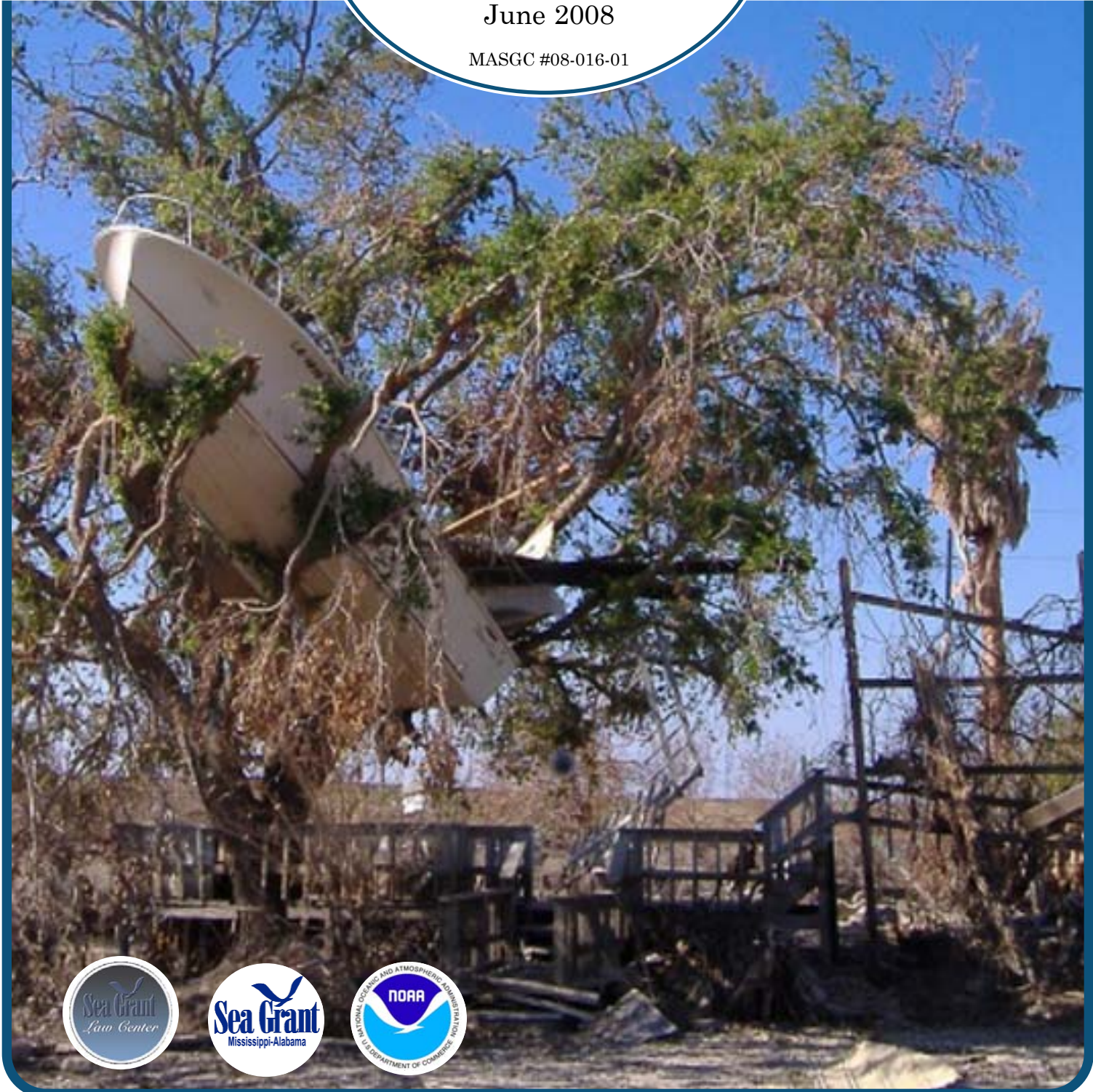


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What is Coastal Resiliency?

Introduction to Symposium Issue

Stephanie Showalter¹

We all know that living in coastal areas is risky business. Hurricanes, cyclones, and typhoons can destroy entire communities in a matter of hours. Cargo ships can introduce exotic species and viruses into coastal ecosystems threatening native wildlife and human health. Coastal economies based on natural resource extraction are vulnerable to declines in supplies and consumer demands.

Some risk in coastal areas is unavoidable. Coastal cities and towns generate food and energy, serve as entry points for global trade, and provide recreational opportunities for millions of visitors. Someone has to provide those essential services, so the losses from the occasional storm and flooding must be accepted as a cost of doing business or living in a dynamic environment. The losses in recent years, however, have been much greater than they should have been. We have significantly increased the risk of living and working in coastal areas. Houses, condominiums, and hotels are built right to the water's edge seemingly in complete defiance of the realities of the coastal environment. As the built environment encroaches on the sea, the natural buffers – wetlands and dunes – are destroyed, thereby further increasing our vulnerability to storms. Impervious surfaces and improperly installed septic tanks increase pollution. Coastal communities today are taking excessive risks with the lives, businesses, and property of their citizens.

The traditional management approach to coastal hazards is resistance - prevent the disaster from occurring in the first place. Resistance, as a scientific term, refers to the ability of a system to avoid disturbance. Galveston, Texas is a prime example. After the city was destroyed in 1900 by a hurricane, city leaders decided to engineer a solution to prevent a reoccurrence - a seventeen-foot high seawall. Unfortunately, such engineering marvels eliminate the protective functions of the natural ecosystems we live in and provide a false sense of security.

How, then, can we encourage coastal communities to reduce such excessive and expensive risks and learn to live with the unavoidable risks? To some, the emerging field of “Coastal Resiliency” holds the key. “Resilience thinking presents an approach to managing natural resources that embraces human and natural systems as complex systems continually adapting through cycles of change.”²

As a general concept, resiliency refers to the ability to recover from or adjust easily to misfortune or change, i.e. the ability to “bounce back.” The concept was first introduced to ecology by C.S. Holling in 1973.³ Holling suggested that natural systems have a “high capacity to absorb change without dramatically altering.” Stated another way, resiliency refers to the ability of a system to absorb shocks and still retain its basic function and structure.

An example of a resilient ecosystem is a forest. Forest fires are part of nature. They can be triggered by lightning or drought conditions. Forest species have evolved to live with the fires. Snakes may burrow deep into the soil to remove themselves from danger. Deer will flee the area to avoid the flames. Some tree species even depend on fire to reproduce. The pygmy pines in the New Jersey pine barrens, for instance, rely on the intense heat of a forest fire to release the seeds from the pine cones.

1. Director, National Sea Grant Law Center at the University of Mississippi School of Law.

2. B.H. WALKER AND D. SALT, *RESILIENCE THINKING: SUSTAINING ECOSYSTEMS AND PEOPLE IN A CHANGING WORLD* (2006).

3. C.S. Holling, *Resilience and Stability of Ecological Systems*, *ANNUAL REVIEW OF ECOLOGY AND SYSTEMATICS* 4: 1–23 (1973).

As a result, when a healthy forest ecosystem is disturbed by a fire, it will bounce back rather quickly. The forest that emerges after the fire will not be identical to the one that stood before, but it is still there. It will survive intact.

Social scientists have recently begun exploring whether the concept of “ecological resilience” could also be applied to social systems, such as institutions (hospitals) and communities, particularly in the context of disaster management. Like ecosystems, social systems are stressed by the impacts of natural hazards and long-term environmental change. Can we learn from nature and increase the capacity of social systems to cope with stress?

Socio-ecological resiliency has been defined as the “capacity of linked social-ecological systems to absorb recurrent disturbances such as hurricanes or floods so as to retain essential structures, processes, and feedbacks.”⁴ Such resiliency can be measured by: (1) degree to which system is capable of self-organization (versus lack of organization or organization forced by external factors) and (2) degree to which the system can build capacity for learning and adaptation.⁵

The poster child for a non-resilient socio-ecological system is New Orleans following Hurricane Katrina. Governmental policies and flood insurance encouraged development in the Lower Ninth Ward right in the shadow of the levees. The levee gave residents a false sense of security and few homes complied with building codes designed to mitigate flood and hurricane damage. Louisiana’s wetlands were sacrificed to massive flood control projects and oil and gas canals. While these factors made New Orleans very vulnerable to floods and hurricanes, it was the failure of the human systems (communication networks, evacuation plans, emergency response) that increased the death toll and suffering after the levees were breached.

What would a resilient community or city look like? David Godschalk, professor of city and regional planning at the University of North Carolina, suggests that in a resilient city development would be guided away from high hazard areas, buildings would meet hazard code standards, the environment would be protected, and governmental and nongovernmental organizations would be prepared to respond.⁶

While coastal resiliency is an intriguing theory, much work remains to be done before that theory can be successfully applied on the ground. With this inaugural symposium issue of the *Sea Grant Law and Policy Journal*, we hope to encourage dialogue and additional research on the concept of coastal resiliency and its implementation. Although the authors of the selected articles come from a wide variety of fields, their objective is the same – help governments, communities, and individuals build safer coastal communities.

This issue of the *Journal* starts with an overview of the government and academic institutional roles in Gulf of Mexico coastal resiliency by Sharon Hodge with Mississippi State University’s Northern Gulf Institute. Her article explores the various resiliency definitions and discusses the expansion of resiliency planning and implementation following Hurricane Katrina. She also provides a survey of the state of practice by government and academic sectors in the Gulf of Mexico, with a brief mention of the role of private and non-governmental organizations.

Sandra Nichols and Carl Bruch with the Environmental Law Institute in Washington, D.C. provide some food for thought with their article on adaptive management frameworks to prepare for the impacts of climate change. Following an overview of the current state of knowledge with respect to climate impacts, Nichols and Bruch explore the revisions to governance structures which will be needed to incorporate adaptive management approaches. The use of adaptive management could reshape

4. Adger et al, *Social-Ecological Resilience to Coastal Disasters*, SCIENCE 309: 1036-39 (2005).

5. *Id.*

6. David R. Godschalk, *Urban Hazard Mitigation: Creating Resilient Cities*, NATURAL HAZARDS REVIEW, 4(3): 136 - 143 (2003).

coastal management law and policy, but a number of challenging issues may arise as we move in that direction including equity, public participation, and public education and capacity building.

Megan Higgins from the Rhode Island Sea Grant Legal Program and Marine Affairs Institute at Roger Williams University School of Law focuses on the legal and policy changes of sea-level rise. Her article addresses the causes of sea level rise, its impacts on beaches and coastal property, the legal implications of existing sea-level rise policies, and the current status of sea-level rise litigation. She concludes with a discussion of the available adaptation responses to alleviate the effects of sea level rise on beaches and coastal property.

Thomas Ruppert, Assistant in Environmental Law at the University of Florida Institute for Food and Agricultural Sciences and Levin College of Law Conservation Clinic, examines the effect of Florida's permitting program for construction of major habitable structures and armoring on Florida's beaches and sea turtles. Ruppert reviews beach nourishment and Florida Beach Management Policy generally before examining the process for permitting construction along Florida's beaches, including a description of the program, examples of problems, trends identified in permitting, and suggestions for reform in the program that respond to the realities of shoreline migration, decreasing sand supply, increasing costs of nourishment, and sea-level rise.

Richard Hartman, Frank Alcock, and Chris Pettit examine the recent spike in local government regulation of fertilizer application and use through municipal ordinances. The dramatic increase in the number of harmful algal blooms in recent years can be linked, in part, to increased nutrient loading from agricultural fields, lawns, golf courses, and other non-point sources of pollution. Hartman and fellow authors provide an overview of all salient fertilizer ordinances enacted in Florida since 2003 and examine the variation among the substantive components of these ordinances. The crucial role that homeowner associations and related neighborhood and community organizations will have on the ultimate impact of fertilizer ordinances enacted by municipal governments is also explored.

John D'Agostino with the New Jersey Coastal Planning Office describes New Jersey's approach to statewide resilience policy. The state's effort has been a multi-layered regulatory and planning effort that seeks to support a variety of hazard mitigation efforts across a diverse coastal zone. D'Agostino discusses the tools which have been developed in New Jersey to manage the state's diverse coastal areas and build coastal resiliency.

This issue of the *Journal* concludes with an article about flood insurance litigation by Ernest Abbott, founder and principal of FEMA Law Associates, PLLC, a firm providing legal services to the emergency management community. Abbott examines the efforts of the NFIP to become financially self-sustaining and shows how these efforts may have created misunderstanding – subsequently reflected in litigation – about the need for and scope of flood insurance.

The future is full of uncertainties for coastal communities. No one can predict where the next hurricane will strike or the next exotic species will invade. Coastal communities must learn how to plan for uncertainties and adapt quickly to changes and disturbances. It is important to remember that resiliency is a way of thinking, not a formula to apply. There is no one “right” way to build a resilient community. Resiliency will emerge not through major policy changes, although those will be needed, but through the combined efforts of federal, state, and local governments, academic institutions, businesses and individuals.

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Government and Academic Institutional Involvement in Gulf Coast Resiliency¹

Sharon H. Hodge, J.D.²

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I. Introduction

This contribution to the inaugural edition of the Sea Grant Law and Policy Journal addresses an issue with significant societal, economic and ecological implications for the citizens along the northern coast of the Gulf of Mexico. How do we encourage and support development of our coastlines so that the communities are resilient to reoccurring hazards and prepared to face future challenges? Coastal resource and emergency managers face the enormous challenge of balancing the sirens' song of coastal living with the realities and responsibilities of protecting people and property. As a lifelong resident of coastal areas, this author will confess to falling under the magical spell of this fragile interface between land and sea in defiance of all things logical. The migration by others also enchanted by the shore has continued at a rapid pace. In 2003, it was estimated that 153 million Americans, or 53% of the U.S. population, lived in a coastal county.³ Although changes in public policy might be able to address the steady shift in populations to the coast,⁴ governmental and academic programs generally do not specifically address how to turn the migration patterns away from the coasts. Instead, the focus has been on building "resiliency."

Several events during this decade shifted this nation's focus toward disaster recovery and rebuilding like never before. We survived the mysteries of Y2K and the possible breakdown of all modern systems related to computers' internal clocks programmed for decades with a two-digit year field. The events of

¹ This paper was presented during the Sea Grant Law and Policy Journal's inaugural symposium on Coastal Resiliency held on March 25–26, 2008 at the University of Mississippi in Oxford, Mississippi. Coastal resiliency refers to the ability of coastal cities, towns, and communities to adapt to and recover from natural hazards, including hurricanes, tsunamis, floods, and disease epidemics. Seven authors were selected to present papers on a wide range of topics related to coastal resiliency. Powerpoint presentations and additional information about the symposium are available at <http://www.olemiss.edu/orgs/SGLC/National/SGLPJ/SGLPJ.htm>.

² Northern Gulf Institute, a NOAA Cooperative Institute. This paper was prepared by Sharon Hodge under award NA06OAR4320264 06111039 to the Northern Gulf Institute by NOAA's Office of Ocean and Atmospheric Research, U.S. Department of Commerce.

³ KRISTEN M. CROSSETT, ET. AL., NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, POPULATION TRENDS ALONG THE COASTAL UNITED STATES: 1980-2008 (Sept. 2004).

⁴ Please see two contributions to this issue of the Sea Grant Law and Policy Journal addressing policy development in this field: Sandra Nichols, *Coastal Adaptation – Keys for Successful Legal and Policy Response*, and Megan Higgins, *The Legal and Policy Impacts of Sea Level Rise on Beaches and Coastal Property*.

September 11, 2001 clearly changed history forever. Most of the changes after 9/11 relate to everyday air travel, but a large federal agency was quickly created to help bolster our security and make us more resilient to the next attack. Most of those issues have been addressed on a federal level, with assistance by state and local law enforcement. The threat from terrorism is an additional element that coastal resource and emergency managers must address in their planning efforts. While terrorism is not limited to coastal areas, most major cities are located on or near our coasts. The coast, therefore, presents unique security issues as an entry point for international shipments by sea and the primary national boundary.

While the December 26, 2004 tsunami in the Indian Ocean did not hit close to home, global news coverage and prevalent video coverage gave us images of devastation we could never have imagined before. We were once again reminded of the vulnerability of coastal areas around the world when Tropical Cyclone Nargis hit low-lying areas of Myanmar on May 3, 2008 resulting in over 134,000 dead or missing.⁵ And the historic earthquake in central China on May 12, 2008 serves as a reminder that coastal areas are not the only areas at risk. The fatigue from responding to these major losses is setting in. Coastal areas were not the only areas facing threats recently. Historical flood events, such as the 1997 floods of Grand Forks, North Dakota, astounded us as we watched historic buildings burn on the nightly news as firefighters stood by – helpless to reach the downtown through the flood waters. The importance of implementing resiliency concepts worldwide is more critical now than ever.

This paper will provide an overview of the government and academic institutional roles in Gulf of Mexico coastal resiliency. Sources of risk like climate change, sea-level rise, and terrorists are global, but the impacts are definitely in my back yard,⁶ and in yours. Just as the problems arise at different levels, the solutions are multi-level. Many solutions are relevant to the entire country, but some are distinctly beneficial to the coastal areas and most important for the Northern Gulf of Mexico region. The first part of the paper provides a discussion of the expansion of resiliency planning an implementation related to Hurricane Katrina and its impacts on Gulf Coast communities. The second part provides a catalog of definitions used to describe the various elements of “resiliency” and their associated applications areas. This is followed by a survey of the state of practice by government and academic sectors, with a mention of the role of private and non-governmental organizations. The paper concludes with a discussion of the specific challenges facing the coast of the northern Gulf of Mexico and some recommendations to address immediate and long term needs.

II. Expansion of Resiliency Work in the Wake of Hurricane Katrina

Hurricane Katrina was by almost all measures the most devastating disaster to hit the United States. In Harrison County, Mississippi 68% of, or 48,617, of homes were damaged or destroyed. Some communities lost 90% of the structures.⁷ Most can agree that failures occurred at many levels before and after Katrina, with loss of many lives in the floods in New Orleans. The state and local governments were overwhelmed and federal elements missed many opportunities to do more to rescue and protect life. However, many within the government ranks rose to the occasion and made heroic efforts to save those stranded by the ravaged and flooded areas after the hurricane. The Coast Guard serves as a stellar example of first response to Katrina. U.S. Geological Survey operations based in Lafayette, Louisiana employed 30 of their vessels and all available staff to assist in rescuing victims in flooded New Orleans in the days immediately following Katrina.⁸

⁵ Seth Mydans, *Weeks After Cyclone in Myanmar, Even Farmers Wait for Food*, N.Y. TIMES, May 26, 2008.

⁶ Perhaps it's time for a new acronym, DIMBY, Definitely In My Back Yard.

