Email from David M. Lamoureux, Jr., Environmental Analyst II, Conn. Dept. of Agriculture, Bureau of Aquauculture, to author (Nov. 5, 2013, 08:07 EST) (on file with author). The skill of the grower can also have a significant impact on the required grow-out depuration length. *Id.*

[102] *Shellfishing Area Classifications*, CONN. DEP'T OF AGRICULTURE, STATE OF CONN. WEBSITE http://www.ct.gov/doag/cwp/view.asp?a=1369&q=259172 (last visited Dec. 6, 2013).

[103] BRENNESSEL, *supra* note 4, at 38.

C. *New York*[104]

Like Connecticut, New York also has several private aquaculture projects that employ relay depuration for shellfish grown in restricted waters. Approximately seventeen percent of New York's total growing waters are closed to harvesting because of poor water quality, and relay depuration allows use of those closed waters.[105] As opposed to Connecticut's requirement of a fourteen-day grow-out, New York sets the minimum grow-out length at twenty-one days.[106] Like Connecticut, New York places additional restrictions on relay to ensure that this short grow-out period is sufficient, such as microbial testing.[107]

New York requires microbial testing of shellfish to ensure that the grow-out period has allowed for contaminant reduction to a level safe for human consumption.[108] Although the regulations allow extension of the twenty-one day grow-out period based on the results of these tests, an extension has never been necessary.[109] However, very few aquaculture projects in New York actually utilize the twenty-one day minimum because most projects relay the shellfish while they are still seed size,[110] which requires a minimum six-month grow-out.[111] This preference for seed relay is likely due to the increased expense of market-size relay because New York regulations require that projects pay additional fees, such as the salary of a monitor, when relay is done after the shellfish have grown beyond seed size.[112] Therefore, New York does permit relay of shellfish of any size, but there are distinct financial incentives to relay shellfish earlier in the life cycle.

D. *Washington*[113]

Washington State's regulations are more liberal than any of the regulations in the New England states examined, yet the regulations still comply with the requirements of the NSSP-MO. Like the

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[104] In New York, aquaculture is managed by the Department of Environmental Conservation's Bureau of Marine Resources. *Marine Permits and Licenses*, N.Y. DEP'T OF ENVTL. CONSERVATION, N.Y. STATE WEBSITE, http://www.dec.ny.gov/permits/6084.html (last visited Dec. 6, 2013).

[105] *Shellfish Safety*, N.Y. DEP'T OF ENVTL. Conservation, N.Y. STATE WEBSITE, http://www.dec.ny.gov/outdoor/9161.html (last visited Dec. 6, 2013).

[106] N.Y. COMP. CODES R. & REGS. tit. 6, § 45.4(e)(1).

[107] New York addresses the slow rate of shellfish purification in cold waters by prohibiting relay from October 11 through March 31 and requiring a minimum temperature of fifty degrees Fahrenheit during the twenty-one day grow-out period. *Id.* §§ 45.4(a)(2), 45.4(e)(1).

[108] *Id.* § 45.4(e)(1); Carden, *supra* note 72.

[109] N.Y. COMP. CODES R. & REGS. tit. 6, § 45.4(e)(1); Carden, *supra* note 72.

[110] *Id.* There has been only one aquaculture project in the last decade to employ relay of market-sized shellfish. In comparison, in 2012, seven permits were issued for aquaculture projects employing seed relay. *Id.*

[111] NSSP-MO, *supra* note 29, at § II, ch. VI, Requirements for the Harvester/Dealer § .03(A).

[112] N.Y. COMP. CODES R. & REGS. tit. 6, §§ 45.5(c), (e) (2012); Carden, *supra* note 72.

[113] In Washington, the state Department of Fish and Wildlife is the primary agency responsible for managing aquaculture, although many other agencies also have roles in relevant regulations and permitting depending on the specifics of the operation. *Aquatic Farm Registration*, *Environmental Permit Handbook,* WASHINGTON STATE GOVERNOR'S OFFICE OF REGULATORY ASSISTANCE, http://apps.oria.wa.gov/permithandbook/permitdetail.asp?id=26 (last visit Dec. 1, 2013); *see also Shellfish Aquaculture*, DEPT. OF ECOLOGY, STATE OF WASHINGTON, http://www.ecy.wa.gov/programs/sea/aquaculture/shellfish.html (last visited Dec. 6, 2013).

newly proposed regulations in Rhode Island, Washington regulations allow harvest of relayed shellfish after six months of grow-out, but unlike Rhode Island, Washington's six-month grow-out does not come with additional caveats.[114] Further, Washington also includes provisions that allow for significant reductions in grow-out time.

Grow-out periods of between fourteen days and six months are permitted provided that the growers conduct validation studies on the relay sites (both the source site and the grow-out site) to verify that the depuration period is sufficient to reduce contaminants to safe levels.[115] Projects can also utilize a grow-out period of between seven and fourteen days provided that more stringent contamination reduction studies are performed.[116] A grow-out period of less than fourteen days requires sampling of every lot of shellfish at both the time of relay and just before harvest to ensure sufficient contaminant reduction.[117]

By employing this three-tiered system, Washington allows shellfish growers to weigh the benefits of shorter relay periods against the costs of additional testing and select the most economically beneficial option. By requiring growers to pay the cost of additional testing, the state agency opens up greater possibilities of employing shellfish relay without placing significant additional burden on the agency itself and maintaining compliance with the NSSP-MO.

E. Canada[118]

Prince Edward Island is one of the largest sources of mussels for the United States market.[119] PEI mussels come from both wild harvest and large aquaculture programs.[120] Relay is a part of the Canadian shellfish aquaculture industry,[121] and relay projects are governed under the Canadian Shellfish Sanitation Program (CSSP), which is the Canadian equivalent of the U.S. NSSP-MO.[122] In 1948, Canada and the United States entered into an agreement that each would allow import of the others shellfish provided that they followed the same basic framework to ensure consumer safety.[123] Like the NSSP-MO, the CSSP sets up a basic framework where the regulatory agencies classify the waters according to water quality and allow relay from contaminated waters to approved waters for natural depuration

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[114] WASH. ADMIN. CODE § 246-282-032(7). Although Washington's six-month grow-out regulations do not set additional requirements such as temperature, the regulations do explicitly require that projects meet all NSSP-MO requirements, and therefore a temperature requirement can be implied. *See id.* § 246-282-032(1)(c).

[115] *Id.* § 246-282-032(1)(e).

[116] *Id.* § 246-282-032(3)(c).

[117] In comparison, relay projects that employ a grow-out period of fourteen days or more may continue to use the set grow-out period for future lots once that grow-out period has been established by contaminant reduction studies on the initial lot. *Id.* § 246-282-032(4).

[118] In Canada, Fisheries and Oceans Canada is the primary body responsible for regulating aquaculture in the nation, although it "works closely with other federal government departments, the provinces and territories, and the aquaculture industry to support" sustainable aquaculture. *Roles and Responsibilities*, FISHERIES AND OCEANS CANADA, http://www.dfo-mpo.gc.ca/aquaculture/management-gestion/roles-eng.htm (last visited Dec. 6, 2013).

[119] BRENNESSEL, *supra* note 4, at 34.

[120] Lindell, *supra* note 17, at 2.

[121] PEI FACT SHEET, *supra* note 24, at 2.

[122] *Id.*

[123] CSSP, *supra* note 34, at Foreword.

prior to harvest.[124] Additionally, the CSSP also includes the requirement for bacteriological testing before a lot of relayed shellfish can be harvested in order to ensure sufficient depuration.[125]

The CSSP calls for varying levels of testing dependent upon the length of time for grow-out. Grow-outs of less than fourteen days but no less than six days are permitted, but require extensive testing.[126] Only a single test for fecal coliform is required for any shellfish lot undergoing a grow-out period between fourteen and twenty-one days.[127] If the grow-out period exceeds twenty-one days, then no testing of the shellfish is required, although the regulatory agency has the discretion to require testing for these longer grow-outs.[128] If the shellfish are transplanted as seed, a minimum six-month grow-out period is required.[129] Since the seed are likely to take at least six months to reach market size, this requirement is unlikely to place any economic burden or restrictions on the grower and their associated farm or business models.

VIII. The Future of Shellfish Aquaculture in Rhode Island

A. Justification for Rhode Island's Protective Regulations and Counterarguments

As noted above, Rhode Island's shellfish relay regulations are more restrictive than those of other states reviewed here. States like Connecticut and New York have relay regulations that are just above the minimums set by the NSSP-MO.[130] However, the model ordinance itself makes clear that these are only minimums, and states are free to set more restrictive regulations as they deem appropriate.[131]

RI-DEM partially justifies its regulations as a need to comply with the requirements of NSSP-MO,[132] but as previously noted, far more liberal regulations would still comply. RI-DEM supports its more conservative regulations with three basic arguments: (1) more restrictive regulations will provide additional public health protection, (2) RI-DEM enforcement does not have the man-power to properly enforce less stringent regulations, and (3) there is sufficient submerged bottom to support the needs of shellfish wild harvest and aquaculture. It is likely, also, that RI-DEM is influenced by the often antagonistic relationship between shellfish aquaculture and wild harvest in Rhode Island.[133]