⁷ HARRISON COUNTY, LONG-TERM COMMUNITY RECOVERY PLAN (Aug. 2006) available at <http://www.governorbarbour.com/Recovery/links/documents/HarrisonPlan.pdf>

⁸ U.S. Geological Survey, *USGS Participates in Interagency New Orleans Search and Rescue Mission: A Summary of Activities*, <http://www.nwrc.usgs.gov/hurricane/katrina-help.htm>.

Total impacts to health and loss of income and property have not yet been fully realized. Short-term needs included first aid and evacuation of the seriously ill. Ironically, those who stayed and accepted housing assistance from FEMA ended up with trailers emitting toxic fumes. Many occupants fell ill trying to survive in these cramped quarters. Many more residents, even those with permanent housing, are having difficulties living in the ravaged region. Some face personal economic ruin due to loss of a business or job. Given the great emotional stress, there has been a steady rise in mental health problems. Suicide rates in Harrison County, Mississippi remain at high levels more than two years after Katrina, and are perhaps related to toll of daily living in a disaster zone. The Mental Health Association of Mississippi is working hard to address this sad reality.⁹ The need for mental health treatment may continue for years. Federal and state agencies are working with non-governmental organizations to address “stress exhaustion” with programs such as “resilience coaching” and “resilience training”.

Nothing brought the importance of coastal community resiliency to the forefront like the 2005 hurricane season. Those storms resulted in an estimated combined loss of life of 1016 souls, (estimates by the National Hurricane Center range up to 1833).¹⁰ The National Hurricane Center estimates that Hurricanes Katrina and Rita caused \$85 billion of total damages to property.¹¹ The non-economic damage to individuals and society is immeasurable. First responders rarely weigh the cost of rescue at the time of a disaster, but common sense would suggest that it is much greater than the cost of avoiding the life-threatening scenario in the first place. With their devastating impacts, Katrina and Rita “opened a window of opportunity for creating more resilient communities.”¹²

III. Concept of Coastal Resiliency

Various definitions of “resiliency” have developed over the past decade or so. Important concepts related to resiliency are “hazard resistant community,” “risk management,” and “adaptability.”¹³ It is important to note that application of these terms is not limited to coastal zone management. There is a widespread movement: the resiliency focus is “an area of explorative research under rapid development with major policy implications for sustainable development.”¹⁴

Resiliency is one of the six principles of sustainability which is defined as “the ability or capacity to keep something going or the state of being durable or able to persist over time.”¹⁵ The six principles of sustainability are:

1. Use a consensus-building, participatory process when making decisions.
2. Maintain and enhance quality of life.

⁹ Press Release, Foundation for the Mid-South, *Community Resilience Grants Awarded to Nonprofit Organizations* (Nov. 20, 2007) available at http://www.fndmidsouth.org/Documents/FMS_BCR_PressRelease_Final.pdf.

¹⁰ 2005 Tropical Cyclone Fatalities, <http://www.weather.gov/os/hazstats/hurricane05.pdf>.

¹¹ NATIONAL HURRICANE CENTER, TROPICAL CYCLONE REPORT, HURRICANE KATRINA, 23-30 AUGUST 2005 (Dec. 20, 2005; Updated Aug. 10, 2006). This report also contains information on tropical wave history, storm surge, tornadoes, surface observations, fatalities, and damage cost estimates.

¹² Philip R. Berke and Thomas J. Campanella, *Planning for Postdisaster Resiliency*, THE ANNALS OF THE AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE, 604(1): 192-207 at 193 (2006).

¹³ Many of the definitions discussed in this section were compiled by the Resiliency working group of the Gulf of Mexico Alliance with great assistance by the Alliance Federal Workgroup and Resiliency Group. Lead support provided by Heidi Recksiek of NOAA’s Gulf Coast Service Center.

¹⁴ Stockholm Resilience Center: Research for Governance of Socio-Ecological Systems, www.stockholmresilience.org.

¹⁵ NATURAL HAZARDS CENTER, HOLISTIC DISASTER RECOVERY: IDEAS FOR BUILDING LOCAL SUSTAINABILITY AFTER A NATURAL DISASTER 11-17 (2006).

3. Build local economic vitality.
4. Promote social and intergenerational equity.
5. Protect environmental quality.
6. Incorporate disaster resilience and mitigation.¹⁶

The practice of sustainable development has a solid footing in national and international planning and conservation practices, and resiliency programs build on that foundation. “The concept of resilience provides a fresh and useful perspective on *sustainable development* – the notion that industrial development today must not jeopardize the well-being of future generations.”¹⁷ Governmental involvement is primarily focused on the response and recovery, mitigation, and planning of the built environment. However, a significant aspect of protecting property is restoration and conservation of natural environments.

A basic dictionary definition of “resilience” is an important place to start. Merriam-Webster’s online dictionary defines “resilience” as:

- (1) the capability of a strained body to recover its size and shape after deformation caused especially by compressive stress; (2) an ability to recover from or adjust easily to misfortune or change.¹⁸

Ecosystem resilience is the capacity of an ecosystem to tolerate disturbance without collapsing into a qualitatively different state that is controlled by a different set of processes. A resilient ecosystem can withstand shocks and rebuild itself when necessary. Ecosystems naturally evolve to a fairly resilient state (e.g., Mississippi River prior to channelization and levees).

C.S. Holling is widely recognized for introducing the concept of resiliency applied to ecosystems in his seminal piece *Resilience and Stability of Ecological Systems*.¹⁹ Holling shifted the perspective from a life and death cycle to a focus on “numbers of organisms and the degree of constancy of their numbers . . . viewing the behavior of systems . . . and the properties of the system concerned.”²⁰ Research by Holling and his associates matured to include elements of biodiversity and capacity:

- It is the buffer capacity or the ability of a system to absorb perturbation, or the magnitude of disturbance that can be absorbed before a system changes its structure by changing the variables.²¹

Resilience as applied to ecosystems has three defining characteristics:

- (1) The amount of change the system can undergo and still retain the same controls on function and structure; (2) the degree to which the system is capable of self-organization, and (3) the ability to build and increase the capacity for learning and adaptation.²²

¹⁶ *Id.* at 1-2.

¹⁷ Center for Resilience, *Resilience and Sustainability*, <http://www.resilience.osu.edu/ResSust.html> .

¹⁸ Merriam-Webster Dictionary online, <http://www.merriam-webster.com/dictionary/resilience> .

¹⁹ C.S. Holling, *Resilience and Stability of Ecological Systems*, ANNUAL REVIEW OF ECOLOGY AND SYSTEMATICS (1973).

²⁰ *Id.* at 4050.

²¹ Holling, C.S., *et. al.*, *Biodiversity in the Functioning of Ecosystems: an Ecological Synthesis*, in BIODIVERSITY LOSS: ECONOMIC AND ECOLOGICAL ISSUES, 44-83 (C. Perrings, *et. al.*, eds. 1995).

²² The Resilience Alliance, *Key Concepts: Resilience*, <http://www.resalliance.org/576.php>.

Social systems have the added capacity of humans who can anticipate and plan for the future. Some scoff at the term “natural disaster,” arguing that events such as Katrina should be referred to as “man-made disasters.”²³ Humans, however, are part of the natural world. We depend on ecological systems for our survival and we continuously impact the ecosystems in which we live from the local to global scale. Coastal management must address both nature’s forces and the impacts of “man-made” disasters, because what might be the perfect solution to protect human development could have negative impacts on the environment.²⁴

Resilience is a property of these linked social-ecological systems. Resiliency, when applied to social systems, refers to the capacity to cope with unanticipated dangers after they have become manifest; i.e. learning to bounce back.²⁵

The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase this capacity for learning from past disasters for better future protection and to improve risk reduction measures.²⁶

The approach to understanding what makes a community resilient has evolved into a science. For example, researchers funded by the National Science Foundation have developed a framework for resiliency which includes: robustness (ability to withstand disaster), redundancy (capability of satisfying function), and resourcefulness (identify and solve problems), and rapidity (restore function in timely manner).²⁷

A distinction should be made at this point between resistance and resilience. Disaster resistance emphasizes the importance of pre-disaster mitigation measures that enhance the performance of structures, infrastructure elements, and institutions in reducing losses from a disaster. Resilience reflects a concern for improving the capacity of physical and human systems to respond to and recover from extreme events.²⁸ Resilience is rooted in making choices about future losses when development decisions are made. While some would like to believe that lightning and other ill winds never strike twice, the likelihood is quite high that weather patterns will repeat. An area that experiences one high hazard event will likely experience many. Resiliency thinking may force us to choose what is lost in future disasters. This is absolutely a new way of thinking which places 100 percent responsibility for those losses on people, as opposed to nature.²⁹

A key component of local resiliency is self-reliance. “Local resiliency with regard to disasters means that a locale is able to withstand an extreme natural event without suffering devastating losses, damage, diminished productivity, or quality of life without a large amount of assistance from outside the community.”³⁰ Places such as New Orleans and Myanmar are on the low end of the spectrum of resiliency

²³ Bob Minzesheimer, *Deluge: A History of Katrina*, USA TODAY ONLINE, May 8, 2006, available at http://www.usatoday.com/life/books/reviews/2006-05-07-brinkley_x.htm.

²⁴ Personal Interview with Michael Carron, PhD, Chief Scientist, Northern Gulf Institute, March 15, 2008.

²⁵ AARON WILDAVSKY, *SEARCHING FOR SAFETY* (1991)

²⁶ UNITED NATIONS, *LIVING WITH RISK: A GLOBAL REVIEW OF THE INTERNATIONAL STRATEGY FOR DISASTER REDUCTION* (UN/ISDR) 16-17 (2004).

²⁷ Kathleen Tierney and Michel Bruneau, *Conceptualizing and Measuring Resilience A Key to Disaster Loss Reduction*, TR NEWS 250 MAY–JUNE 2007 14-17, available at http://onlinepubs.trb.org/onlinepubs/trnews/trnews250_p14-17.pdf.

²⁸ *Id.*

²⁹ S.B. Manyena, *The Concept of Resilience Revisited*, *DISASTERS* 30(4): 433-450 (2006).

³⁰ D.S. MILETTI, *DISASTERS BY DESIGN: A REASSESSMENT OF NATURAL HAZARDS IN THE UNITED STATES* (1999).

– they have a low capacity to respond to external shocks. An increase in community spirit, however, can lead to an increase in resiliency. “The reduction of social vulnerability through the extension and consolidation of social networks, both locally and at national, regional, or international scales, can contribute to increases in ecosystem resilience.”³¹ Failure to plan, however, is not unique to coastal zones. The failure to plan for the 500-year earthquake event could result in similar tragedy. Communities with plans in place can more quickly respond to the needs of their citizens and recover from disasters.

A key ingredient to responding effectively to a disaster is proper response planning,³² with the essential step of confirming that all assumptions are valid. For example, the evacuation call for New Orleans in advance of Hurricane Katrina was based on the assumption that all citizens had private transportation and a specific safe destination available. That assumption proved fatally flawed for hundreds of individuals.³³ Part of the problem was the lack of emergency shelters and temporary lodging which would accept pets. Calls for sheltering in place and shelters that accept family pets have been heeded since the storm and should benefit citizens in any region faced with the difficulties of evacuations.³⁴

For example, understanding the demographics of the community is critical to planning a sheltering program or evacuation plan. Many of Hurricane Katrina's victims were senior citizens who became trapped by floodwaters and drowned in their homes, according to a newly released accounting of the 2005 storm. The average age for men who died in the northern Gulf Coast hurricane was 64 years old, according to a Scripps Howard News Service analysis of data recently released by the Centers for Disease Control and Prevention. Female victims were older, averaging 71. That is more than 23 years older than the average age of women who died during the 2004 Atlantic hurricane season and 13 years older than women who died in other 2005 storm events.³⁵ If emergency planners had known more about the demographics of their respective jurisdictions, more people may have been evacuated or other, safer, arrangements made.

Financial systems in coastal communities must also be resilient. For those individuals whose homes are their savings or retirement plans, income is lost forever when the properties are washed away. Tourism to ravaged areas declines, as does the financial viability of tourist attractions and their employees. Of course, the Gulf of Mexico did experience an unprecedented rebuilding boom with a huge increase in sales tax, but as a wise man once said, even a 10 car pile-up on the interstate is economic development. However, resiliency is not just the ability of a community to begin rebuilding quickly. The hallmark of a resilient community is its wise use of resources during the rebuilding process. The right economic incentives are as important as education and regulation in guiding development and rebuilding in the direction we want it to go. State economic development agencies can help make the connections with the private sector to get the economy rolling again. Federal grants and tax incentives, such as the Gulf Opportunity Zone Act of 2005, can spur capital investment back into the damaged region.³⁶

Similar in approach, but with less of a focus on risk management, “smart growth” has been widely adopted in planning circles. Definitions of smart growth range slightly, but a useful one comes from the

³¹ Tompkins, E. L., and W. N. Adger, *Does Adaptive Management of Natural Resources Enhance Resilience to Climate Change?*, *ECOLOGY AND SOCIETY* 9(2): 10 (2004).

³² Henry R. Renteria, *Mutual Aid and State Plans are Key to Effective Emergency Management*, *NATURAL HAZARDS OBSERVER* 43(2): 4-6 (Nov. 2007).

³³ Maureen Fordham, *Social Vulnerability and Capacity*, *NATURAL HAZARDS OBSERVER* 43(2): 1-3 (Nov 2007).

³⁴ *Wildfires Force Mass Evacuations in Southern California*, FOX NEWS, Oct. 23, 2007 available at <http://www.foxnews.com/story/0,2933,303881,00.html> .

³⁵ Gavin Off, *Look at the Victims of Hurricane Katrina*, SCRIPPS HOWARD NEWS SERVICE, Feb. 20, 2008.

³⁶ For more information on the GoZone Act and its application within Mississippi, visit <http://www.mississippi.org/content.aspx?url=/page/3120>

Environmental Protection Agency: “a range of development and conservation strategies that help protect our natural environment and make our communities more attractive, economically stronger, and more socially diverse.” The American Planning Association has adopted similar concepts with several additional core principles.³⁷

A resilient community captures that smart growth flavor and includes “intentional action to enhance the personal and collective capacity of its citizens and institutions to respond to, and influence the course of social and economic change.”³⁸ The Centre for Community Enterprise has identified behaviors that a resilient community demonstrates, with the first being that “they take a multi-functional approach to create a sustainable (economically, ecologically, politically, and socially) development system with the community.”³⁹

Hurricane Katrina had a huge impact to the field of resiliency planning. Books on sustainable development were rewritten after the 2005 hurricane season to address the shift in, or rather the realization of, this risk.⁴⁰ The remainder of this paper examines the current state of resiliency initiatives on the federal level and within the Gulf of Mexico region.

IV. Federal Resiliency Efforts

Essential elements of any coastal resiliency initiative includes building capacity to respond to a disaster and planning to avoid risks facing the coast. Utilizing education, outreach, regulation, and incentives, programs can help effectuate stronger, more resilient coastal communities. The resiliency work by governmental entities is somewhat cyclical in nature – plan, respond, learn, plan, and respond again. Emergency managers who run through a “lessons learned” exercise, will come out better prepared to respond to the next event. Federal, state and local governments plan and prepare for known hazards, but they have to respond to unexpected, as well as known, hazards. The time-frame to take advantage of the opportunity presented by a disaster to build back resiliently is very short, however. Pressures come from residents wanting to move back home and from commercial interests needing to recapture their income streams.⁴¹ Governments must be ready to implement resilience concepts quickly.

This section describes the current state of practice by federal, state, local government and academic sectors in the field of resiliency in the Gulf of Mexico. Although it is important to consider the international activities in this field, a review of the practice throughout the globe is beyond the scope of this paper. Many of the federal activities of this country, such as those related to tsunami warning systems, are shared with the international community. But as discussed in more detail below, the bulk of planning and implementation occurs at the local level.

Three months before Hurricane Katrina, the President’s National Science and Technology Council issued a report on disaster reduction recognizing that resiliency is a multi-faceted effort.

Grand Challenge #5 – Assess disaster resilience using standard methods. Federal agencies must work with universities, local governments, and the private sector to identify effective standards

³⁷ See, JOSH CLEMONS, MISSISSIPPI-ALABAMA SEA GRANT LEGAL PROGRAM, SMART GROWTH, MASGC 07-030 (Dec. 2007).

³⁸ The Community Resilience Project, Centre for Community Enterprise, <http://www.cedworks.com/communityresilience02.html>

³⁹ *Id.*

⁴⁰ Holistic Disaster Recovery, *supra* note 15.

⁴¹ Berke and Campanella, *supra* note 12, at 193 (noting that resiliency issues have both short- and long-term windows of opportunity).

and metrics for assessing disaster resilience. With consistent factors and regularly updated metrics, communities will be able to maintain report cards that accurately assess the community's level of disaster resilience. This, in turn, will support comparability among communities and provide a context for action to further reduce vulnerability. Validated models, standards, and metrics are needed for estimating cumulative losses, projecting the impact of changes in technology and policies, and monitoring the overall estimated economic loss avoidance of planned actions.⁴²

A. *National Oceanic and Atmospheric Administration*

The National Oceanic and Atmospheric Administration (NOAA) leads the field of coastal resiliency planning. Their efforts are both large scale (*e.g.*, integrated ecosystem assessment planning) and local (*e.g.*, direct support to state coastal programs, regional and local efforts and individuals). The efforts range from very technical research and development to the most basic of approaches. NOAA has developed sophisticated risk assessment tools with a basis in geospatial technologies. However, the very low tech two-sided, laminated 8.5" x 11" NOAA Extreme Weather Information Sheets developed shortly after Katrina has been very well received by the public.⁴³

NOAA is also a leader in assimilating and disseminating relevant and important information to assist in resiliency planning. It has made clear that improving resilience is a top priority for the agency:

Whether the hazards are coastal or inland, or the losses felt immediately or gradually over time, NOAA's primary responsibility is to mitigate the escalating economic, societal, and environmental costs associated with environmental hazards. . . [T]he longer term challenge of improving resilience also requires a strategic approach to the full set of capabilities that NOAA can bring to bear on this challenge. With this overarching strategic imperative in mind, NOAA has included "contribution to resilience" as a key criteria in its decision matrix for FY 2009-2013 program priorities.⁴⁴

NOAA is helping communities address the things they can change. Through the Coastal Storms Program, NOAA focuses its assistance on helping to develop strong partnerships, create user-driven products, and target outreach.⁴⁵ Resiliency for the northern Gulf coast area, for example, includes a special emphasis on hurricanes. It is readily apparent that the tropical system storm surge (or in the case of New Orleans, failed levees and the floods that resulted from the storm surge) presents the largest threat to people and property in the coastal zone. While high winds are damaging, modern construction codes have been widely adopted and enforced with very positive results. Setting aside the notion that the strength of Katrina was due to global warming, can we explain how we as an advanced society created such a precarious existence?