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[124] *See id.* §§ 2.2, 2.3.1, 10.3, 10.4.
[125] *Id.* §§ 10.3.7, 10.4.7.
[126] *Id.* § 10.3. Before approval of the project, twenty lots of shellfish must be tested to prove that the contaminants are reduced to safe levels. Afterwards, every lot must be tested for fecal coliform before it can be sold. *Id.* §§ 10.3.7, 10.3.8. Additionally, this short-term relay is only permitted when the shellfish are held in containers after relay rather than transplanted onto the bottom. *Id.* § 10.3.
[127] *Id.* § 10.4.7.
[128] *Id.*
[129] *Id.* § 2.3.6(a).
[130] NSSP-MO, *supra* note 29, at §§ II, ch. V, §.02(D), (E); CONN. GEN. STAT. § 26-192k; N.Y. COMP. CODES R. & REGS. tit. 6, § 45.4(e)(1).
[131] NSSP-MO, *supra* note 29, at § II, Purpose.
[132] Duhamel, *supra* note 77.
[133] BRENNESSEL, *supra* note 4, at 98; *see* Ray Huling, Presentation at University of Rhode Island Marine Affairs Seminar Course (Oct. 31, 2012).

RI-DEM coordinates with the RI-DOH on shellfish sanitation regulations, and RI-DOH's stance is for elimination of all potential risk to consumers.[134] The desire to provide maximum protection dictates grow-out purification times longer than the federally mandated minimum. However, Rhode Island's excessive increase in depuration time correlates to RI-DEM's second justification – a lack of enforcement manpower.[135]

Throughout the shellfish industry, there is a fear that persons will harvest shellfish from closed waters and these contaminated shellfish will reach the market, causing illness.[136] RI-DEM enforcement staff is already worn thin trying to patrol closed waters to prevent harvest.[137] By permitting culture in and relay from closed waters, the jobs of enforcement staff could become increasingly difficult as they need to distinguish between those legally tending gear or harvesting in closed waters and those illegally harvesting contaminated stocks.[138] Loosening the regulations would increase the monitoring requirements of RI-DEM's enforcement staff, and RI-DEM views the potential benefits of opening up more areas to relay as not worth the increase in associated time, cost, and risk. Despite RI-DEM's reasons to justify the one-year grow-out requirement, there are valid counterarguments that support changing the current regulations.

In regards to the public health concern, the only scenario in which an extended grow-out period is justified is when the shellfish are collected from waters that are contaminated by heavy metals or other non-biological contaminants. Such contaminants take a significantly longer period of grow-out to reach levels safe for human consumption, often several months.[139] Such contamination is common in shellfish grown in or around marinas where there are more frequent and intense inputs of anthropogenic contamination.[140] Therefore, shellfish grown in marina waters would typically require significantly longer grow-out periods than the federal minimums. However, for shellfish transferred from waters impacted exclusively by biological contamination, the public health concern will likely be satisfied with the minimum grow-out periods called for in the model ordinance, as other states have successfully demonstrated.[141]

The bigger problem is that RI-DEM lacks sufficient resources to adequately patrol restricted waters with relay projects underway.[142] However, alternative funding methods could be employed to ease this burden. For example, in New York, growers must pay to have a monitor aboard their vessels as they carry out relay depuration projects.[143] In fact, Rhode Island employs this same technique for

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[134] *Shellfish Inspection Program: Mission*, RHODE ISLAND DEP'T OF HEALTH, http://www.health.ri.gov/programs/shellfish/ (last visited Dec. 6, 2013); *see* Interview with Michael Rice, Professor of Fisheries and Aquaculture, University of Rhode Island, in Kingston, R.I. (Dec. 24, 2012) [hereinafter Rice Interview].

[135] Migliore Interview, *supra* note 23.

[136] *Id.*

[137] *Id.*

[138] *See id.*

[139] NSSP-MO, *supra* note 29, at § IV, ch. II, §.06.

[140] Rice Interview, *supra* note 134; *see also* NSSP-MO, *supra* note 29, at § II, ch. IV, Requirements for the Authority, § .05(A) (limiting the available water classifications for marina waters to conditionally approved, conditionally restricted, or prohibited).

[141] *See* Carden, *supra* note 72; Getchis, *supra* note 93.

[142] *See* Migliore Interview, *supra* note 23.