Currently the National Hurricane Center has difficulty communicating risk – the long used Saffir-Simpson Scale actually reflects only the wind risk – with very little correlation to storm surge, which is a function of the storms entire energy budget, geomorphology of the coastline, shelf slope and wetlands

⁴² SUBCOMMITTEE ON DISASTER REDUCTION, NATIONAL SCIENCE AND TECHNOLOGY COUNCIL, GRAND CHALLENGES FOR DISASTER REDUCTION (June 2005).

⁴³ NOAA Coastal Services Center, Storm Data Resource Guides, *available at* http://www.csc.noaa.gov/storm_info/guide.html .

⁴⁴ NOAA OFFICE OF PLANNING AND INTEGRATION, ANNUAL GUIDANCE MEMORANDUM FOR FY 2009-2013 (2006).

⁴⁵ See, www.csc.noaa.gov/csp/ and www.csc.noaa.gov/hat/ for the Hazard Assessment Tool which can help educate residents about the potential hazard risk. The HAT includes descriptions and general information about each of the hazards such as storm surge, flood, wind and erosion.

buffer loss. The National Science Foundation and NOAA recently released a call for proposals “focusing on advancing fundamental understanding of the communication of hurricane outlooks, forecasts, watches, and warnings both to decision makers (i.e., emergency managers, elected officials) and to the general public.”⁴⁶

B. Federal Emergency Management Agency

Many lessons have been learned and a new attitude of individual and organizational responsibility has taken hold. At the time of Hurricane Katrina, it seemed that many citizens expected federal agencies to provide any and all support in the face of such disasters. There are limits, however, to the authority and ability of agencies like the Federal Emergency Management Agency (FEMA) to reduce the loss of life and property. FEMA’s approach is to protect the Nation from all hazards, including natural disasters, acts of terrorism, and other man-made disasters, by leading and supporting the Nation in a risk-based, comprehensive emergency management system of preparedness, protection, response, recovery, and mitigation.⁴⁷

Many areas of our country are subject to damage from floods. The approaches to building near or in areas subject to floods vary among communities, especially after a devastating storm. After Hurricane Katrina legions trumpeted a “return to normalcy,” but those communities hit hardest remain a long distance from normal. Not all communities, however, aim for a return to status quo or “normalcy.” Some want to build back stronger and better. Fortunately, the National Flood Insurance Program (NFIP) managed by FEMA has matured to a point that it accommodates smart growth and resiliency. For example, flood insurance claim payouts do not have to be reinvested in structures that will be subject to the same hazards in the future. Significant grants of \$30,000 per home were offered for mitigation, a real step in the resiliency direction.⁴⁸

When the NFIP was conceived and promulgated, the basic philosophy viewed land use regulation as of the primary focus of floodplain management.⁴⁹ The drafters of the flood program expressed concerns for the difficulty of regulation, a concern that has proven to have been well founded as we continue to see approval of wetlands fill in the coastal zone.⁵⁰ Part of the problem is the perceptual differences between gradual changes and sudden catastrophic events. The small changes, such as filling an acre of wetlands here, two acres of wetlands there, are tolerated. The total amount of destruction is often not realized until of the changes make a difference in the resilience of a community during a severe weather event.⁵¹

The NFIP administration has suffered through fraud, abuse, and ill-conceived policy shifts. According to one report:

NFIP estimates just 1% of insured properties were responsible for about 25% of claims, mainly due to repeated flooding and rebuilding in the same location. . . structures with repeat losses

⁴⁶ National Science Foundation, Program Solicitation NSF-08-551.

⁴⁷ The authorization for most federal disaster response that FEMA undertakes is based on the Robert T. Stafford Disaster Relief Emergency Assistance Act, Pub. L. No. 100-707, signed into law November 23, 1988; amended the Disaster Relief Act of 1974, Pub. L. No. 93-288.

⁴⁸ Harrison County Community Recovery Plan, *supra* note 5.

⁴⁹ For a thorough discussion of the NFIP, see Ernest Abbott, *Floods, Flood Insurance, Litigation, Politics – and Catastrophe* in this issue of the Sea Grant Law and Policy Journal.

⁵⁰ Rutherford Platt, *Comments on the National Flood Insurance Program (NFIP) Evaluation Final Report*, NATURAL HAZARDS OBSERVER, 32(2): 11-12 (Nov 2007).

⁵¹ Samuel D. Brody, et. al., *Examining the relationship between wetland alteration and watershed flooding in Texas and Florida*, NATURAL HAZARDS 40(2):413-28 (Feb. 2007).

represented almost a third of all claims paid between 1978 and March 2004. The areas in Alabama and Mississippi affected by Hurricane Katrina include roughly 2,400 structures with repeat losses, while the areas of Louisiana damaged by the storm include roughly 20,000 structures that have had repeat claims.⁵²

FEMA also supports state and local governments in the wake of a disaster through its Public Assistance Grant Program.

Through the [Public Assistance] Program, FEMA provides supplemental Federal disaster grant assistance for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain Private Non-Profit organizations.⁵³

C. Other Federal Efforts

Numerous other federal programs address important components of our communities' resiliency. For example, the Naval Research Laboratory conducts surge inundation modeling and the U.S. Geological Survey's Northern Gulf of Mexico Ecosystem Change and Hazards Program provides mapping and planning to support particular technical needs of other researchers and stakeholders.⁵⁴ The National Guard plays an essential role providing assets found nowhere else such as human power, toughened vehicles, and survival training and tools.

The Department of Homeland Security's Southeast Region Research Initiative is addressing resiliency issues in areas such as technology and infrastructure that are key to our complex society.⁵⁵ Three related projects under the Community and Regional Resilience Initiative are described as ". . . a new U.S. Department of Homeland Security pilot program focused on helping more communities strengthen their ability to prepare for, respond to, and rapidly recover from significant man-made or natural disasters with minimal downtime to basic community, government and business services."⁵⁶ The goal of these projects is to develop a community risk index for Memphis, Tennessee, Gulfport, Mississippi and Charleston, South Carolina which would be transferable to other communities. The Gulf of Mexico Alliance Resiliency Working Group, discussed below, is also developing a resiliency index to serve as a guide for identifying weakness in the community.⁵⁷

Resiliency projects are rolling out so fast that new ones present themselves as this research proceeds. For example, the Department of Transportation recently released the following information about climate change studies.

Based on 21 simulation models and a range of emissions scenarios, the study found that potential changes in climate over the next 50 to 100 years could disrupt transportation services in the region. 27% of major roads, 9% of rail lines, and 72% of area ports are at or below 4 feet in

⁵² David C. John, *Fixing Flood Insurance Before the Next Disaster: House Bill Takes Several Steps in the Wrong Direction*, Heritage Foundation WebMemo # 16455 (Sept. 27, 2007) available at <http://www.heritage.org/Research/Regulation/wm1645.cfm>

⁵³ FEMA Public Assistance Grant Program, <http://www.fema.gov/government/grant/pa/index.shtm>.

⁵⁴ USGS, Northern Gulf of Mexico Ecosystem Change and Hazard Susceptability Project, <http://ngom.usgs.gov/>

⁵⁵ South East Region Research Initiative, <http://serri.org/research.html>. SERRI research areas are aligned with the US Department of Homeland Security's Science and Technology Integrated Product Teams (IPT).

⁵⁶ Community and Regional Resilience Initiative, CARRI News, <http://www.resilientus.net/pdfs/carrinewsletteroctober2007.htm>

⁵⁷ RESILIENCE WORKING GROUP, GULF OF MEXICO, PROGRESS REPORT, available at http://www2.nos.noaa.gov/gomex/coastal_resil/resil_wg_2pager.pdf

elevation, and could be vulnerable to flooding due to future sea level rise and natural sinking of the area's land mass. The study is designed to help state and local officials as they develop their transportation plans and make investment decisions. Federal transportation officials will continue to work closely with state and local planners as they incorporate the study into their planning processes.⁵⁸

It is important to remember, however, that resiliency is not just a bricks and mortar issue. The Department of Health and Human Services awards grants to states for preparation against pandemic influenzas.⁵⁹ Additional Department of Health and Human Services programs address health care, mental health care, quality of life, and emergency service needs such as hospitals and clinics, emergency operations centers, evacuation plans, law enforcement and fire protection, and libraries.

V. Gulf of Mexico Resiliency Programs

Coastal resiliency planning is a complex, calculating, and deliberate approach to the wise use and development of coastal areas. This section will describe some of the regional efforts toward building a hazard resistant coastline.

In spite of the recent active storm seasons, related insurance increases and instability, and the housing bubble and mortgage crisis, Mississippi's southern six counties led the state in population increases.⁶⁰ And experts believe the trend will continue – people are still likely to migrate toward the coastlines. In addition, the Gulf of Mexico is rich in recreational opportunities, natural fisheries stocks, and petroleum reserves which draw tourists, fishermen, and seasonal workers.

Leadership sets the tone for any rebuilding, and thankfully the call for rebuilding smartly has been made in the Gulf. For example, the Corps' Interagency Performance Evaluation Task Force, convened to analyze how the hurricane protection system in Southeast Louisiana worked during Hurricane Katrina, has developed a state-of-the-art prototype risk assessment model to characterize current annual flood risk in the area.⁶¹

Progress, however, is slow. Infrastructure repair is proceeding along beachfront Highway 90, but the storm water, wastewater and drinking water lines have not been modernized in advance of the highway repairs. Although the coastal region is the fastest growing region in Mississippi, affordable housing is difficult to find. A few months after the storms, the states of Mississippi and Louisiana hosted charettes to help guide the communities in rebuilding while retaining their sense of place. Two and a half years later, however, many homes have not been restored or replaced. While Mississippi is credited with embracing smart growth and New Urbanism⁶² principles, the plans developed during the charettes disregarded important conservation and hazard concerns.⁶³ Resilient communities will only emerge if homes are rebuilt in a way that reduces the risk to each structure and to the community as a whole.

⁵⁸ U.S. CLIMATE CHANGE SCIENCE PROGRAM, IMPACTS OF CLIMATE CHANGE AND VARIABILITY ON TRANSPORTATION SYSTEMS AND INFRASTRUCTURE: GULF COAST STUDY (2008) available at <http://www.climatechange.gov/Library/sap/sap4-7/final-report/>.

⁵⁹ One stop access to U.S. government avian and pandemic flu information is available at www.pandemicflu.gov/news/allocation.html.

⁶⁰ Melissa Scanlan, *Shelter from the Storm*, SUN HERALD (Biloxi, MS), Mar. 20, 2008 at A-1.

⁶¹ Information on the IPET and its model is available at <http://nolarisk.usace.army.mil/index.htm#map>.

⁶² New Urbanism is an architectural movement to transform sprawling city blocks into compact, walkable neighborhoods with old-fashioned features.

⁶³ See Mississippi Governor's Commission on Recovery, Rebuilding, and Renewal, <http://www.mississippirenewal.com/>; Berke and Campanella, *supra* note 13, at 197.

Just as important as rebuilding the infrastructure, is rebuilding the social fabric – schools, churches, shopping and recreational venues. The schools in most of the Mississippi communities reconvened within six weeks of the storm. Test scores have even rebounded in several areas to surpass pre-storm levels.⁶⁴ However, hope is low that parts of New Orleans that were uninhabitable and nearly completely evacuated will ever be rebuilt.⁶⁵

A. Gulf of Mexico Alliance

Now and again Congress takes stock of the world around us in a big way. The early 1970's brought our first wave of major federal environmental legislation. In 2000, Congress passed the Oceans Act and formed the U.S. Commission on Oceans Policy, which embarked on a comprehensive review of the health of our oceans and emerged with a vision for a new approach to conservation of its resources. The U.S. Commission on Ocean Policy released its report of findings, *An Ocean Blueprint for the 21st Century*, in 2004.⁶⁶ In 2003, the independent Pew Oceans Commission released similar findings with its report *America's Living Oceans: Charting a Course for Sea Change*.⁶⁷ We need to care for and treat our oceans as ecosystems, not as a separate media disconnected from man's activities on land, and vice versa. While the goal of ecosystem management is healthy oceans, the call to manage systems holistically should serve a model for other coastal management objectives, including hazard resiliency.

Shortly after these comprehensive efforts to address the crisis of our oceans' health, the President released the *U.S. Ocean Action Plan*.⁶⁸ One of the actions identified by the President for immediate implementation was support of a regional partnership in the Gulf of Mexico. The five states bordering the Gulf of Mexico, Florida, Alabama, Mississippi, Louisiana, and Texas, have formed a coalition – known as the Gulf of Mexico Alliance (GOMA) – to work together to implement the President's action plan in the region. GOMA's first report, *Governors' Action Plan for Healthy and Resilient Coasts: March 2006-March 2009* was released in March 2006.⁶⁹ All of the national reports and GOMA's new action plan highlight smart growth and coastal resiliency concepts. The 2006 – 2009 action plan is almost fully implemented with great gains in environmental education, nutrient management, habitat restoration, and water quality.

One of the most significant developments during this first implementation phase was the GOMA's recognition of the importance of resiliency. The level at which federal and state governments are working together on this issue is unprecedented. NOAA and the Environmental Protection Agency lead a thirteen-agency "Alliance Federal Workgroup" to coordinate support of the Gulf of Mexico Alliance. Numerous initiatives are underway to build resilience in the region. A recent request for proposals to address elements of the Governors' Action Plan will further increase collaboration and resiliency programs in the Gulf. While the focus of GOMA is the Gulf of Mexico region, their activities are not limited to the coastline and their approach could serve as a model for other regions. The Alliance is currently drafting its second action plan which will address the 2009 – 2014 time period.

⁶⁴ Mississippi Department of Education, Mississippi Assessment and Accountability Reporting System, online at: <http://orsap.mde.k12.ms.us:8080/MAARS/index.jsp> .

⁶⁵ Berke and Campanella, *supra* note 13, at 200.

⁶⁶ U.S. COMMISSION ON OCEAN POLICY, AN OCEAN BLUEPRINT FOR THE 21ST CENTURY (2004) available at <http://oceancommission.gov/> .

⁶⁷ PEW OCEANS COMMISSION, AMERICA'S LIVING OCEANS: CHARTING A COURSE FOR SEA CHANGE (2003) available at http://www.pewtrusts.org/our_work_detail.aspx?id=130 .

⁶⁸ U.S. OCEAN ACTION PLAN: THE BUSH ADMINISTRATION'S RESPONSE TO THE U.S. COMMISSION ON OCEAN POLICY (2004) available at <http://ocean.ceq.gov/actionplan.pdf> .

⁶⁹ The Governors' Action Plan is available at <http://www.dep.state.fl.us/gulf/plan.htm> .

B. *Mississippi Coastal Improvement Program*

In response to a 2006 directive from Congress, the Corps developed the Mississippi Coastal Improvement Program (MCIP). Congress required the Corps to:

conduct an analysis and design for comprehensive improvements or modifications to existing improvements in the coastal area of Mississippi in the interest of hurricane and storm damage reduction, prevention of saltwater intrusion, preservation of fish and wildlife, prevention of erosion, and other related water resource purposes at full Federal expense; Provided further, that the Secretary shall recommend a cost-effective project, but shall not perform an incremental benefit-cost analysis to identify the recommended project, and shall not make project recommendations based upon maximizing net national economic development benefits; Provided further, that interim recommendations for near term improvements shall be provided within 6 months of enactment of this act with final recommendations within 24 months of this enactment.⁷⁰

The MCIP is criticized for settling merely for risk reduction, instead of aiming for risk avoidance altogether.⁷¹ The Corps has proposed a number of alternative storm protection plans, including submerged gates that would be raised at the bays to prevent storm surges, levees and pump systems (smaller versions of New Orleans system), and buyouts of properties inappropriate for redevelopment. Instituting any large-scale changes in the hurricane protection system along the Gulf will be difficult. For example, plans to restore the barrier islands to their elevations in the 1960s are in direct conflict with the current plan of the Gulf Islands National Seashore managed by the National Park Service. In addition, homeowners are wary of buyout offers, the environmental community is concerned about the impact of engineered structures on the fragile Gulf coast environments, and communities still do not agree on how much protection is enough.

C. *Mississippi Department of Marine Resources*

The efforts of the Mississippi Department of Marine Resources (DMR) following the storm is a real success story of a state agency that served its citizens well and could serve as a model to others.⁷² The DMR's Comprehensive Resource Management Plan program funded by NOAA and the EPA and in place since 1998 helped county and municipal planners and stakeholders in the southern six counties of Mississippi address smart growth issues and eventually develop a "Land Development Suitability" map. The program's essential ingredient was regularly convening a network of representatives from the six counties. That network, when combined with a comprehensive inventory of county assets compiled shortly prior to Hurricane Katrina, enabled the Mississippi Governor's Office to address the needs of the communities in the most efficient manner. This success story can serve as a model for planning, education and collaboration for communities in any region.

VI. Role of Academic Institutions

In addition to the government agencies working to protect the public's health, safety, and welfare, academic institutions have an important role in building more resilient coastal communities. Academic institutions can provide the science and education upon which governments can base their actions. Education and training programs help with national, regional, and local public efforts to balance the

⁷⁰ Department of Defense Appropriations Act, 2006, Pub. L. No. 109-148 (Dec. 30, 2005).

⁷¹ Berke and Campanella, *supra* note 13, at 197.

⁷² Information on DMR's Comprehensive Resource Management Program is available at www.dmr.state.ms.us.

preservation of natural areas, oil and gas and other energy needs, provisions of bountiful seafood harvests, and need for recreational opportunities. Government and academic institutions have had a long partnership, with government funding often helping academic institutions conduct research and fulfill their stated missions.