[143] Carden, *supra* note 72.

aquaculture sites that have been grandfathered in conditionally approved waters. If the growers want to work on their sites while the area is closed, they must pay to have an enforcement officer accompany them to the site.[144] This shifts the cost from the state agency onto the industry, although it is unclear if this pay-to-play system would be too costly for private projects.[145] However, expanding regulations to include new options will allow the individual growers to determine whether the additional cost provides worthwhile benefits.

RI-DEM's final supporting reason examined here, that there are sufficient sites currently available, is only true based on a status quo view of the Rhode Island shellfish industry. Furthermore, the fact that a site may be located in open waters does not necessarily mean that the site is suitable or practical for aquaculture. Many people foresee expansion of shellfish aquaculture in the future both locally and globally.[146] Expansion of the Rhode Island shellfish aquaculture industry may require more access to submerged bottom than currently available, although the greater need is likely to be seed taken from restricted waters.[147]

Current seed supply is from cultured sources, often from upwellers[148] in marina waters or in approved waters,[149] but the supply is unlikely to support anticipated expansion.[150] With a shortage of seed from approved waters, growers are likely to seek wild seed, perhaps from restricted waters.[151] Utilizing restricted waters as a seed source may also require relay of some adults out of these closed waters in order to reduce population density and improve reproductive success.[152] Therefore, a benefit could be gained from regulatory change in regards to both seed size and market-size shellfish. However, it should be noted that seed collected from marina waters or other waters contaminated with heavy metals will face the likely problem of necessary longer grow-out periods.

Despite the existence of justifications for changes to relay regulations, RI-DEM has chosen to maintain its restrictive regulations. The balancing of risks against potential benefits may be skewed by

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[144] Migliore Interview, *supra* note 23.

[145] *Id.* This expectation is supported because in New York there is only one project that takes advantage of the state's option to pay for monitors and relay market-size shellfish. Carden, *supra* note 72.

[146] BRENNESSEL, *supra* note 4, at 3; Lindell, *supra* note 17, at 3.

[147] *See* Rice Interview, *supra* note 134; Migliore Interview, *supra* note 23.

[148] An upweller is a container in which shellfish seed is placed to be grown to a sufficient size to be transplanted to an aquaculture site. The upweller is connected to a water source – often estuaries or other marine waters – through pipes that allow water to flow without allowing the seed to escape. The water flow provides plankton for the seed to feed upon. Gef Flimlin, *Nursery and Growout Methods for Aquacultured Shellfish*, Northeastern Regional Aquaculture Center Publication No. 00-002 (on file with author).

[149] Rice Interview, *supra* note 134. The seed cultured in marina waters must undergo a relay-style transfer to approved waters and comply with the twelve-month grow-out requirement of the RI-DEM regulations. Aquaculture of Marine Species in Rhode Island Waters (proposed Aug. 21, 2012) (to be codified at 12-080-053 R.I. CODE R. § 8.9).

[150] Lindell, *supra* note 17, at 5.

[151] *Id.* Currently, RI-DEM also prohibits collection and possession of wild shellfish seed, so a regulatory change to permit relay of wild seed from restricted waters would additionally require a regulatory change permitting collection of wild seed. *See* 12-080-053 R.I. CODE R. §§ 4.21, 4.35.1-2, 4.35.6-2 (establishing minimum sizes for shellfish and prohibiting possession of shellfish below the minimum size).

[152] *See* Dora Carolina Marroquin-Mora & Michael A. Rice, *Gonadal Cycle of Northern Quahogs,* Mercenaria mercenaria *(Linne, 1758), from Fished and Non-Fished Subpopulations in Narragansett Bay*, 27 J. SHELLFISH RESEARCH 14 (2008) [on file with author].

the tension between wild harvest and aquaculture in Rhode Island. The RI-CRMC explicitly recognizes this tension historically[153] and also implicitly addresses its continued existence by setting a policy to deny private shellfish aquaculture leases in uncertified waters "which contain significant shellfish stocks available … for the free and common fishery."[154] RI-DEM's relay regulations are likely also in response to this same concern for avoiding conflict between the wild harvest fishery and aquaculture.