Education systems at the primary level resumed classes in just a matter of weeks amid all of the devastation. The resumption of routine for the children obviously benefited the community greatly, and test scores for these systems are even higher in the year after the storm in some categories. But the role of academic institutions after an extreme weather event along the coast is not limited to just research and education. There are many examples of institutions of higher learning saving lives. In the immediate aftermath of Katrina, the GeoResources Institute of Mississippi State University brought to bear its expertise in remote sensing and mapping to help in the search and rescue and recovery efforts.⁷³

As a compliment to the governmental role, academic programs support the field of resiliency with research and educational programs in numerous disciplines. Examples of important educational program areas are emergency management, homeland security, risk management, disaster management and hazard mitigation, urban planning, and environmental liability and related engineering disciplines that support these fields. One guidebook lists over 100 resiliency-related degree programs.⁷⁴

A few academic programs with a focus on resiliency deserve special mention. The University of South Carolina's Coastal Resiliency Information Systems Initiative for the Southeast was awarded nearly \$400,000 to fund eighteen research projects on the societal and environmental impacts of Hurricane Katrina within days of the storm⁷⁵ Another leader in the field is the Natural Hazards Center at the University of Colorado at Boulder. The NHC's mission is "to advance and communicate knowledge on hazards mitigation and disaster preparedness, response, and recovery . . . using an all-hazards and interdisciplinary framework . . ."⁷⁶

Essential to the academic approach is the delivery of the research from the scientists to the various user groups. The National Sea Grant College Program has been developing partnerships and delivering research results to coastal communities for over thirty years. In addition to funding research supporting NOAA missions, the Sea Grant program provides this important translation service through academic institutions around the country. There are four Sea Grant programs in the Gulf – Florida Sea Grant; Mississippi-Alabama Sea Grant; Louisiana Sea Grant; and Texas Sea Grant. From the development of databases to helping to manage limited resources, such as waterfront property,⁷⁷ to delivering data generated by the Gulf Coastal Ocean Observing System, the Sea Grant network in the Gulf provides valuable research, education, and outreach services.

Another effective hybrid of government and academia is the NOAA Cooperative Institute Program. There are twenty-one cooperative institutes within NOAA, thirteen of which are directed by NOAA's Oceanic and Atmospheric Research (OAR) line office. The cooperative institute in the Gulf is the Northern Gulf Institute, a consortium of five universities led by Mississippi State University. Researchers

⁷³For more information on the Mississippi State University GeoResources Institute's hurricane forecasting and recovery assistance, see <http://www.gri.msstate.edu/eid/hurricanes/katrina.php>

⁷⁴ PUBLIC ENTITY RISK INSTITUTE, RISK MANAGEMENT RESOURCE GUIDE 2007 (2007).

⁷⁵ University of South Carolina's Katrina CRISIS (Coastal Resiliency Information Systems Initiative for the Southeast) Program, <http://www.sc.edu/katrinacrisis/eric.shtml> .

⁷⁶ For more on the Natural Hazards Center at the University of Colorado at Boulder, visit <http://www.colorado.edu/hazards/>

⁷⁷ Mississippi-Alabama Sea Grant Consortium, *Working Waterfronts: Database Tool for Planning*, Sea Briefs, 8(1): 1 (Spring 2008).

at these five universities and NOAA are conducting research to address priority gaps and reduce limitations in current Northern Gulf of Mexico awareness, understanding and decision support of coastal ecosystem issues. The NGI conducts research, education, and outreach programs in the following areas: ecosystem-based management, geospatial data/information and visualization in environmental science, climate change and climate variability, effects on regional ecosystems, and coastal hazards and resiliency.⁷⁸ The Northern Gulf Institute is researching the economic costs of storms, including evacuations, on a coastal economy. For example, the NGI recently funded research at Mississippi State University “to develop regional economic valuation (REV) models that will define the interconnected relationships between the economic activities and drivers in the coastal communities.”⁷⁹

One particularly unique challenge to the Gulf coast’s resiliency is the need to carry out expensive evacuations. The Northern Gulf Institute is researching the economic costs of storms, including evacuations, on a coastal economy. There is a movement toward reducing the need for difficult (and sometimes deadly) evacuations with the new philosophy of “shelter in place” – or at least shelter nearby. This supports the notion of providing substantial shelters within a short distance of the coastal areas to help encourage more use of shelters thereby eliminating near gridlock on the highways leading away from the coast. Combined with new research that is improving estimates of the track and impact of hurricanes, decision-makers will be better prepared to implement the next evacuation order.

Other important government programs with essential associations with academic institutions are making significant contributions to the field of coastal resiliency. For example, the Department of Homeland Security has recently announced its decision to fund a Center of Excellence to combine the strengths from several complimentary organizations. The University of North Carolina at Chapel Hill and Jackson State University in Jackson, Mississippi will co-lead the new Center of Excellence for Natural Disasters, Coast Infrastructure and Emergency Management. The new Center is responsible for conducting research and enhancing the nation's ability to safeguard populations, properties, and economies from the consequences of catastrophic natural disasters, including hurricanes, tornadoes, floods, earthquakes, droughts, and wildfires. This Center will build on existing expertise at these and affiliated institutions.⁸⁰

These initiatives both established and new are taking advantage of synergies and existing government networks to build regional associations between government, academia and private sector. Such activities, of course, are not limited to the coastal zone. But engaged regional associations can help deliver information to coastal communities and provide the critical step of involving the public in the sustainable development and resiliency building processes. Building participation by the public, helping people acquire new civic skills, building networks, and developing a culture that values resiliency are key to creating a resilient community.⁸¹ Although there will be a new sense of place to go along with the new landscape, it contains remnants of the historical community which has evolved to better respond to the known and unknown hazards of the future.

VI. Role of the Private and Charitable Sectors

As is apparent by this survey so far, the practice of resiliency management is being carried out by governmental agencies and academic institutions on a large scale. Important work by the private sector, non-governmental organizations and professional associations, however, is essential to complete the

⁷⁸ Northern Gulf Institute, www.NorthernGulfInstitute.org .

⁷⁹ See Garen Evans, Developing a Foundation for Analysis of Natural and Human-Induced Disturbances to Coastal Economies, abstract online at: <http://www.northerngulfinstitute.org/research/abstract.php?pid=1> .

⁸⁰ BROWER, D.J., *ET. AT.*, REDUCING HURRICANE AND COASTAL STORM HAZARDS THROUGH GROWTH MANAGEMENT: A GUIDEBOOK FOR NORTH CAROLINA COASTAL LOCALITIES (1987).

⁸¹ Berke and Campenella, *supra* note 13, 205-206.

network of resiliency components. Professional organizations closely linked to academic and governmental agencies, for example, play a vital role in disseminating information and advancing the state of the practice. For example, a conference regarding state-of-the art floodproofing, sponsored by the Association of State Floodplain Managers, FEMA Headquarters and Corps' National Nonstructural Floodproofing Committee was just announced for the fall of 2008.⁸²

One private organization worthy of recognition for exemplary performance is Mississippi Power Company, which experienced 100 percent loss of power, but restored service within twelve days to those of the 194,725 customers who could receive.⁸³ Utility commissions are part of the government which helps ensure competent public utility services, an integral part of a resilient community. While the utility companies are effective in response, much of the utility infrastructure remains unhardened (*e.g.*, power lines have not been buried) and the system is once again vulnerable.

Anyone who has lived through a rebuilding after a major disaster such as Hurricane Katrina cannot overlook the huge role charitable and religious organizations play. In the Gulf, some faith-based groups have established semi-permanent bases and announced they will remain in the region for three years to help rebuild. Foundations are providing money to address the evolving long-term resiliency needs of the coast (*e.g.*, Rockefeller Foundation Announces \$70 Million Commitment to Climate Change Resilience).⁸⁴

Individuals can also play an important role by adopting an attitude of personal responsibility. Individual personal responsibility is an essential component of coastal resiliency too. A very useful role played by individuals is information-sharing. For example, after Hurricane Katrina, internet-savvy individuals helped rejoin family, friends and pets. This author even learned that she was reported "Alive" in Gulfport on September 2, 2005.⁸⁵

VIII. Conclusion

Since we all cannot or will not do what is logical and move to regions with less natural hazards, we will continue to see development pressures increase along our shorelines and low lying areas near our bays and bayous. Unfortunately, litigation⁸⁶ and the 104th Congress and its vocal supporters of private property rights, have dampened the spirit of the hardest of conservation-minded coastal resource manager. Most state coastal programs and state statutes have provisions favoring the use of shorelines for water-dependent activities, but administering the program is difficult. Off course, major storms have the last word about which developments will prove true folly. Fortunately, insurance availability and rates might advance resiliency along the Northern Gulf coast faster than regulation and education efforts can possible hope to by limiting, or at least slowing, development in some areas.

Low-lying coastal properties are particularly vulnerable to increases in sea level. According to the U.S. Geological Survey's *National Assessment of Coastal Vulnerability to Future Sea-Level Rise*, the "best guess" estimate of sea-level rise is 50 cm by 2100 – double the rate of the last century. The sea level rise

⁸² The call for abstracts for the conference is posted at:

<http://www.floods.org/Conferences%20Calendar/nfpc4.asp>

⁸³ See Resolution by the Mississippi Legislature describing these heroic efforts and commending Mississippi Power Company for their phenomenal accomplishments to help the Mississippi coastal community recover after Hurricane Katrina available at <http://billstatus.ls.state.ms.us/documents/2006/pdf/SC/SC0562SG.pdf> .

⁸⁴ Rockefeller Foundation News Advisory, August 9, 2007.

⁸⁵ <http://sharon-hodge-1.katrina.aidpage.com/sharon-hodge/>

⁸⁶ The seminal Supreme Court case involving coastal management is *Lucas v. South Carolina Coastal Commission*, 505 U.S. 1003 (1992). In *Lucas*, the Supreme Court held that a state regulation resulted in a constitutional taking if it deprives an owner of all economically viable use of the property.

combined with high water from tides and storms can create more destruction, and with more frequency.⁸⁷ Floods from precipitation and from storm surge can both be addressed by the NFIP through its community rating system. In the effort to ease the regulatory burden on those trying to rebuild after Katrina, some communities are reportedly relaxed in their approach to building code creation and enforcement. If this is true a higher community rating, and therefore higher flood insurance premiums for the entire community might result. The City of Gulfport is currently addressing a recent report of noncompliance and hopes to assuage the concerns of the insurance administration.⁸⁸

One concern with guiding future development in coastal areas is how to deal with communities steeped in maritime traditions. Numerous families of immigrants have been proud to call coastal places “home” for many generations. Most of the pressures for non- water dependent activities on the fragile waterfronts does not come from people who grow up on the water, but rather from those not familiar with the risks of coastal living. Hopefully through efforts like the Mississippi-Alabama Sea Grant Program’s Working Waterfronts Initiative, stewardship of these very limited resources will increase.⁸⁹ Resiliency also addresses recovering from diaspora – the displacement or scattering of entire populations. Residents scattered from New Orleans in the wake of Katrina in numbers greater than ever before witnessed in our nation’s history. But the call of the clan is strong. Many clusters of New Orleans transplants have formed in other towns and cities in an effort to retain the community spirit. The call of home is strong as well. Visitors and immigrants who tolerated the adverse conditions came to rebuild the ravaged areas. Only time will tell when or if those who were scattered can be part of the effort to rebuild resilient communities.

Insurance battles in the wake of Hurricane Katrina took every form. Some of the conflicts seem counter intuitive. Policy holders who filed claims under their flood insurance and their standard homeowners wind policies objected to claims being settled on their slabbed homes solely based on “flood.”⁹⁰ Those outside the region expressed concern that the taxpayers were carrying a heavier burden of the loss than insurance companies, because the government was paying on the flood policies. An effort was launched to implement a national approach through all-hazard insurance, and the debate is vital in order to develop an equitable incentive policy that encourages resiliency building.⁹¹

Armed with the lessons learned discussed above, a few observations can be made and policy recommendations drawn for rebuilding in coastal areas after a disaster. Berke and Campanella make the following recommendations:

- First, plans in place before a disaster make a difference in mitigating risk after a disaster. . .
- Second, federal and state governments should play a stronger role to encourage or require local planning for post-disaster recovery and mitigation. . .
- Third, New Urbanism [can be used], however, without proper planning, this high-density development pattern can lead to greater risk.
- . . . Forth, federal disaster policy is in need of major reform . . . and state and local governments

⁸⁷ Dan Cayan et al., *Projecting Future Sea Level Rise: A Report for California Climate Change Center*, 18 (March 2006).

⁸⁸ Public Meeting, City of Gulfport, MS, Mar. 20, 2008.

⁸⁹ See program information at: <http://www.masgc.org/communications/pubs/masgp/08-011-01.pdf> The program in Alabama has been successful in focusing attention on the importance of careful development of waterfronts for water dependent activities.

⁹⁰ “Slabbed” is a term that came into common parlance after Hurricane Katrina forces left only slabs of tens of thousands of homes.

⁹¹ Efforts to pass a multi-peril insurance program have stalled at this time, see <http://74.86.203.130/bill/110-h920/show> .

must play a more significant role in accepting the risks posed by development in hazardous locations.⁹²

As a next step, researchers need to conduct a comprehensive gap analysis to assess what elements of a community and region are not currently being addressed in hazards planning. Currently there are several groups working in parallel on developing community resiliency indices. Should they be working together or is there a need for more than one approach? There is wide agreement on the need for more research and educational efforts in several areas – understanding the societal context, improving weather forecasting and communicating information to enable informed decision making.⁹³ The trick will be eliminating overlap and maximization of scarce resources and funding.

In a recently five-year plan released by the NOAA Gulf Coast Service Center, two themes stood out:

1. Communication and coordination. Regional customers need help keeping track of the myriad of entities, projects, and resources and facilitating better coordination across local, state, regional, and federal parties.
2. Product delivery. Delivery of products and services is as important as their development. Simply providing more data and more technical tools is not the answer – there is a need for more outreach, training, and technical assistance to ensure that NOAA's information and tools are truly useful to constituents and other users.⁹⁴

The clear simple delivery of the information is essential – and providing a constant reminder of real risks is important for residents of a region that can seem like paradise most days, but is actually the foundation of a fragile existence if not properly stewarded.

The keynote address for the *Sea Grant Law and Policy Journal's* 2008 Inaugural Symposium was provided by Lt. Gen. Clark Griffith who chairs the Mississippi Reviving the Renaissance Commission. His presentation reminded the author that perhaps the most important ingredient of coastal resiliency programs is the deep felt personal care for community and country shown by people like General Griffith, his wife and fellow citizens during times of tragedy and recovery

And with a “res ipsa loquitur,”⁹⁵ or perhaps rather more of a “Being John Malkovich”⁹⁶ sensibility, this survey would be incomplete without acknowledging the work of one of the most relevant hybrid government/academic activities, the National Sea Grant Law Center at the University of Mississippi. The center made a spot-on and timely selection of this important topic to focus its inaugural edition of the *Sea Grant Law and Policy Journal*.

⁹² Berke and Campanella, *supra* note 13, at 201.

⁹³ NOAA, RESEARCH IN NOAA, TOWARD UNDERSTANDING AND PREDICTING EARTH'S ENVIRONMENT: A FIVE-YEAR PLAN: FISCAL YEARS 2008-2012 (Feb. 2008).

⁹⁴ NOAA COASTAL SERVICES CENTER, NEEDS ASSESSMENT FOR THE NOAA GULF COAST SERVICES CENTER, FINAL DRAFT (Nov. 27, 2007).

⁹⁵ Latin phrase meaning "the thing speaks for itself."

⁹⁶ Wikipedia on-line, http://en.wikipedia.org/wiki/Being_John_Malkovich.

New Frameworks for Managing Dynamic Coasts: Legal and Policy Tools for Adapting U.S. Coastal Zone Management to Climate Change¹

Sandra S. Nichols and Carl Bruch²

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I. Overview of Coastal Impacts

Climate change is changing coastal zones, and these changes are expected to become increasingly significant; unfortunately, current laws governing coastal zone management do not account for climate change. There is an urgent need to reform the diverse national, state, and local laws governing human activity in coastal zones.

Climate change causes rising sea level, increases in the severity of storms, and changes in precipitation patterns. These phenomena threaten to inundate, erode, and otherwise destroy infrastructure and natural

¹ This paper was presented during the Sea Grant Law and Policy Journal’s inaugural symposium on Coastal Resiliency held on March 25–26, 2008 at the University of Mississippi in Oxford, Mississippi. Coastal resiliency refers to the ability of coastal cities, towns, and communities to adapt to and recover from natural hazards, including hurricanes, tsunamis, floods, and disease epidemics. Seven authors were selected to present papers on a wide range of topics related to coastal resiliency. Powerpoint presentations and additional information about the symposium are available at <http://www.olemiss.edu/orgs/SGLC/National/SGLPJ/SGLPJ.htm>.

² Sandra S. Nichols is a Staff Attorney and Carl Bruch is a Senior Attorney and Co-Director of International Programs at the Environmental Law Institute (ELI). The authors gratefully acknowledge the research assistance of Angela King, Michael Dudkin, Andra Popa, and James Partridge.

resources on a vast scale.³ While impacts will vary from place to place, a wide range of coastal human and natural communities will be affected by climate change.

Low-lying coastal lands are particularly vulnerable. Worldwide, estimates of sea-level rise (SLR) range from about 4 inches to more than 13 feet during the next century.⁴ In the Gulf Coast region of the U.S., sea levels are expected to rise at least 15 to 17 inches over the next century.⁵ Massachusetts has assumed a 1 to 3 foot rise in its coastal planning recommendations⁶ and the Rhode Island Coastal Resources Management Council has assumed a 3 to 5 foot rise in its new climate change regulations.⁷ By 2060, at least 25% of the houses within 500 feet of the U.S. coast may be lost due to SLR, while significantly more land will experience periodic or permanent inundation.⁸

More striking than the predicted rise in water levels is the *range* in the predictions. There is widespread agreement that climate change is reshaping the world's coastlines, and that these changes call into question historical assumptions used to manage our coasts. Unfortunately, the precise extent, severity, or timing of the effects is still unknown. Action is necessary; but what sort of action? It is not feasible to wait to gain a full understanding of the potential impacts of climate change – on already dynamic systems – before beginning to determine how to respond.⁹

This article describes legal and policy approaches that can be used to prepare for climate impacts despite the uncertainties. While this article focuses on the United States context, the concepts presented, including adaptation and resilience, are more widely applicable. Section I provides an overview of the impacts of climate change. Section II explains why adapting to the effects of climate change will necessitate revising governance structures to incorporate adaptive approaches. Section III presents some examples of how new governance concepts could reshape coastal management law and policy. Section IV explains some of the broader issues that may arise in the transition to an adaptive governance approach, including equity, public participation, and public education and capacity building. Section V concludes with some thoughts on the imperative of transitioning coastal zone management to a more adaptive approach, as well as steps for initiating the transition.

While society is only beginning to consider how to approach the impacts of climate change, many tools already exist that could be used to address many impacts. Communities and courts are already demanding

³ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY 324 (2007), available at <http://www.ipcc.ch/ipccreports/ar4-wg2.htm>; Eli Kintisch, *Roads, Ports, Rails Aren't Ready for Changing Climate, Says Report*, 319 SCIENCE 1744 (Mar. 28, 2008).

⁴ IPCC, CLIMATE CHANGE 2001: THE SCIENTIFIC BASIS 881 (Cambridge Univ. Press, Cambridge, 2001); Orrin H. Pilkey et al., *Society and Sea Level Rise*, 303 SCIENCE 1781 (Mar. 19, 2004); Robin Kundis Craig, *Combating Sea Level Rise: Should We Even Try?*, Northeast Florida Environmental Summit (Nov. 2, 2007). (Some scenarios even predict sea level could ultimately rise up to 200 feet.)