B. Potential Regulatory Changes in Rhode Island

Although the existing regulations comply with federal requirements, they remain a constraint on potentially viable industry expansion. The RI shellfish aquaculture industry is limited because lease sites are typically only available in approved waters.[155] Given that many viable shellfish culture and seed sites are currently within closure lines, the ability of shellfish aquaculture to flourish without utilizing relay is limited.[156] As noted above, Canadian producers of mussels have reached their biological and social carrying capacities, and therefore Rhode Island is poised to meet an anticipated gap in supply availability with the comparatively high carrying capacity of the Bay.[157]

However, in order to become a major source of shellfish via relay and aquaculture, Rhode Island regulations would need to be altered to allow for faster delivery to market after transfer out of restricted waters for depuration. Under the current regulatory scheme, the shellfish must undergo grow-out for one year following transfer, which reduces economic viability of relay projects because, even when relayed as seed, mussels and some other shellfish will reach market size in less than a year.[158]

The key to increasing the utility of shellfish relay is to reduce grow-out time requirements. These reductions have been called for by aquaculture industry representatives, and RI-DEM has responded with the proposed regulation changes discussed above.[159] Although these changes are a step in the direction of improving viability of aquaculture relay depuration, the actual impact of the regulations on project timeframes, and therefore economic viability, is negligible.

Even though the new regulations cut the grow-out time requirements in half, six months is still a significant grow-out period. The inclusion of minimum growth requirements effectively eliminates any time reduction as the growth requirements are designed to mimic the anticipated growth of shellfish over a twelve-month period.[160] This addition of a growth requirement may also place greater restrictions on relay of market-sized shellfish because they grow at a slower rate than shellfish transferred at seed size. Alternative changes could expand options for shellfish growers without placing increased risk on consumers. These changes could be blanket reductions for all species or they could be species-specific.

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[153] *Red Book, supra* note 15, at § 200.4(B)(2).
[154] *Id.* at § 300.11(E)(2).
[155] *See id.*
[156] *See id.* at § 200.4(B)(1); RAY HULING, HARVESTING THE BAY 140 (2012).
[157] *See* Byron et al, *supra* note 14, at 1743, 1744 (citations omitted).
[158] 12-080-053 R.I. CODE R. § 8.9; Lindell, *supra* note 17, at 3; *see* CSSP, *supra* note 34, at § 2.3.6(a).
[159] Duhamel, *supra* note 77.
[160] *Id.*

C. Justifications for Grow-out Time Requirement Reductions

With few exceptions, shellfish naturally reduce contaminant levels within their tissues to levels that are safe for human consumption in three days to one week.[161] This short depuration time is recognized by federal regulations in permitting relays with grow-out periods of as little as six days.[162] Although depuration rates are affected by factors such as temperature and the specific contaminant at issue, these variables can be addressed by inclusion of additional protective requirements and still allow for a shorter grow-out period.[163]

The rate at which shellfish filter water through their systems is directly related to water temperature.[164] Because depuration occurs via water filtration, shellfish will not purge contaminants from their tissues when they are not actively filtering water.[165] Many states take this factor into account by requiring minimum water temperatures throughout the minimum grow-out period, and drops in temperature below a given threshold necessitate a restart of the minimum time period.[166] Some states also adopt seasonal restrictions, prohibiting relay during the winter months in recognition of lower temperatures.[167] Adding these temperature or seasonal requirements could allow RI-DEM to reduce relay grow-out timeframes without increased risk to consumer safety.[168]

Requiring contaminant reduction studies is another method to protect consumer safety while still allowing for reduced grow-out periods. Except for Rhode Island, every state examined here requires

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[161] Pietrak et al., *supra* note 37, at 36 (noting reduction to safe levels after seventy-two hours); E. Strogyloudi et al., *Estimating the Accumulation and Transfer of* Nodularia spumigena *Toxins by the Blue Mussel* Mytilus edulis: *An Appraisal from Culture and Mesocosm Experiments*, 48 TOXICON 359, 359 (2006) (noting reduction to safe levels after seventy-two hours); *cf.* R.J. Pruell et al., *Uptake and Depuration of Organic Contaminants by Blue Mussels (*Mytilus edulis*) Exposed to Environmentally Contaminated Sediment*, 91 MARINE BIOLOGY 497, 497 (1986) (noting half-lives of highly toxic contaminants such as PCBs of sixteen to forty-six days).

[162] NSSP-MO, *supra* note 29, at §§ II, ch. V, §.02(C), (E).

[163] *Id.* at § IV, ch. II, §.03; BRENNESSEL, *supra* note 4, at 38; Pruell et al., *supra* note 161, at 505. Additional factors impacting depuration rate include size of the shellfish (*see* Strogyloudi et al, *supra* note 161, at 370), shellfish species (*see* Röder et al, *supra* note 37, at 173), and salinity (*see* NSSP-MO, *supra* note 29, at § IV, ch. II, §.03).

[164] BRENNESSEL, *supra* note 4, at 38.

[165] *See* Lee-Ann Jaykus, Mary T. Hemard, & Mark D. Sobsey, *Human Enteric Pathogenic Viruses*, *in* ENVIRONMENTAL INDICATORS AND SHELLFISH SAFETY 124 (Cameron R. Hackney & Merle D. Pierson, eds. 1994); Strogyloudi et al., *supra* note 161, at 368.