⁵ ROBERT R. TWILLEY ET AL., CONFRONTING CLIMATE CHANGE IN THE GULF COAST REGION: PROSPECTS FOR SUSTAINING OUR ECOLOGICAL HERITAGE 12 (Oct. 2001), available at <http://www.ucsusa.org/gulf/gcchallengereport.html>.

⁶ Massachusetts Office of Coastal Zone Management, StormSmart Coasts, *Using Freeboard to Elevate Structures Above Predicted Sea* at: <http://www.mass.gov/czm/stormsmart/regulations/freeboard.htm> (last visited June 9, 2008).

⁷ Peter B. Lord, *Global Warming Prompts New Rules for Coastal Development*, THE PROVIDENCE JOURNAL, Mar. 28, 2008, available at http://www.projo.com/news/content/coastalhazards_03-25-08_QH9G8PE_v11.380972e.html.

⁸ THE HEINZ CENTER, EVALUATION OF EROSION HAZARDS 150 (Apr. 2000); see also *Oceans: Rising Sea Levels Threaten California's Delta Islands*, CLIMATE WIRE, Mar. 11, 2008. (The 5,000 residents of California's Sacramento-San Joaquin Delta Islands may be the first climate refugees in the U.S. as rising waters from rising tides and mountain floods threaten the already fragile levee system.)

⁹ L.J. HANSEN ET AL. (EDS), BUYING TIME: A USER'S MANUAL FOR BUILDING RESISTANCE AND RESILIENCE TO CLIMATE CHANGE IN NATURAL SYSTEMS (2003)

a more effective use of these existing tools. A homeowners' association in James City County, Virginia, has demanded that the county buy out their homes because of severe flooding. Located between the James and York Rivers in the flood plain near the Chesapeake Bay, Jamestown 1607 residents argue that the flooding problem is caused by the burgeoning development upstream that the county failed to control.¹⁰ Similarly, the Supreme Court of Virginia recently accepted the case of 700 victims of 1999 Hurricane Floyd who argue that the \$35 million of damage to their homes was due in part to developments permitted by the city despite the flood risk.¹¹ Such legal claims are only likely to proliferate with SLR and more extreme storms, even if it is difficult to directly link a specific instance of harm with climate change.¹²

Beyond the physical threats coastal residents face from climate change, they are further exposed by the response of the insurance industry to increasing risk. Already, as insurance providers are dealing with a greater number of claims – and suffering greater losses¹³ – they are increasing the cost of coverage, refusing to write new policies,¹⁴ or withdrawing coverage altogether.¹⁵

Insured losses for seven of the ten most costly hurricanes in U.S. insurance history, which occurred between August 2004 and October 2005 – Hurricanes Katrina, Rita, Wilma, Charley, Ivan, Frances, and Jeanne – totaled \$79.1 billion.¹⁶ These are the insured losses. For Hurricane Katrina alone, *uninsured* losses are estimated at \$125 billion.¹⁷ In Florida, State Farm, the state's largest private provider at the time, raised rates an average of 70%.¹⁸

As private insurance grows increasingly unaffordable or altogether unavailable, homeowners are turning to state-run insurance schemes. Several Eastern and Gulf Coast states now offer insurance for coastal homeowners, assuming risks that are too costly to be supported by the market. States are legislating premium caps, but only at the expense of the state taking on billions of dollars more risk.¹⁹ Florida's

¹⁰ Cortney Langley, *Responsibility for Flooding*, VIRGINIA GAZETTE, Mar. 12, 2008 at 5A.

¹¹ *Id.*

¹² Floods are the most common and destructive natural disasters in the U.S. 90% of U.S. natural disasters involve floods. GOVERNMENT ACCOUNTING OFFICE (GAO), THE FEDERAL EMERGENCY MANAGEMENT AGENCY, CHALLENGES FOR THE NATIONAL FLOOD INSURANCE PROGRAM 1 (Jan. 25, 2006), available at <http://www.gao.gov/new.items/d06335t.pdf>.

¹³ Florida homeowners insurers' underwriting losses in 2004 (\$9.3 billion) and 2005 (\$3.8 billion) resulted in a four-year cumulative loss of \$6.7 billion, even after including the profitable years of 2006 (\$3 billion) and 2007 (\$3.4 billion), when there were no hurricanes. Since 1992 the deficit is -\$6.2 billion. Insurance Information Institute, *Florida Property Insurance Facts* (Jan. 2008), available at <http://www.iii.org/media/research/floridafacts08/>.

¹⁴ Tom Zucco, *State Farm to Florida Homeowners: No Thanks*, ST. PETERSBURG TIMES, Feb. 23, 2008.

¹⁵ Anika Myers Palm, *50,000 to Lose State Farm Insurance*, ORLANDO SENTINEL, July 20, 2007; Jacqueline L. Uργο, *Insurance Companies Dropping New Jersey Shore Policies*, PHILADELPHIA INQUIRER, May 1, 2008.

¹⁶ Insurance Information Center, *Hurricane Katrina Facts File: 2007*, <http://www.iii.org/media/research/katrinafacts07/> (last visited May 6, 2008); See also, *At \$22 Billion, Insured Losses from Four Florida Hurricanes Will Exceed Andrew's Record*, INSURANCE JOURNAL, Oct. 1, 2004, <http://www.insurancejournal.com/news/national/2004/10/01/46438.htm> (the 2004 Atlantic hurricane season resulted in insured losses of \$22 billion); ENVIRONMENTAL DEFENSE, BLOWN AWAY: HOW GLOBAL WARMING IS ERODING THE AVAILABILITY OF INSURANCE COVERAGE IN AMERICA'S COASTAL STATES iv (2007) (after Hurricanes Katrina and Rita, insurers paid out more than \$55 billion in claims); NOAA, *Hurricane Katrina*, <http://www.katrina.noaa.gov/> (last visited May 6, 2008)(insured losses from Hurricane Katrina alone were estimated at \$60 billion).

¹⁷ NOAA, *supra* note 16.

¹⁸ Marilyn Adams, *A Storm of Trouble*, USA TODAY, May 24, 2006.

¹⁹ Abby Goodnough, *Florida Acts to Lower Home Insurance Cost*, N.Y. TIMES, Jan. 23, 2007. (In Florida, for instance, 2008 legislation allows private insurers to buy back-up coverage from the state Hurricane Catastrophe Fund at below-market rates in return for agreeing to lower their premiums).

Citizens Property Insurance (CPIC), created as the insurer of last resort, now has the largest portion of the state market share.²⁰ State insurance funds further burdens state residents through higher taxes and premiums.²¹ For example, after the hurricanes of 2004 and 2005, more than \$700 million in state tax revenues were used to offset CPIC's debt.²² Another series of large-scale disasters could overwhelm state insurance schemes, leading, at a minimum, to significant diversions of state funds from other expenditures, and at worst, to potential bankruptcy for the state.²³

The federal government also steps in when private insurance does not meet coverage needs; but in many cases, federal programs have compounded the problems. The National Flood Insurance Program (NFIP) was established because flood risk made some areas of the country uninsurable by private companies,²⁴ but the program provided the incentive to develop in these high-risk zones.²⁵ The General Accounting Office declared the NFIP "actuarially unsound," in 2003,²⁶ arguably due to a flawed design.²⁷ Following Hurricanes Katrina and Rita, the NFIP paid approximately \$16.2 billion in claims²⁸ and as a result was \$17.5 billion in debt,²⁹ in spite of the fact that the vast majority of those affected by flooding were not covered by flood insurance.³⁰ The federal government also provided \$100 billion in relief after Hurricane Katrina through other programs.³¹ Coastal ecosystems and natural resources will also be affected by

²⁰ *Id.* (The CPIC covered 1.3 million households, as of January 2007).

²¹ Carole Fleck, *Home Insurance Hell: Why Your Rates Are Out of Control*, AARP Bulletin (July-Aug. 2007), http://www.aarp.org/bulletin/yourmoney/home_insurance_hell.html (In Mississippi following Hurricane Katrina, the state insurance plan premiums increased by up to 90%).

²² Environmental Defense, *supra* note 16, at 15-18 (CPIC experienced a shortfall of \$516 million in 2004 as a result of excessive claims and by the end of 2005, the company had a deficit of \$1.7 billion).

²³ Insurance Journal, *supra* note 16; STATE OF LOUISIANA, STATE BUDGET FISCAL YEAR 2007-2008, (Sept. 28, 2007), <http://doa.louisiana.gov/OPB/pub/FY08/FY08%20SBD%20-%20part%201.pdf> (Losses from Hurricane Katrina were estimated to be significantly more than Louisiana's annual budget).

²⁴ Insurance Information Institute, *National Flood Insurance Program*, <http://www.iii.org/media/facts/statsbyissue/flood/> (last visited May 6, 2008).

²⁵ JUSTIN R. PIDOT, COASTAL DISASTER INSURANCE IN THE ERA OF GLOBAL WARMING: THE CASE FOR RELYING ON THE PRIVATE MARKET (2007), available at http://www.law.georgetown.edu/gelpi/current_research/documents/CoastalDisasterInsuranceReport.pdf; RAYMOND J. BURBY ET AL., CREATING HAZARD RESILIENT COMMUNITIES THROUGH LAND USE PLANNING (2000), available at http://www.planning.unc.edu/facstaff/faculty/burby/Hazard_Resilient_Communities.pdf; *Rethinking Federal Flood Insurance*, WASHINGTON POST, Sept 21, 2005; James Bovard, *Uncle Sam's Flood Machine*, THE FREEMAN (2006), available at <http://www.fee.org/pdf/the-freeman/0601Bovard.pdf>; RAWLE O. KING, CONGRESSIONAL RESEARCH SERVICE, FEDERAL FLOOD INSURANCE: THE REPETITIVE LOSS PROBLEM (2005), available at <http://www.fas.org/sfp/crs/misc/RL32972.pdf> (noting that even in cases when purchasing flood insurance is required, if disaster strikes, the NFIP will provide aid even to those who failed to purchase flood insurance, so there is less incentive to buy coverage, which makes risky development less expensive); Kenneth J. Bagstad et al., *Taxes, Subsidies, and Insurance as Drivers of United States Coastal Development*, 63 ECOLOGICAL ECONOMICS 285 (2006) (asserting that by providing a safety net, the program also removes the state and local governments' incentive to address underlying issues to prevent disasters).

²⁶ Environmental Defense, *supra* note 16 at 8.

²⁷ GAO, *supra* note 12.

²⁸ FEMA estimated that Hurricanes Katrina, Rita, and Wilma will generate claims and payments of about \$23 billion – far surpassing the total claims paid in the entire history of the NFIP. *Id.*, at 4.

²⁹ Environmental Defense, *supra* note 16, at 8; see also Insurance Information Institute, *supra* note 24; GAO, *supra* note 12 (reporting that after the hurricane season of 2005, the NFIP was given the authority to borrow \$18.5 billion in debt from the U.S. Treasury through 2008, but it's highly unlikely that the program as currently structured will be able to repay that debt).

³⁰ ROBERT P. HARTWIG, INSURANCE INFORMATION INSTITUTE, THE FUTURE OF THE NATIONAL FLOOD INSURANCE PROGRAM (Oct. 18, 2005), available at http://server.iii.org/yy_obj_data/binary/745025_1_0/NFIP_Testimony.pdf.

³¹ Environmental Defense, *supra* note 16, at 8 (the federal government declared approximately 140 major disasters in more than forty states between 2005 and 2007. Following Hurricane Katrina, the federal government granted

climate change, both directly and indirectly. Coastal resources provide crucial wildlife habitat, they sequester significant amounts of carbon, provide sediment and nutrient water quality benefits, and generate economic benefits through provision of ecosystem services, farming, forestry, fishing, and recreational opportunities. While coastal ecosystems are already dynamic, climate change will accelerate the *rate* of change, altering the historical balance. Ecological niches will shift, which means species distribution in a given area is likely to change as well. This ecological game of musical chairs gives invasive species an opportunity to claim a new seat.³² One of the greatest challenges for ecological management under new climate conditions, therefore, will be trying to distinguish between invasive species, and a species range expansion or contraction that would be expected under changing ecological conditions.

Wetlands provide critical wildlife habitat and buffer against impacts of extreme weather.³³ SLR will submerge wetlands, waterlog soils, and cause plant death from salt stress.³⁴ The loss of coastal wetlands is accelerated by more frequent and intense tropical storms.³⁵ An increase in mean annual temperature of 3°C may result in the loss of 30% of global coastal wetlands.³⁶ In Florida, a 15-inch rise in sea level, expected by 2100, would result in the loss of nearly 50% of critical salt marsh and 84 percent of tidal flats.³⁷ In specific areas in the state, the predictions are even more devastating. By 2100, Charlotte Harbor is projected to lose 97% of its tidal flats and 89% of its salt marsh.³⁸ By only 2050, Florida Bay is predicted to lose 98% of its tidal flats; the area of dry land in the state is projected to decrease by 14%; roughly 30% of ocean beaches and two-thirds of estuarine beaches will disappear.³⁹ All this is for a

\$100 billion in relief through the United States Department of Housing and Urban Development (HUD) and United States Department of Homeland Security's Federal Emergency Management Agency).

³² One study examined 58 species to determine their potential to establish in the Great Lakes by comparing characteristics of these potential invaders to 11 recent invaders. Of the 58 species studied, 27 could potentially establish if temperatures warm from climate change, while the others could not. ROXANNE THOMAS ET AL., EFFECTS OF CLIMATE CHANGE FOR AQUATIC INVASIVE SPECIES AND IMPLICATIONS FOR MANAGEMENT AND RESEARCH, EPA/600/R-08/014, 1-1, 2-2 (Feb. 2008).

³³ Florida Department of Environmental Protection, *Coastal and Aquatic Managed Areas Supports*, <http://www.dep.state.fl.us/coastal/about.htm> (last visited May 6, 2008) (noting that in Florida, 43% of the federally listed threatened or endangered species rely directly or indirectly on wetlands for their survival).

³⁴ VICTOR KENNEDY ET AL., PEW CENTER ON GLOBAL CLIMATE CHANGE, COASTAL AND MARINE ECOSYSTEMS & GLOBAL CLIMATE CHANGE: POTENTIAL EFFECTS ON U.S. RESOURCES 13, 24 (Aug. 2002), available at http://www.pewclimate.org/docUploads/marine_ecosystems.pdf (although wetlands can migrate onto newly inundated adjacent dry lowlands when space is available, the availability of dry land within 1m of high water is insufficient to accommodate the expected losses). See also Robert J. Nicholls et al., *Regional Issues Raised by Sea-level Rise and the Policy Implications*, 11 CLIMATE RESEARCH 5 (Dec. 1998), available at <http://www.int-res.com/articles/cr/11/c011p005.pdf>.

³⁵ LOUISIANA COASTAL WETLANDS CONSERVATION AND RESTORATION TASK FORCE, COASTAL WETLANDS PLANNING, PROTECTION AND RESTORATION ACT (CWPPRA): A RESPONSE TO LOUISIANA'S LAND LOSS (2006), available at <http://lacoast.gov/reports/program/index.asp> (Increased intensity of storm precipitation can result in increased rates of sediment delivery to estuaries but more frequent intense precipitation and drought extremes may weaken coastal cliffs and exacerbate erosion. The U.S. Geological Survey estimated that 75,520 acres (118 square miles) of Louisiana's coastal marsh were lost as a result of Hurricanes Katrina and Rita, exceeding the estimates of future land loss over the next 50 years.).

³⁶ IPCC, *supra* note 3, at 16.

³⁷ JULIE HAUSERMAN, FLORIDA'S COASTAL AND OCEAN FUTURE: A BLUEPRINT FOR ECONOMIC AND ENVIRONMENTAL LEADERSHIP 22 (2006), available at <http://www.environmentflorida.org/uploads/8M/93/8M93vwP-jdtpmONV41ck2Q/flfuture.pdf>.

³⁸ *Id.*

³⁹ *Id.*

relatively modest rise of sea level of 15 inches. Globally, over 50% of wetlands would be lost to a 1m rise in sea level.⁴⁰

One particular family of wetland species – mangroves – supports an ecological community that plays a direct role in protecting human lives from impacts of weather-related disasters such as the 2004 Asian tsunami and the recent Cyclone Nagris in Myanmar.⁴¹ The tsunami wiped out 273,000 people in coastal villages;⁴² but those villages with intact mangrove forests were largely spared.⁴³ Worldwide, since 1980, it is estimated that more than 3.6 million hectares of mangroves have been destroyed, a loss of approximately 20%.⁴⁴ The United States has lost approximately 28% of its 275,000 hectares of mangroves since 1980.⁴⁵

New climate conditions will affect the prevalence and distribution of species, including invasive species, in coastal regions.⁴⁶ Changing climatic conditions can exacerbate the potential for the spread of invasive species because new species will be able to survive, known invasive species can expand their range into new territories, and species that are currently not considered invasive may become invasive and cause significant impacts.⁴⁷ The impacts of these invasive species can be especially deleterious when native ecosystems are already out of balance.⁴⁸

Climate change will also affect ecosystem services provided by coastal resources. SLR threatens to contaminate coastal aquifers with saline water unusable for human consumption or irrigation.⁴⁹ Saltwater intrusion could also facilitate the spread of contaminated water from hazardous waste facilities or septic systems.⁵⁰ Climate change also threatens the flood and storm surge protection provided by coastal wetlands.

⁴⁰ Nicholls *et al.*, *supra* note 34, at 9.

⁴¹ Mark Kivner, *Mangrove Loss "Put Burma at Risk,"* BBC NEWS, May 6, 2008, available at <http://news.bbc.co.uk/2/hi/science/nature/7385315.stm>.

⁴² *Death Toll in Asian Tsunami Disaster at 273,000*, China News Agency, Mar. 5, 2005, available at http://www.chinadaily.com.cn/english/doc/2005-03/05/content_422102.htm.

⁴³ Kivner, *supra* note 41.

⁴⁴ FOOD AND AGRICULTURAL ORGANIZATION, *THE WORLD'S MANGROVES, 1980 – 2005* 9, available at <ftp://ftp.fao.org/docrep/fao/010/a1427e/a1427e00.pdf>.

⁴⁵ *Id.*, at 11, 31.

⁴⁶ Thomas *et al.*, *supra* note 32, at 1-8.

⁴⁷ *Id.*, at 2-15.