[166] N.Y. COMP. CODES R. & REGS. tit. 6, § 45.4(e)(1) (requiring a minimum temperature of fifty degrees Fahrenheit); *Shellfishing Area Classifications*, CONN. DEPT. OF AGRICULTURE, http://www.ct.gov/doag/cwp/view.asp?a=1369&q=259172 (last visited Dec. 6, 2014) (requiring a minimum temperature of fifty degrees Fahrenheit).

[167] N.Y. COMP. CODES R. & REGS. tit. 6, § 45.4(a)(2) (prohibiting relay between Oct. 11 and Mar. 31).

[168] Although monitoring of water temperatures could increase RI-DEM's operating costs, these cost increases can be avoided through simple adoption of a seasonal restriction. The costs can also be mitigated by requiring the growers to perform the monitoring or pay for RI-DEM's monitoring. Passing the cost of the test on to the growers will allow greater flexibility because each individual can decide whether her business model is better supported by a longer relay grow-out period at a reduced cost or a shorter period with increased costs.

contaminant reduction studies for some or all of their relay projects.[169] These studies can be costly, but the costs can be passed on to growers. Many states require that the grower provide either his or her own testing or funding for state tests.[170] By passing the costs on to the grower, each can make an independent determination of whether it is economically advantageous to pay for these tests to obtain a shorter grow-out period.[171]

Requiring these contaminant reduction studies also serves the purpose of accounting for potential risks in shorter grow-out periods. Although one-week grow-out periods are sufficient for most shellfish with most contaminants, certain variables reduce the depuration rate and necessitate a longer grow-out period.[172]

One of the major sources of increase in necessary depuration time is contamination with heavy metals or highly toxic substances such as PCBs (polychlorinated biphenyls).[173] Heavy metals can take up to eighty-four days to decrease to levels that are safe for human consumption.[174] In order to avoid overly complex regulations accounting for these various factors, contaminant reduction studies can indicate on a case-by-case basis where additional depuration time is required. Employing these studies would allow greater flexibility for aquaculture relay projects with little additional cost to RI-DEM and should improve the economic position of Rhode Island in the shellfish market.

D. Justifications for Species-Specific Regulations

Regulation changes may be more appropriate if they are specialized to deal differently with individual species rather than by a blanket change for all species. Although many factors influence the filtration rates of shellfish, filtration rate is largely species-specific.[175] For example, filtration rates

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[169] CONN. GEN. STAT. § 26-192k (noting that Conn. requires testing before harvest); N.Y. COMP. CODES R. & REGS. tit. 6, § 45.4(e)(1) (noting that N.Y. requires testing before harvest, and for relay of market-sized shellfish, testing is also required at the time of relay); WASH. ADMIN. CODE §§ 246-282-032(3)(c), (4), (7) (Wash. requires testing for any relays of less than six months); Sawyer Interview, *supra* note 88 (explaining that Mass. requires testing at the time of relay and again when the shellfish are harvested). The NSSP-MO also requires contamination reduction studies for any relay less than sixty days and any relay involving contaminants other than microbial contaminants. NSSP-MO, *supra* note 29, at § II, ch. V, §.02(C). In Rhode Island, the regulations do not expressly require contaminant reduction studies. However, all current relay programs are carried out by the state, and in practice, the state does conduct these studies. Migliore Interview, *supra* note 23.

[170] *See, e.g.*, N.Y. COMP. CODES R. & REGS. tit. 6, § 45.5(c) (requiring payment of "supervision fees" to pay for salary of employee required to conduct the extensive testing required for relay of market-sized shellfish).

[171] In New York, for example, only one project has selected to incur the extensive supervision fees for market-sized relay. However, this program has proven economically viable, has continued for many years, and has never required an extension of the grow-out requirement beyond the twenty-one day minimum. Carden, *supra* note 72.

[172] *See* NSSP-MO, *supra* note 29, at §§ III, ch. V, §.02; IV, ch. II, §.06.

[173] *Id.* at § IV, ch. II, §.06; Pruell et al., *supra* note 161. Currently, seed cultured in upwellers in marinas typically have heavy metal contamination, and such contamination would likely be presumed even from wild shellfish collected from an area close to a marina or other industrialized area. *See* Rice Interview, *supra* note 134.

[174] NSSP-MO, *supra* note 29, at § IV, ch. II, §.06.