⁴⁸ *Id.* (For example, the green crab (*Carcinus maenas*) is an invasive species prevalent on both the East and West Coasts, which damages native coastal fisheries. Higher water temperatures will likely expand their range, further stressing native populations of commercially important clams, which may not be able to withstand the added stresses of climate-change effects. AIS in the Chesapeake Bay include pathogens such as Dermo and MSX, plants such as hydrilla, Purple loosestrife, Eurasian watermilfoil, phragmites, and animals such as mute swan, nutria, Northern snakehead, Chinese mitten crab, and zebra mussel).

⁴⁹ *Climate Change Threatens Drinking Water, As Rising Sea Penetrates Coastal Aquifers*, SCIENCE DAILY, Nov. 7, 2007, <http://www.sciencedaily.com/releases/2007/11/071106164744.htm>; Mohsen M. Sherif & Vijay P. Singh, *Effect of Climate Change on Sea Water Intrusion in Coastal Aquifers*, 13 HYDROLOGICAL PROCESSES 1277, 1279 (1999); U.S. Environmental Protection Agency, *Coastal Zones and Sea-level Rise*, <http://www.epa.gov/climatechange/effects/coastal/index.html> (last updated Feb. 8, 2008) (U.S. coastal aquifers in several areas are threatened. Florida's Everglades currently recharge the Biscayne aquifer, the primary water supply for the Florida Keys. As rising water levels submerge low-lying portions of the Everglades, portions of the aquifer will likely become saline. Similarly, aquifers in New Jersey to the east of Philadelphia are recharged by fresh portions of the Delaware River, which may become saline in the future.).

⁵⁰ Craig, *supra* note 4.

Many coastal economies of the United States rely heavily on natural resource-based industries including commercial and recreational fishing, forestry, agriculture, and tourism. In Florida, over 70% of commercially important fish and shellfish species are dependent on estuaries threatened by SLR.⁵¹ Increased water temperature increases risks to fish populations from habitat degradation,⁵² parasites, toxic algae, and other pests; these changes may also affect species habitat range.⁵³ The land that supports forestry and agricultural activities is vulnerable to SLR and increased storm severity. Damage to forests may potentially result in a positive feedback mechanism, which could result in further elevating levels of carbon dioxide in the atmosphere.⁵⁴

Predicted climate impacts will also have public health consequences, further exacerbating existing weak points in health protection systems.⁵⁵ Changes in climate will enable the invasion of disease vectors and hosts.⁵⁶ Disease vectors that may become more prevalent include those for Lyme disease, Hantavirus, malaria, and dengue fever.⁵⁷

II. Climate Adaptation and the Governance Imperative: A Conceptual Framework for Adaptation Law and Policy

Climate change impacts are already impossible to ignore and are predicted only to intensify. Society has neither the resources to engineer our way out of the effects of climate change, nor to predict them precisely. Adapting to climate change means changing how society manages water, biodiversity, agriculture, forests, land use planning, and coastal zones, recognizing that there will never be complete knowledge about environmental dynamics and that many aspects will only be understood through experience, including experimentation.⁵⁸ This means new laws and new governance frameworks – a paradigm shift. An adaptive society needs legal systems that are capable of adapting to the new reality of climate change. This legal reform should address four⁵⁹ aspects of climate change response: (1) building

⁵¹ EPA, *supra* note 49.

⁵² Kennedy et al., *supra* note 34 at 24 (Increased temperatures reduce the capacity of water to hold the oxygen necessary for aquatic life. For instance, predicted oxygen deprivation may prevent striped bass from spawning in the Chesapeake Bay and increase the intensity, duration, and extent of harmful algal blooms, which further deprive aquatic organisms of oxygen and threaten their habitats. Warmer water also encourages water-borne pathogens, such as Dermo, a protozoan that attacks oysters.).

⁵³ 2WE CONSULTING LTD., *AQUACULTURE AND CLIMATE CHANGE IN CANADA* (2000), available at http://www.cics.uvic.ca/workshop/Aquaculture&climate-in-Cda.htm#_Toc482687853. (for example, by changing ocean currents, an increase in temperature will likely limit the range of salmon); *see also* IPCC, *supra* note 3, § 11.2.4.4 (Fisheries and Aquaculture).

⁵⁴ Jeffrey Q. Chambers et al., *Hurricane Katrina's Carbon Footprint on U.S. Gulf Coast Forests*, 318 *SCIENCE* 1107 (2007) (Growing forests absorb carbon, which significantly affects the atmospheric carbon balance, and thus climate conditions. Dead and damaged trees emit carbon dioxide. Increased storm activity is expected to reduce forest biomass stocks and increase ecosystem respiration. The biomass lost due to hurricane Katrina represented 50 to 140 percent of the net annual U.S. carbon sink in forest trees.).

⁵⁵ Diarmid Campbell-Lendrum et al., *Global Climate Change: Implications for International Public Health Policy*, 25 *BULLETIN OF THE WORLD HEALTH ORGANIZATION* 161-244 (2007), available at <http://www.who.int/bulletin/volumes/85/3/06-039503/en/>.

⁵⁶ The range of tropical aquatic snails is expected to expand with warming temperatures. These snails carry trematodes native to tropical and sub-tropical regions of the world that cause the disease schistosomiasis. Thomas et al., *supra* note 32, at 1-9.

⁵⁷ Centers for Disease Control and Prevention, *Climate Change and Public Health, Health Effects*, <http://www.cdc.gov/ClimateChange/effects/default.htm> (last visited May 11, 2008); Twilley et al., *supra* note 5, at 57.

⁵⁸ CARL WALTERS, *ADAPTIVE MANAGEMENT OF RENEWABLE RESOURCES* (1986).

⁵⁹ The terminology of conceptual frameworks for proposed new conceptual frameworks to adapt to climate change vary. *See, e.g.* PAM RUBINOFF, *USAID COASTAL ADAPTATION GUIDEBOOK, CHAPTER 5: IDENTIFYING ADAPTATION*

resilience to anticipated effects; (2) enhancing adaptive capacity of the governance system; (3) providing early warning of emerging threats; and (4) ensuring effective emergency response to specific incidents.

Building resilience generally includes measures to address existing stressors, enabling resources to better cope with the added stresses associated with climate change. The uncertainties regarding the specific effects of climate change, as well as the unknown effectiveness of legal and institutional responses, require a governance system with enhanced adaptive capacity. Incorporating *adaptive management* into laws and institutions can build the capacity of governance systems and thus ecosystems to adapt to changing climatic conditions, new technologies and techniques, and increased scientific understanding. *Early warning* includes monitoring and notification regarding potential droughts, floods, heat-waves, and introduction of invasive species. Finally, institutional and legal measures are necessary to provide for *emergency response* to particular events.

While there is a fair amount of experience – albeit without the climate change overlay – in developing and implementing laws that enhance resilience, early warning, and emergency response, there is relatively limited experience in structuring legal frameworks around adaptive management. Adaptive management acknowledges that decisions are made with imperfect information, and thus are necessarily provisional. While there are different approaches, adaptive management is generally understood to entail: the development and adoption of a provisional measure (a law, policy, institutional arrangement, management decision, etc.); ongoing monitoring; periodic assessment of the collected information; modification of the legal and institutional frameworks, as appropriate; and continuing the cycle of management actions, monitoring, assessment, and revision.⁶⁰

Many existing environmental laws and institutions already address some of these measures, for example with respect to implementation or monitoring (although the monitoring tends to focus particularly on compliance). However, the last step – the introduction of feedback loops – is the most revolutionary.⁶¹ In fact, this has been a concern for some because of potential tensions between an adaptive approach and notice-and-comment rulemaking requirements as well as impact assessment requirements of the National Environmental Policy Act.⁶² On the other hand, adaptive management has successfully been incorporated into numerous federal and state natural resource decisions, including dam licenses and management plans such as the state of Oregon's Plan for Salmon and Watersheds.⁶³ Adaptive management must be introduced in tandem with efforts to address related concerns.

III. A New Generation of Policy Responses

While the framework articulated above broadly represents the changes that need to be made to adapt coastal zone management to climate change, incorporating them into various sectors will require considering specific contexts including: (1) for the built environment (*inter alia*, observation, monitoring,

MEASURES TO COASTAL CLIMATE CHANGE (in preparation), presented at Adapting to Coastal Climate Change, Pre-Conference Meeting at the 4th Global Conference on Oceans, Coasts, and Islands, in Hanoi, Vietnam (Apr. 7, 2008).

⁶⁰ Kai N. Lee et al., *Adaptive Management: Learning from the Columbia River Basin Fish and Wildlife Program*, 16 ENV. LAW 431 (1986); Holly Doremus, *Adaptive Management, the Endangered Species Act, and the Institutional Challenges of "New Age" Environmental Protection*, 41 WASHBURN LAW J. 50 (2001).

⁶¹ Carl Bruch, *Adaptive Water Management: Strengthening Laws to Cope with Uncertainty*, in WATER MANAGEMENT BEYOND 2020 (2008) (forthcoming).

⁶² *Id.* (Noting that notwithstanding some agencies' concerns about adaptive management, other U.S. agencies have a growing body of experience in managing natural resources adaptively. For example, the Department of the Interior has introduced adaptive management for river basins, federal lands, wildlife, and forests; the U.S. Forest Service has utilized adaptive management for forests; and the Federal Energy Regulatory Commission has introduced adaptive management into the licensing process for hydropower dams.).

⁶³ *Id.*

and assessment, comprehensive planning and zoning, building codes, disclosure, insurance, disaster relief programs, and erosion control); (2) for ecological and natural resources (*inter alia*, coastal forest management, marine resources, agricultural practices, wetlands, and invasive species); and (3) public health considerations (*inter alia*, surveillance, response systems, and health impact assessment). While climate adaptation planning is important, policy decisions and legal frameworks must also incorporate climate change adaptation.⁶⁴

A. Policy Responses for the Built Environment

When considering how to prepare and adapt coastal communities and states for the effects of climate change, decision makers must consider both existing infrastructure and infrastructure that will be built. Policy responses may also depend on whether infrastructure is public or private.

1. Observation, Monitoring, and Assessment

Preparing the built environment for climate change requires understanding impacts, such as SLR, as they are happening. An integrated sea-level observation system enables comprehensive surveillance, monitoring, documentation, and dissemination of information, such as rates and locations of SLR, for emergency response systems or for the development of adaptive management systems.

Development of a SLR observation system and policy responses should involve national, state, regional, and local authorities, but broader – statewide or regional – authorities should take the lead.⁶⁵ When assessing public and private infrastructure vulnerabilities, it will be important to use a broader perspective because when viewed from a particular community’s perspective, much of the infrastructure is likely to be critical. After identifying vulnerable infrastructure, authorities can categorize and assess threats and impacts and then formulate strategies to prioritize responses.

2. Comprehensive Planning

It is much easier and affordable to direct new construction than retrofit or move existing construction. While there are often significant constraints on what can be done to adapt the existing built environment for climate change, coordinated, integrated “safe growth” can make the future built environment significantly more resilient and able to adapt to changing conditions if authorities *plan* accordingly.⁶⁶ For example, the town of Nags Head, North Carolina developed a comprehensive plan that sought to direct construction so as to reduce vulnerability to storms.⁶⁷ Planning can provide an opportunity to address a

⁶⁴ Rubinoff, *supra* note 59.

⁶⁵ MARYLAND CLIMATE CHANGE COMMISSION ADAPTATION AND RESPONSE WORKING GROUP, EBEI-2 OBSERVATION SYSTEM FOR CHANGE IN COASTAL AREAS (Mar. 3, 2008), *available at* <http://www.mdclimatechange.us/twg.cfm> (some examples of existing information-gathering programs include the Maryland Coastal Program’s Comprehensive Shoreline Inventory and NOAA’s Coastal Service Center’s Strategic Shore Erosion Assessment for Maryland).

⁶⁶ EVAN MILLS, CERES, FROM RISK TO OPPORTUNITY 16 (Nov. 2007), *available at* <http://www.ceres.org/NETCOMMUNITY/Page.aspx?pid=858&srcid=593>; *see also* Raymond J. Burby, *Hurricane Katrina and the Paradoxes of Government Disaster Policy*, ANNALS OF THE AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE 604: 171-191 (Mar. 2006).

⁶⁷ Raymond J. Burby, *Land-Use Planning for Flood Hazard Reduction: The United States Experience*, in DENNIS J. PARKER, FLOODS 7 (2000) (in implementing a local comprehensive plan, the Outer Banks town had a goal “to reduce, to the extent possible, future damage from hurricanes and severe coastal storms.” Examples of the plan’s pre-storm measures to improve resilience include: (1) encouraging growth away from the highest storm hazard areas; (2) natural mitigation features, such as dunes and wetlands; (3) increased areas of permanent open space; (4) reduction of local hazards by identifying, and attempting to influence, federal, regional, and state policies and

wide range of potential responses to impacts from climate change – from protection to accommodation to retreat, integrating plans for hazard-related factors such as stormwater and flooding into broader comprehensive or capital planning tools. Given the uncertainty of climate impacts and specific effects on infrastructure, planners can help prepare by developing, in advance, a system for deciding how to deal with infrastructure under various scenarios.

Coordination and consistency in planning approaches will contribute to the effectiveness of frameworks for integrating all of the elements of the climate adaptation process.⁶⁸ So, while local governments are planning authorities, an appropriate state agency or coalition could spearhead planning reform by conducting a technical review and assessment of coastal local governments' planning guidelines and measures, determining how best to coordinate across the levels of government, and providing technical assistance, grants, and support for local GIS mapping.⁶⁹ Planning reform must be accompanied by appropriate amendment to state and local law to introduce an adaptive approach, if such an approach is not already provided for.

3. Zoning

Paired with planning policies for reducing vulnerability, increasing resiliency, and strengthening adaptive capacity, zoning can be a crucial part of policy responses to gird the future built environment against climate change. As an enforceable aspect of land use planning, zoning is key to effective climate adaptation. Zoning tools can include specialized easements, construction restrictions, and directing policy through prioritization.

Erosion control easements are legal agreements between a landowner and a land trust or government agency that restricts development in erosion-prone areas.⁷⁰ Such easements can be over the entire property or just the shoreline and can be written to prohibit all development or any particular kinds. *Rolling easements* apply along a shoreline to prevent landowners from holding back the sea without restricting landward development.⁷¹ Landward of the mean high water or mean higher high water line, which delineates the boundary of state-owned submerged lands, beaches can be privately owned, but may be subject to the public beach easement, allowing the public free and unrestricted access to and use of the beach.⁷² Because shoreline stabilization structures cannot be erected, sediment transport remains undisturbed and wetlands and other important tidal habitat can migrate naturally. This approach assures that there will always be dry or intertidal land for the public to walk along, preserving lateral public access to the shore.⁷³ By allowing landward development, rolling easements are less prone to takings claims (discussed further in the section on regulatory takings).⁷⁴ Rolling easements have been used in various states including California, South Carolina, and Texas, where they are built into the Open Beaches Act.⁷⁵ Enforcement in Texas prioritizes removal lawsuits against the owners of structures that:

program affecting local mitigation; (5) the active support and use of the NFIP and FEMA's Community Rating System to prevent damage from storms and flooding; and (6) the opposition and prohibition of finger canal construction).

⁶⁸ Bruch, *supra* note 61.

⁶⁹ MARYLAND CLIMATE CHANGE COMMISSION ADAPTATION AND RESPONSE WORKING GROUP, COMMON OPTION (FBEI-1): INTEGRATED PLANNING FOR SEA-LEVEL RISE, COASTAL STORMS AND COASTAL EROSION (Mar. 3, 2008), available at <http://www.mdclimatechange.us/ewebeditpro/items/O40F15920.pdf>.

⁷⁰ NOAA Office of Ocean and Coastal Resource Management, *Erosion Control Easements*, http://coastalmanagement.noaa.gov/initiatives/shoreline_ppr_easements.html (last visited Apr. 21, 2008).

⁷¹ *Id.*

⁷² Texas General Land Office, *Coastal Issues*, <http://www.glo.state.tx.us/coastal.html> (last visited May 5, 2008).

⁷³ NOAA, *supra* note 70.

⁷⁴ See, *Feinman v. Texas*, 717 S.W.2d 106 (Tex. 1986).

⁷⁵ TEX. NAT. RES. CODE ANN. § 61.001 et seq.

“(1) significantly restrict or impair the public’s access to or use of the beaches, (2) pose an imminent public health and safety hazard, or (3) are located on state-owned submerged land.”⁷⁶

Another regulatory tool for protecting structures from erosion is *construction setbacks*, which are restrictions on how far from the water construction is permitted. Like rolling easements, setbacks also seek to protect shoreline dynamics and help to maintain lateral beachfront access. The type of setback, including how and where they are established, can vary widely.⁷⁷

Establishing setback lines can be controversial if the setback renders some properties unbuildable and could be viewed as a taking, depending on the impacts of the restriction.⁷⁸ One way to reduce takings claims is to ensure waterfront lots are sufficiently deep to allow for relocation as the shore retreats.⁷⁹ In particularly flat coastal areas, however, it may not be feasible to ensure that waterfront lots are sufficiently deep to accommodate a rise of three feet; and in most coastal areas, waterfront lots are already subdivided into smaller units. In the long run, zoning approaches based on current conditions as they change, such as rolling easements, are likely to be more effective than those that base standards on conditions existing at the time the regulation is established. Maps created at any given time will eventually be out of date. Zoning approaches will need to be truly adaptive to be responsive to climate change impacts.

Competing demands and political realities may make it impossible to employ all resiliency-building tools across our entire coastal zones. In choosing where to focus protection of land to reduce climate impacts, decision makers can maximize benefits by considering what other benefits can be gained by the same actions. Zoning can include scientific and technical criteria to prioritize preservation of land that improves the resilience to impacts of climate change, as well as being ecologically or economically valuable. Using appropriate selection criteria,⁸⁰ *zoning for priority protection* can be initiated with an assessment to

⁷⁶ TEXAS GENERAL LAND OFFICE, TEXAS OPEN BEACHES ENFORCEMENT POLICY (Sept. 18, 2006), *available at* <http://www.glo.state.tx.us/coastal/beachdune/openbeaches.html>; *see also* TEXAS GLO, TEXAS LAND COMMISSIONER JERRY PATTERSON’S PLAN FOR TEXAS OPEN BEACHES (June 2006), *available at* <http://www.glo.state.tx.us/news/archive/2006/docs/PATTERSONPLAN.pdf>.