[175] B.L. Bayne, R.J. Thompson, & J. Widdows, *Physiology: I, in* MARINE MUSSELS: THEIR ECOLOGY AND PHYSIOLOGY 121, 142-43 (B.L. Bayne ed., 1976); F. Møhlenberg & H.U. Riisgård, *Filtration Rate, Using a New Indirect Technique, in Thirteen Species of Suspension-Feeding Bivalves,* 54 MARINE BIOLOGY 143, 146 (1979); Hans Ulrik Riisgård, *On Measurement of Filtration Rates in Bivalves – The Stony Road to Reliable Data: Review and Interpretation,* 211 MARINE ECOLOGY PROGRESS SERIES 275, 278 (2001).

compiled by Riisgard indicate that blue mussels, *Mytilus edulis*, filter at more than double the rate of quahogs, *Mercenaria mercenaria*.[176] With these large differences in filtration rate, species-specific grow-out requirements could allow relay projects of species with faster filtration rates, like mussels, to proceed in shorter time periods without increased risk to consumer safety, while longer grow-out times could be required for species with slower filtration rates, like quahogs.

Potential complications do exist for species-specific regulations, and these potential problems need to be carefully considered before making any regulatory changes. First, having different regulations for every species could become overly complicated, leading to difficulty for both the regulated community and enforcement personnel. Second, as noted above, filtration rate is influenced by many factors, for example temperature, in addition to species.[177] Adequately determining a safe grow-out period for every shellfish species could potentially be an intensive task for RI-DEM because of the influence of other factors.

One way to overcome the burden of species-specific regulations would be to limit specialized regulations to only a few, major species. Extensive research is already available on the major aquaculture species, including filtration rates.[178] With extensive knowledge already available, less agency time and resources will be required to set specialized regulations. Additionally, by highlighting only the few most common species, there is less potential for confusion among the regulated industry or enforcement personnel from complexity of the regulations. RI-DEM has already begun this species distinction in the proposed relay regulation changes by distinguishing separate growth requirements after relay for oysters and quahogs, leaving all other species with one generic requirement.[179] RI-DEM could continue this species distinction to allow for expansion of the shellfish aquaculture industry without increased risk to consumer safety.

If RI-DEM determines that species-specific regulations are unwarranted even for key species, a simpler distinction could be made between shellfish transferred as seed and those transferred beyond seed-size. The distinction between seed and post-seed size is already made in the regulations, but the relay grow-out times are the same for both groups.[180] However, shortening the grow-out requirements for seed-size relay alone may easily be justified because (1) all contaminants will be reduced below levels of concern by the time the seed reach market size, and (2) the enforcement difficulties will be lessened because RI-DEM already regulates based on shellfish size. Increasing the potential for seed relay would also be beneficial because seed source is likely to be the limiting resource for future shellfish aquaculture expansion, particularly mussel aquaculture.[181]

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[176] Riisgård , *supra* note 175 (indicating filtration rate as a function of shellfish weight); *see also* Bayne, Thompson, & Widdows, *supra* note 175, at 138 (noting that *Mytilus edulis* has been shown to have higher filtration rates when compared with another *Mytilus* species as well as a species of *Modiolus*).

[177] John Widdows & Peter Donkin, *Mussels and Environmental Contaminants: Bioaccumulation and Physiological Aspects, in* THE MUSSEL MYTILUS: ECOLOGY, PHYSIOLOGY, GENETICS AND CULTURE 389 (Elizabeth Gosling ed., 1992).

[178] *See* D. Roberts, *Mussels and Pollution, in* MARINE MUSSELS: THEIR ECOLOGY AND PHYSIOLOGY 67, 67 (B.L. Bayne ed., 1976); *see also* Riisgård, *supra* note 175, at 275, 278.

[179] *See* Aquaculture of Marine Species in Rhode Island Waters (proposed Aug. 21, 2012) (to be codified at 12-080-053 R.I. CODE R. §§ 9.9.1, 9.9.2, 9.9.3).

[180] 12-080-053 R.I. CODE R. §§ 8.8, 8.9.

[181] Lindell, *supra* note 17, at 5; *see also* Marroquin-Mora & Rice, *supra* note 152, at 1.