⁷⁷ NOAA, *supra* note 70 (Approximately two-thirds of coastal and Great Lakes states have some type of construction setback or construction control line requiring development to be a certain distance from the water’s edge; most others have delegated authority to local governments or local coastal programs to establish setbacks. Setback regulations must articulate standards for when a building damaged or destroyed by a storm or chronic erosion can be rebuilt and establish clear standards on how setback lines can move as the beach naturally or artificially accretes. “For example, New Jersey’s Coastal Zone Management Rules do not allow a waiver from the setback if the beach accretes. A permit application for development within a setback area of an accreting beach would be denied. However, if an Administrative Hearing request was filed, the applicant could petition for a permit if they can show the accreted beach offers sufficient increased protection from erosion.”) *See also* County of Maui, *Shoreline Setback Areas*, *available at* <http://www.co.maui.hi.us/departments/Planning/czmp/ssa.htm> (last visited May 18, 2008) (the Maui Planning Commission requires coastal development to be set back a distance of 50 times the annual erosion rate plus 20 feet, or the old arbitrary setback, whichever is greater).

⁷⁸ NOAA, *supra* note 70.

⁷⁹ For example, in Maine, if repairs will cost more than 50% of the structure’s value, the existing structure must comply with the setback requirements. *Id.*

⁸⁰ MARYLAND CLIMATE CHANGE COMMISSION ADAPTATION AND RESPONSE WORKING GROUP, RRI-1 NEW CRITERIA FOR IDENTIFYING PRIORITY PROTECTION AREAS (Jan. 11, 2008), *available at* <http://www.mdclimatechange.us/twg.cfm> (Once these criteria are available, authorities can develop a series of targeted actions: (1) conducting a condition assessment to identify high priority economic and natural resource lands; (2) conducting a functional assessment to identify coastal land areas that will be important for maintaining ecosystem integrity and connectivity and to support farming, forestry, and fisheries industries; (3) determining where high priority coastal lands are currently protected and where strategic conservation and restoration targets

identify undeveloped lands that will be critical for targeted conservation *and* coordinated response to SLR and its associated effects.⁸¹

4. Building Codes

As described above, a wide range of planning and land use tools can be enlisted in preparing for SLR and other impacts from climate change. Appropriate building codes can play an important role in making buildings safer from predicted climate impacts by addressing a range of issues including building elevation, foundation design, moisture-entrapment, and damage from debris. Any effective effort to update codes to respond to climate change will have to be ongoing and adaptive. Codes will have to be periodically re-evaluated for effectiveness in new and evolving circumstances. To account for the lifespan of newly constructed buildings, evaluation of codes in light of threats associated with climate change will involve looking many decades into the future and trying to predict impacts. Where deficiencies are found, the codes, regulations, and laws will have to be updated.

Effective implementation and enforcement, especially in light of continuing adaptation, will require ongoing training of enforcement personnel and education of the building community and property owners. Such an effort will be most effective if led at the state-level using an integrated approach involving the participation of all stakeholders in the construction process.⁸²

5. Notification of Buyers

Awareness of threats will be essential for resilience and effective emergency response. Homeowners are a key group who will need to be aware of potential threats. While this information can be shared through a general education campaign or as a notice on real estate listings, the information will be the most meaningful at the time of the transaction. A disclosure requirement, building on similar existing requirements for lead paint and radon, would have the advantage of being focused on an individual property at the time of the transaction.⁸³ The disclosure could take various forms, including generic notification that the property is in a zone vulnerable to SLR or a more specific notification of buyer that the particular property has experienced flooding or storm damage in the past or warranting that it has not had such impacts.

This notification would put the purchaser on notice of the potential effects of SLR. As such, it would inform and may influence investor-backed expectations. It would not likely prevent sales, but it could affect the ultimate sales price to reflect increased risk of SLR and of regulatory measures.

6. Insurance

Insurance policy includes two large categories of insurance: federal disaster relief programs and traditional private homeowners insurance. Climate change has altered the foundational industry rules that: (1) risk is spread over large and diverse groups to minimize the likelihood of having to pay everyone off at once; and (2) sufficiently understanding the past enables insurers to predict what will occur in the

should be identified; and (4) developing a set of field-based criteria to further identify the suitability of lands for protection and/or restoration.).

⁸¹ *Id.*

⁸² MARYLAND CLIMATE CHANGE COMMISSION ADAPTATION AND RESPONSE WORKING GROUP, EBEL-8 BUILDING CODE REVISIONS AND INFRASTRUCTURE DESIGN STANDARDS (Mar. 3, 2008), available at <http://www.mdclimatechange.us/twg.cfm>.

⁸³ MARYLAND CLIMATE CHANGE COMMISSION ADAPTATION AND RESPONSE WORKING GROUP, EBEL-10 DISCLOSURE (May 9, 2008), available at <http://www.mdclimatechange.us/twg.cfm>.

future.⁸⁴ While the past has historically served as a good indicator of future events when calculating the risks associated with insurance coverage, climate change introduces new and uncertain risks into these calculations.⁸⁵ In effect, climate change voids the historical record. Scientists caution that intense weather events may become more predictable in only one sense: “They will become a lot more severe, and quite possibly more frequent.”⁸⁶

a. *Private Insurance*

The backbone of the economic institutional framework that makes it possible for people to recover from damage caused by intense weather events comprises the insurance and reinsurance companies.⁸⁷ Most insurance companies in the United States have responded to the challenges posed by climate change with financial strategies to reduce risk in coastal areas.⁸⁸ Risk is reduced by raising premiums, increasing deductibles, limiting coverage, or discontinuing coverage altogether.⁸⁹ States are stepping in, filling coverage gaps, but also assuming enormous risk.⁹⁰ States, in turn, are increasingly appealing to the federal government for help. Coastal states, led by Florida, are lobbying for a national catastrophe fund that would allow state funds and private insurers to buy lower-cost reinsurance from the federal government to limit their exposure to disasters.⁹¹

But before the liability is simply passed down the line, authorities have the opportunity to consider how the insurance industry can contribute to lowering the risk. If states gather information on existing insurance programs, conduct an assessment of the potential hazards and the threats they pose, and evaluate how the insurers and reinsurers are currently managing those risks, they can develop strategies for managing the risks and uncertainties that could result from climate change and, therefore, for avoiding bankruptcy when the risks manifest themselves as impacts. Such a study can also help determine how the insurance industry can promote environmental management goals, and the relationship between changing building and design standards and insurance.⁹²

Because insurance companies are expert managers of risk, their role in persuading policymakers to undertake proactive measures can be extremely influential.⁹³ A national network of investors, environmental organizations, and other public interest groups working with companies and investors to address sustainability challenges, called CERES, published a list of ten proactive strategies available to the insurance industry, including promoting loss prevention, encouraging risk-reducing behavior,

⁸⁴ Environmental Defense, *supra* note 16, at 1.

⁸⁵ *Id.*, at 1; Mills, *supra* note 66, at 6 (Historic examples of such “watershed events” include the Great Dust Bowl of the 1930s and the urban riots of the 1960s).

⁸⁶ Environmental Defense, *supra* note 16, at 1.

⁸⁷ *Id.* While insurance companies serve as a means to protect homeowners and businesses, reinsurance companies serve to protect the insurance companies themselves. The use of reinsurance, although not a novel idea, has increased in recent years. For example, roughly one third of the \$20 billion in insured losses of the 2004 season was covered by reinsurance, while one half of the losses experienced by Hurricane Katrina in 2005 was covered by reinsurance.

⁸⁸ Mills, *supra* note 66, at 7.

⁸⁹ Environmental Defense, *supra* note 16, at iv, 1.

⁹⁰ *Id.*, at 9.

⁹¹ Valerie Bauerlein, *Catastrophic-Fund Plan Moves to Fore in Florida*, WALL STREET JOURNAL, Jan. 26, 2008; see also House Reps. *Introduce National Catastrophe Insurance Proposal*, INSURANCE JOURNAL, Jan. 5, 2007, available at <http://www.insurancejournal.com/news/national/2007/01/05/75650.htm>.

⁹² Mills, *supra* note 66, at 3 (noting that although proactive measures exist, many insurers are “behind the curve” in the development of these products and services).

⁹³ *Id.*, at 5.

financing climate protection improvements, investing in climate change solutions, building awareness, leading by example, and disclosing risks.⁹⁴

b. *Federal Disaster Relief Programs*

While a primary concern regarding the NFIP has been simply keeping the program sufficiently funded to continue functioning, allowing it to continue without reexamining its basic premise and effectiveness is irresponsible.⁹⁵ In its current form, the NFIP creates a moral hazard by enabling people to choose to live in places that put a burden on society. Instead, the program can promote a change in behavior if the policy of grandfathering certain properties and allowing variances is discontinued, the flood maps are updated regularly, and the disincentives for states to take responsibility for hazard management are removed.⁹⁶ The GAO reported that the program would better meet its intended purposes⁹⁷ if: (1) FEMA's oversight is strengthened; (2) the inventory of subsidized repetitive loss properties is reduced; (3) existing mandatory purchase requirements are enforced; (4) coverage is expanded by encouraging voluntary purchase through marketing and expanding mandatory purchase requirements (which would require more precise flood mapping); and (5) fully implementing the 2004 Flood Insurance Reform Act, including improved communications, developing an appeals process, and assuring that agents meet education and training standards.⁹⁸

Although flood insurance policies are sold through contracted private insurance companies, the program is funded and regulated by the federal government, so reforming the program provides a valuable opportunity to build resilience. Similarly, mapping for the program is done by contractors and state and local partners. The maps are currently being updated, but this process should be coordinated and meet uniform quality standards. For example, FEMA can improve the quality of the information the program relies on by developing and implementing data standards and consistent analysis, and require maintenance of accurate maps.⁹⁹

⁹⁴ *Id.*, at 22-30.

⁹⁵ It is also recommended that issuing more policies through a mandatory lender-based policy will allow risks to be spread more evenly and allow for pricing of premiums that more appropriately reflects risks. Hartwig, *supra* note 30, at 6.

⁹⁶ Frank D. Russo, *Historic Package of Flood Bills Become Law*, CALIFORNIA PROGRESS REPORT (2007), http://www.californiaprogressreport.com/2007/10/historic_packag.html (California provides a model for how states can reduce climate risk. In October 2007, Governor Schwarzenegger signed a legislative package of comprehensive flood reforms. Under the new requirements, the state must develop a plan for flood protection, and cities and counties are prohibited from entering into development agreements, approving permits or subdivision maps in a flood zone unless there is adequate flood protection. Local authorities must incorporate flood hazards into their development plans to minimize risk in flood-prone areas, as they must already do for fire and earthquakes. The new standards increase the level of accountability and professional experience on the state water board for maintaining the state's levee system. The State is now required to develop floodplain maps, inspect state levees and notify landowners if their property is at risk of flooding. Importantly, incentives are now more directly aligned because local governments now share liability for a flood when they make unreasonable development decisions. Finally, California is using a time scale more likely to reflect risk into the future, doubling the commonly-used 100-year flood horizon.) See also Press Release, Office of the Governor (California), *Governor Schwarzenegger Signs Legislation to Strengthen Flood Protections in California* (Oct. 10, 2007), available at <http://gov.ca.gov/index.php?/press-release/7661/>.

⁹⁷ The NFIP is intended to: (1) provide flood insurance for those who would benefit for it; (2) reduce tax-payer funded disaster assistance; and (3) reduce property damage through flood plain management based on accurate, useful flood maps and the enforcement of building standards. GAO, *supra* note 12, at 1.

⁹⁸ *Id.*

⁹⁹ *Id.*

7. Erosion Control Measures

While the decisionmaking framework described in the comprehensive planning section will dictate *which* elements of the built infrastructure will be prioritized for different responses, there must also be a framework for deciding *what kind* of response is appropriate. The first level of decisionmaking will involve choosing between protecting, retrofitting, removing, and abandoning structures; there must also be a decision about which methods to use. A presumption in favor of methods that will improve ecosystems and create new opportunities will maximize effectiveness, for example, in the context of erosion due to SLR.¹⁰⁰ Such a presumption can be applied through the regulatory permitting process.

General approaches for responding to coastal erosion include: natural defenses, managed retreat, soft defenses, and coastal armoring. Natural defenses such as coastal wetlands provide critical buffers to protect land by reducing tidal amplitude, dissipating wave energy, storing excess water, and reducing sea wall maintenance costs.¹⁰¹ Intertidal systems provide not only biodiversity and ecosystem services, but also protect land from erosion. A second category of policy response to coastal erosion is managed realignment or retreat, including the landward relocation of flood defenses and restoration of intertidal habitat to protect shoreline development against coastal erosion and inundation, which allow the natural coastal processes of erosion and accretion to occur.¹⁰² Under this approach, communities avoid future coastal development in particularly vulnerable places if possible, or attempt to configure coastal development in a sustainable way, taking into account the migration of coastal systems over time.¹⁰³ If managed retreat is chosen as an option, long-term planning and coordination are crucial to avoid a chaotic abandonment of coastal assets and the societal disruption that it would entail.¹⁰⁴

A third category of responses to the encroachment of the sea is soft defenses that include beach nourishment, dune restoration, and shoreline stabilization using vegetation. Beach nourishment is a longstanding practice of pumping aggregate onto a beach to offset erosion.¹⁰⁵ One drawback to this strategy is the ecological impact of collecting the sand¹⁰⁶ and opponents of this method argue that it is responding to a symptom, not the underlying cause.¹⁰⁷ A less controversial form of soft defenses is dune restoration. Dunes, often vegetated with salt-resistant, deep-rooted plants, trap and store sand and also

¹⁰⁰ IPCC, *supra* note 3, § 6.4.2 (Beaches, Barriers, and Cliff Coasts).

¹⁰¹ European Land Ocean Interaction Studies (ELOISE), *Case Study: Climate Change and Coastal Management in Practice – A Cost Benefit Assessment in the Humber, UK*, <http://www.eloisegroup.org/themes/climatechange/casestudy4.htm> (last visited June 9, 2008).

¹⁰² NATURAL ENGLAND, PLANNING FOR BIODIVERSITY AS CLIMATE CHANGES – BRANCH FINAL PROJECT REPORT (2007), available at <http://www.naturalengland.org.uk/press/docs/branch-report.pdf>.

¹⁰³ *Id.*

¹⁰⁴ IPCC, *supra* note 3, § 10.2.5.2 (Coastal Settlements and Sea-Level Rise).

¹⁰⁵ Several states have developed beach renourishment requirements. NOAA COASTAL SERVICE CENTER, BEACH NOURISHMENT: A GUIDE FOR LOCAL GOVERNMENT OFFICIALS, available at <http://www.csc.noaa.gov/beachnourishment/html/human/law/index.htm> (last visited Mar. 12, 2008).

¹⁰⁶ UNIVERSITY OF HAWAII'S SEA GRANT EXTENSION SERVICE AND THE COUNTY OF MAUI'S PLANNING DEPARTMENT, BEACH MANAGEMENT PLAN FOR MAUI, available at http://www.soest.hawaii.edu/SEAGRANT/bmpm/objectives_and_recom_3.html (last visited May 18, 2008); NOAA, Coastal Service Center, *supra* note 106; see also Cornelia Dean, *Next Victim of Warming: Beaches*, N.Y. TIMES, June 20, 2006 (Sand for beach nourishment is often gathered by dredging, which alters currents and wave patterns and increases turbidity, damaging ecosystems); UNIVERSITY OF HAWAII'S SEA GRANT EXTENSION SERVICE AND THE COUNTY OF MAUI'S PLANNING DEPARTMENT, COASTAL EROSION, BEACH LOSS, AND CORAL REEF DEGRADATION, BEACH MANAGEMENT PLAN FOR MAUI, available at http://www.soest.hawaii.edu/SEAGRANT/bmpm/coastal_erosion.html (last visited May 18, 2008) (Erosion of the fine sediments used in beach nourishment reduces water quality).

¹⁰⁷ Dean, *supra* note 106.

provide a natural buffer against erosion; they shelter beachfront development and reduce the threat from high-water events.¹⁰⁸

The final category of response to erosion, coastal armoring, has a long history.¹⁰⁹ Coastal armoring aims to reduce land loss by erecting hard structures which are environmentally and economically unsustainable.¹¹⁰ Because landowners are often more familiar with coastal armoring strategies than other alternative approaches, they may assume that a hard defense is the only way to prevent the loss of property. Permitting policies may inadvertently promote this practice by making it easier and faster to obtain the permits required for coastal armoring than those required for alternative approaches.¹¹¹ And, in spite of the detrimental impacts, coastal armoring may be the only viable option when vital infrastructure is facing immediate threat.¹¹²

The presumption in favor of methods that are sustainable and that improve ecosystems dictates a preference against hard responses to erosion. This presumption in favor of sustainable responses that improve ecosystems must be included in any reforms of law, policy, and practice related to protection of the built environment and must be reflected in both planning and permitting programs. Some states such as Connecticut already have a ban on using hard defenses, while Maryland expresses a regulatory preference for soft measures.¹¹³ One approach is a requirement that permit applicants demonstrate that their preferred erosion control alternative is the least disruptive to the shoreline and any buffer area. In order to guide applicants, relevant state agencies can develop a set of prioritized erosion control methods and practices.¹¹⁴ Finally, authorities can assist landowners by developing guidelines on preferred shoreline and buffer management practices that support adaptive strategies for responding to climate change.¹¹⁵

B. Policy Responses for Ecological and Natural Resources

Adaptive and integrated approaches are already used for management of many natural resources. Paired with legally required performance standards and robust stakeholder involvement, these adaptive approaches can provide a policy model for effectively responding to climate change. An initial step for

¹⁰⁸ Beach Management Plan for Maui, *supra* note 106.

¹⁰⁹ For example, the City of Baltimore recognized a landowner's right to "hold back the sea" as early as the 18th Century. *Baltimore & O. R. R. Co. v. Chase*, 43 Md. 23, 32-33 (1875), *citing* The Act of 1745, ch. 9, sec. 10, which was a supplement to the Act incorporating Baltimore Town.

¹¹⁰ Coastal Clash, *Coastal Armoring*, www.kqed.org/w/coastalclash/armoring.html (last visited May 18, 2008) (This artificial "bounding" of the beach often results in decreased dissipation of storm wave run-up and increased turbulence at the toe of the structure, which in turn causes increased scour and beach lowering in front of the structure, further reducing the effective width of the natural buffer system.).

¹¹¹ Kathy Klein, *Climate Change Hits Home*, ESTUARY NEWS (Winter 2007), available at <http://www.delawareestuary.org/pdf/EstuaryNews/2007/WinterNews07.pdf>.

¹¹² IPCC, *supra* note 3, § 17.2.3 (Beaches and Coastal Changes).

¹¹³ Connecticut Department of Environmental Protection, *Overview of Connecticut's Coastal Permitting Program*, http://www.ct.gov/dep/cwp/view.asp?a=2705&depNav_GID=1635&q=323580 (last visited June 9, 2008); MARYLAND CRITICAL AREAS COMMISSION, HOUSE BILL 1253 OVERVIEW OF 2008 LEGISLATION (May 20, 2008), available at <http://www.dnr.state.md.us/criticalarea/guidancepubs/052008overviewofhousebill1253.pdf>.