Shellfish relayed as seed will require at least six months to reach market size, likely longer.[182] By the time seed reach market size, all non-metal contaminants will be below levels of concern because of both depuration through filtration and dilution through tissue growth.[183] Metals contamination is often viewed as the more significant problem, but in Rhode Island metal levels are already below federally set tolerance levels, and by the time relayed seed reach market size, the metals in their tissues are no longer detectable.[184] Even seed collected from within contaminated sediment, which have greater contaminant levels in their tissues, still have undetectable levels of contaminants in their tissues by the time they reach market size after relay grow-out.[185]

Therefore, because shellfish relayed as seed will be safe for human consumption by the time they reach market size, seed relay grow-out times could be reduced without increasing consumer risk and without adding undue burden to enforcement personnel. The current Rhode Island regulations permit relay of seed from other than approved waters,[186] and therefore RI-DEM enforcement personnel are already charged with monitoring for illegal versus permitted seed relay. Lowering the grow-out requirement would only shift the enforcement personnel's duties post-relay. If RI-DEM finds that these additional monitoring duties are still overly burdensome, shifting the cost of the additional monitoring to the grower would permit each to decide whether bearing the additional cost is worthwhile for her business model. As this section has described, there are many potential regulatory changes that could permit expansion of shellfish relay in Rhode Island and therefore allow for expansion of the Rhode Island shellfish industry, most with minimal impact to RI-DEM and its shellfish industry regulation and enforcement mandates.

IX. Conclusion

With the growing demand for shellfish in southern New England, nationally, and globally, the economic potential of shellfish aquaculture is high. Unfortunately, lease space and seed source for aquaculture is limited, and the non-use of contaminated waters increases this limitation. Relay depuration provides a method to expand aquaculture operations without increased consumer risk. While many states are already effectively utilizing relay programs to promote their local economies, RI has reduced the efficacy of this possibility by placing highly restrictive time requirements on post-depuration grow-out periods. If Rhode Island wishes to compete in the shellfish marketplace, improve its economy, and provide new job opportunities to the state from this industry, RI-DEM should reevaluate its relay depuration regulations and consider reducing the minimum required grow-out time.

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[182] *See* Lindell, *supra* note 17.

[183] Robert Rheault, History of the Proposal to Culture Seed in Uncertified Waters for Aquaculture: Prepared for RI-DEM 1, 2 (June 2012) [on file with author]; Rice Interview, *supra* note 134.

[184] Rheault, *supra* note 183, at 3; Rice Interview, *supra* note 134.

[185] *Id*.

[186] 12-080-053 R.I. CODE R. §§ 8.8, 8.9. Again, currently only seed cultured in other than approved waters may be transferred as current regulations prohibit collection of wild seed. *See* 12-080-053 R.I. CODE R. §§ 4.21, 4.35.1-2, 4.35.6-2 (establishing minimum sizes for shellfish and prohibiting possession of shellfish below the minimum size).

Appendix
Comparison of State and Federal Regulations

Jurisdiction	Minimum Grow-Out Time	Requirements for Minimum	Alternate Grow-Out Option	Requirements for Alternate	Grow-Out with No Testing	Grow-Out for Seed
Rhode Island[187]	12 Months	Projects must be done under the authority of DEM and DOH Directors				12 Months
Federal[188]	6 Days	Contaminant reduction study with "more intensive sampling"	14-60 Days	Contaminant reduction study	60 Days (only for microbial contamination)	6 Months
Connecticut[189]	14 Days	(1) Water temperature over 50 degrees and (2) purification verification study (i.e., contaminant reduction study)	Any permissible grow-out under NSSP-MO			
New York[190]	21 Days	(1) Water temperature above 50 degrees and (2) approval of the Dep't of Environmental Conservation (DEC requires a contaminant reduction study)				
Massachusetts[191]	3 Months	(1) Municipally-sponsored program, (2) completion of a spawning season, and (3) contaminant testing at time of relay and time of harvest				
Washington[192]	7 Days	Validation study (i.e., contaminant reduction study) with sampling from each harvest	8 Days – 6 Months	Validation study at least every 12 years or when conditions change	6 Months	
PEI[193]	6 Days	Process verification (i.e., contaminant reduction study)	14-21 Days	Fecal coliform testing	21 Days	6 Months

[187] Source: 12-080-053 R.I. CODE R. § 8.9.
[188] Source: NSSP-MO, *supra* note 29, at §§ II, ch. V, VI.
[189] Source: CONN. GEN. STAT. § 26-192k (2011).
[190] Source: N.Y. COMP. R. & REGS. tit. 6, § 45.4.
[191] Source: *Programs and Projects: Shellfish Sanitation and Management*, EXEC. OFFICE OF ENERGY AND ENVTL. AFFAIRS, COMMONWEALTH OF MASS., http://www.mass.gov/eea/agencies/dfg/dmf/programs-and-projects/shellfish-sanitation-and-management.html (last visited Mar. 25, 2014).
[192] Source: WASH. ADMIN. CODE § 246-282-032.
[193] Source: CSSP, *supra* note 34.