¹¹⁴ Maryland Climate Change Commission, *supra* note 80 (For example, after a storm damages a tidal marsh, a land owner should be permitted to add fill, plants, and temporary biodegradable structures in order to rebuild the marsh.).

¹¹⁵ *Id.*; Robert L. Fischman, *Global Warming and Property Interests: Preserving Coastal Wetlands as Sea Levels Rise*, 19 HOFSTRA L. REV. 565, 600 (1991) (arguing that, as with many policy responses to climate change, the transition will be smoother if efforts begin sooner and are implemented incrementally to allow property owners enough time to reconcile their expectations with the consequences of a projected rise in sea level).

improving the resilience of ecological and natural resources is baseline studies on the current condition of the resource, current trends, and expected impacts.

Measures for increasing adaptivity in management will be similar for many ecological and natural resources. These entail, for example, enhancing monitoring and assessment requirements in resource planning, including developing and assessing criteria to track the impacts of climate change. As noted above, one of the central features of adaptive management, which is often not adequately accounted for in existing legal frameworks, is an established process for revising management actions to respond to lessons learned in the assessment process. If the resource begins to show signs of stress or decline, management methods need to be reconsidered.

Forests are managed by federal, state, and private authorities, so legal and policy regimes will differ depending on the jurisdiction. In federal and state forests, planning tools can adopt management actions that use the adaptive approach and improve resilience.¹¹⁶ On private land, regulation is more limited and incentives can play an important role.

Managers of *near-shore marine resources* such as those used by the seafood industry can begin to prepare for impacts from climate change by gathering information about the current status of populations in order to monitor and assess how they are faring as conditions change. Authorities should conduct industry studies for various seafood species to determine, for example, whether appropriate responses to damage to populations will require repopulation from other sources, such as aquaculture, or whether native populations should be reinforced before such events take place. In certain instances, climate-induced changes may so stress economically important marine resources that more dramatic measures may be necessary.¹¹⁷

The most effective step for minimizing harm to *agricultural activities* in coastal areas is to prevent further establishment of such enterprises in vulnerable areas and to encourage progressive and orderly relocation through planning and zoning efforts. Education and incentives can be used to either induce farmers to relocate or to change their practices to those what will increase their own resilience and not compound impacts to others.

Mangroves, salt marshes, and other coastal wetland systems may migrate inland as sea level rises in relation to the seaward margin. On developed or armored coasts, however, wetlands cannot move inland because human-made features block their spread.¹¹⁸ So while wetlands can protect against the impacts of climate change, they are also threatened by “coastal squeeze.”¹¹⁹ In order for *wetlands* to migrate as sea-level rises, the area landward should – to the extent possible – be free of physical barriers such as sea walls, roads, and buildings. Planning efforts must factor in corridors for wetlands to migrate; the presumption against hard defenses will also be important. Locations where there are corridors that will provide for wetland migration in the case of SLR should be prioritized for protection.

¹¹⁶ MARYLAND CLIMATE CHANGE COMMISSION ADAPTATION AND RESPONSE WORKING GROUP, RR-# RESOURCE-BASED INDUSTRY – ECONOMIC INITIATIVE (Jan. 1, 2008), available at <http://www.mdclimatechange.us/ewebeditpro/items/O40F15963.pdf> (setting forth proposed measures to increase forest resilience to climate change by: promoting a buffer zone of salt tolerant tree species; modernizing the industry and hastening processing, manufacturing, and distribution to decrease the risk of loss of the value of timber in uncertain conditions; and producing fast-growing and resistant timber species).

¹¹⁷ See, e.g. 2WE Consulting Ltd., *supra* note 53.

¹¹⁸ ERIC GILMAN ET AL., PACIFIC ISLAND MANGROVES IN A CHANGING CLIMATE AND RISING SEA, UNEP REGIONAL SEAS REPORTS AND STUDIES NO. 179 (United Nations Environment Programme, Nairobi, 2006), available at www.unep.org/PDF/mangrove-report.pdf.

¹¹⁹ IPCC, *supra* note 3, § 6 (Deltaic Coasts).

Several technical options are available to combat the threat that *salinization of aquifers* poses to water supply in coastal areas.¹²⁰ The economic viability of each method depends on many factors including the nature of the local hydrological system, local water use and development patterns, and climate variability.¹²¹ Policies determining the most appropriate methods and promulgation of any necessary regulations, using an adaptive approach, can help water management authorities be prepared to protect underground water resources as sea level rises.¹²²

As the primary natural resource managers in most cases, states will most likely be responsible for performing effective prevention, control, and eradication of *invasive species* under changing climatic conditions. There are many uncertainties about precisely how climate change will affect ongoing invasive species management activities.¹²³ In order to begin to adapt invasive species management activities to project altered climate conditions, managers can begin by incorporating climate change considerations into leadership and coordination activities; identifying new invasive species threats as they emerge; identifying ecosystem vulnerabilities and improving resilience; evaluating the efficacy of control mechanisms under changing conditions; and managing information systems to include considerations of changing conditions.¹²⁴ State invasive species management authorities can incorporate climate change-driven stressors¹²⁵ into their existing management frameworks and adapt current frameworks to reflect these new stressors. This involves adapting policy design to incorporate climate change-related variables, as well as adapting existing prevention, control and management, and restoration activities to take into account the climate-related ecological changes.

C. Policy Responses for Protecting Public Health

In order to appropriately prepare for the public health risks associated with increased intensity of natural disasters and changes in infectious disease patterns, we must consider different aspects of these risks: they are diverse, global, and likely irreversible over human time-scales; they are vast; they will be inequitable due to the fact that those likely to be most impacted are not those most responsible; and many health impacts are avoidable.¹²⁶ Safeguarding public health from climate change impacts will not require new interventions, but renewed political commitment and financial resources to strengthen key functions of environmental management, surveillance, and response.¹²⁷

One way to reduce the health impacts resulting from climate change is to proactively assess public health consequences of proposed mitigation and adaptation strategies prior to their adoption. A key tool is the Health Impact Assessment (HIA), which consists of: (1) rapidly assessing the level of HIA necessary,

¹²⁰ See Robert M. Sorensen et al., *Control of Erosion, Inundation and Salinity Intrusion Caused by Sea-level rise, in GREENHOUSE EFFECT AND SEA-LEVEL RISE: A CHALLENGE FOR THIS GENERATION* (Michael C. Barth and James G. Titus, eds., 1984), available at <http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterPublicationsSLRChallenge.html>.

¹²¹ *Id.*

¹²² For a discussion of adaptive management of water resources generally, see Bruch, *supra* note 64.

¹²³ Thomas et al., *supra* note 32, at 1-1, 2-2 (State invasive programs have expressed concern that climate change will cause invasive species range expansions; a lack of ability to predict which species will be likely to establish under changing conditions in order to appropriately modify management priorities; development of prediction and assessment of conditions that many lead to invasion, increased spread, survival, and growth rates, unanticipated interactions between climate changes and invasive species; the effects of climate change on control efforts; and the effects on the ecosystem from increased invasions.)

¹²⁴ *Id.*, at xi, 2-4, 2-6 (Alaska, Hawaii, and Washington have already included considerations of changing conditions in AIS management plans; only Virginia actually discusses climate change in its AIS management plan).

¹²⁵ These include increased water temperatures, higher CO₂ concentrations, and altered precipitation patterns.

¹²⁶ Campbell-Lendrum, *supra* note 55, at 244.

¹²⁷ *Id.*

performed by a department of health; (2) if a formal HIA is recommended, developing the data needs and objectives of the HIA; (3) analysis of the impacts and presentation of potential alternatives; and (4) monitoring and evaluation. Data from the Centers on Disease Control Environmental Public Health Tracking project could contribute to the development of HIAs.¹²⁸

In order to prepare for the potential climate impacts on human health and welfare, communities should develop and reexamine (as appropriate) established early warning systems, evacuation and emergency response systems, comprehensive disaster response systems, and strategies for responding to increased range and incidence of tropical disease. Policy responses should specifically address the increased possibilities of vector- and water-borne diseases in a warmer climate. In addition to educating the public about these threats and how to minimize them, vector-borne disease surveillance and control programs must be introduced or enhanced.

IV. Cross-Cutting Considerations

Effective adaptation to climate change will require widespread and dramatic changes to how people manage and relate to the natural environment. Introducing such reforms requires consideration of a set of cross-cutting issues. In most instances, society is already facing these issues, but they will become imperatives for a successful transition to an adaptive approach. Specific considerations include strategies for approaching uncertainty while ensuring effective management, and concerns about equity, public participation, public education, capacity building, and takings.

A. *Coping with Significant Uncertainty*

Climate change entails many uncertainties that are beyond the experience of human society, and thus beyond our experience coping with new circumstances. In order to respond to these future unknown circumstances, human society will need to enhance its adaptive capacity and resilience.¹²⁹ Building resilience involves increasing the ability of the social and ecological system to withstand shocks and surprises and to revitalize itself if damaged.¹³⁰

Adaptive management enables systems to deal with unknown risks such as those posed by climate change through an iterative process that can learn from experience.¹³¹ Policy responses to climate change threats or impacts should pay particular attention to those that have more than one positive effect, such as policies that both improve adaptive ability and reduce impacts.¹³² As with the introduction of any new norm, changing decisionmaking to include a feedback loop to enable adapting in light of new information and changing circumstances will be uneven.

¹²⁸ MARYLAND CLIMATE CHANGE COMMISSION ADAPTATION AND RESPONSE WORKING GROUP, HHSW-1 HEALTH IMPACTS ASSESSMENT OF THE CLIMATE CHANGE ACTION PLAN (Feb. 8, 2008), available at <http://www.mdclimatechange.us/twg.cfm>.

¹²⁹ EMMA L. TOMPKINS ET AL., BUILDING RESILIENCE TO CLIMATE CHANGE THROUGH ADAPTIVE MANAGEMENT OF NATURAL RESOURCES, TYNDALL CENTER FOR CLIMATE CHANGE RESEARCH WORKING PAPER 27, 2 (2003).

¹³⁰ *Id.*, at 3 (defining elements of coastal resilience to include: governance, society and economy, coastal resources management, land use and structural design, risk knowledge, warning and evacuation, emergency response, and disaster recovery); GLENN RICCI, USAID COASTAL ADAPTATION GUIDEBOOK, CHAPTER 4: MODIFYING COASTAL RISK AND VULNERABILITY ASSESSMENTS FOR CLIMATE CHANGE, (in preparation), presented at Adapting to Coastal Climate Change, Pre-Conference Meeting at the 4th Global Conference on Oceans, Coasts, and Islands, in Hanoi, Vietnam, (Apr. 7, 2008).

¹³¹ Garry Peterson et al., *Uncertainty, Climate Change, and Adaptive Management*, CONSERVATION ECOLOGY [online] 1(2): 4 (1997), available at <http://www.ecologyandsociety.org/vol1/iss2/art4/>; Tompkins et al., *supra* note 132, at 4; Rubinoff, *supra* note 59.

¹³² Tompkins et al., *supra* note 132, at 6.

B. *Equity and Climate Justice*

Some people and some systems will be better able to adjust to the new approach. This raises concerns about equity. In coastal zones, as everywhere, there are people who have the wherewithal – understanding and means – to evacuate when a storm is threatening. There are others who have no means to travel, no place to go, and perhaps no understanding of why evacuation is necessary. There are some whose vacation homes are threatened by SLR and others whose ancestral, and only, homes are threatened. Finally, some have experience with moving to different places when circumstances change, and some expect to be able to stay right where they have always been.¹³³

Equity must be carefully considered in any plans or strategies to adapt communities to climate change. The *Climate Justice* movement has developed to attempt to ensure that climate change policies do not unfairly or disproportionately affect poor and marginalized people, who are least able to cope with the effects of climate change, and may often lack the resources to effectively adapt. Climate justice recognizes that the burdens of responding to and coping with climate change impacts should not be distributed without consideration of who reaped the benefits of the processes that caused the climate change.¹³⁴ Accordingly, measures for adapting to climate change should consider how to allocate the burdens of adapting fairly. In this respect, some of the legislative proposals currently circulating may be informative: many of them link climate change mitigation with adaptation, for example by providing funding for adaptation through revenues generated by auctions for carbon emissions. Such an approach could – if structured appropriately – help to ameliorate potential inequities and disproportionate burdens.

C. *Public Participation*

There are two aspects of public participation that must be considered when making the proposed transition: how best to use this tool to effectively make the transition, and how adaptive approaches will work with existing public participation requirements.

When asking people to make drastic changes in the way they live – as with many of the likely adaptation measures – it is important to include them in the decision-making processes. Public engagement of a broad range of stakeholders in the process of introducing adaptive management and adaptation generally can build awareness of the need for adaptive management and ultimate acceptance of the new legal and conceptual framework.¹³⁵ Additionally, participatory processes can enable stakeholders to provide feedback on structuring and implementing adaptive management and can alleviate concerns that adaptive management provides a loophole for avoiding taking effective action.¹³⁶

Public participation requirements already exist in many U.S. and state environmental laws. For example, when setting standards or issuing permits, the public must be notified and given the chance to comment within an enumerated time schedule. Some U.S. agencies have expressed concern about the potential conflict between the feedback process of adaptive management and existing requirements for public participation, which can take a long time. Environmental advocates have also expressed concern that an

¹³³ Jennifer Couzin, *Living in the Danger Zone*, 319 SCIENCE 748 (Feb. 8, 2008).

¹³⁴ Environmental Justice and Climate Change Initiative, <http://www.ejcc.org/> (last visited May 9, 2008).

¹³⁵ Bruce Shindler et al., *Integrating Citizens in Adaptive Management; A Propositional Analysis*, 3 CONSERVATION ECOLOGY 9 (1999); Pavel Kabat et al., *Climate Changes the Water Rules: How Water Managers Can Cope with Today's Climate Variability and Tomorrow's Climate Change*, in DIALOGUE ON WATER AND THE CLIMATE (2003).

¹³⁶ CARL BRUCH ET AL., COMPENDIUM OF RELEVANT PRACTICES ON IMPROVED DECISION MAKING, PLANNING AND MANAGEMENT OF DAMS AND THEIR ALTERNATIVES: COMPLIANCE THEME (UNEP Dams and Development Project) (2007)

adaptive approach will give agencies discretion that could provide legal cover to avoid acting in the best interest of the public or the environment.

The keys to harmonizing public notice-and-comment requirements, enforceable standards, and adaptive management are to introduce the adaptability at the correct scale¹³⁷ and to increase transparency. While there have been concerns about the compatibility of the adaptive approach with existing expectations already enshrined in law, EPA is also beginning to find ways where the two regimes work together. For example, in the new Clean Water Act Compensatory Mitigation Rule, EPA and the Army Corps of Engineers require adaptive management in compensatory mitigation plans.¹³⁸ The rule allows adaptation in the methods used to manage the wetlands, without changing which wetlands are mitigated for or which wetlands have certain values. This illustrates how adaptation can be structured, while maintaining participation requirements and more substantive values.

D. Public Education and Capacity Building

Efforts to adapt to climate change will be more effective the better the public is educated and prepared, regardless of whether specific risk can be precisely identified. Given the wide range of sectors, number of people potentially affected, and the complexity of the issues, broad training and awareness raising efforts are necessary. Infrastructure protection efforts such as new building codes will only be effective if the building and development communities are aware of and understand the importance of the new policies. Local governments need to know how to implement and enforce new policies. Training on climate change and sea-level risks, as well as adaptation measures, can be voluntary, encouraged, or even required; it can be general, or it can target particular sectors.¹³⁹

Education and capacity building programs should take a variety of forms. For example, educational programs can address appropriate behavior before, during, and following extreme events. In order to develop such awareness capacity building programs, a first step would be to identify existing training and capacity-building programs that could incorporate adaptation. Training professionals can help to identify gaps in public awareness, capacity, and training.¹⁴⁰ As training efforts progress, they can become more nuanced in providing specific information for those in the most vulnerable geographic areas or sectors.

E. Takings

A government mandate to conduct activities to build resilience or to prohibit activities that increase vulnerability is appealing for its simplicity. However, such restrictions could be a regulatory taking, which would require compensation. Thus, a regulatory response intended to protect against climate change risks must be constructed carefully to avoid being deemed a taking.

Takings determinations are made on a case-by-case basis evaluating the purpose of the regulations, economic impact or the nature of the interference, and the extent of interference with reasonable investment-backed expectations.¹⁴¹ This balancing test has been refined by U.S. Supreme Court rulings,

¹³⁷ CHRISTEN MITCHELL ET AL., HAWAII'S COMPREHENSIVE WILDLIFE CONSERVATION STRATEGY (2005), available at http://www.state.hi.us/dlnr/dofaw/cwcs/process_strategy.htm (last visited May 9, 2008); Bruch, *supra* note 59; CLAUDIA PAHL-WOSTL ET AL., TRANSITION TO ADAPTIVE WATER MANAGEMENT; THE NEWATER PROJECT, NEWATER WORKING PAPER X (2005).

¹³⁸ 73 Fed. Reg. 19594, 19597 (Apr. 10, 2008).

¹³⁹ Maryland Climate Change Commission, *supra* note 119.

¹⁴⁰ *Id.*

¹⁴¹ *Penn. Central v. City of NY*, 438 U.S. 104, 124 (1978).

including that there must be an essential nexus between the legitimate state interests and the regulation;¹⁴² that a regulation constitutes a taking if it deprives a landowner of all economically viable use of the property;¹⁴³ that the takings analysis must consider the parcel as a whole;¹⁴⁴ and finally, that the impact of the regulation must be roughly proportional to the impact of the development.¹⁴⁵

Climate-related regulations must be crafted to be “takings-proof” – that is, they must be constructed in consideration of the factors of takings jurisprudence. The purpose of the regulation must have a significant nexus with a legitimate government purpose. An example could be the recently passed revisions to the Maryland Critical Areas Program that prohibit the construction of bulkheads.¹⁴⁶ A legislative finding that migration of coastal wetlands is in the interest of human health, safety, or welfare will make a regulation more likely to meet the legitimate state interest standard.¹⁴⁷ Such a finding can also be important to help demonstrate the nexus between the regulatory burden and the public interest advanced.

Another factor in takings doctrine is the economic impact of the regulation on a landowner. For a court to find a taking purely on this factor, the restrictions imposed must be such that the property cannot be used for any reasonable purpose.¹⁴⁸ If the regulation meets the other factors, it is not enough for the property owners to show that the public benefit of the bulkhead prohibition is outweighed by substantial loss or hardship – the regulation must deny “all economically beneficial or productive use of land.”¹⁴⁹ An additional factor in a takings analysis is the proportion of the property that is impacted by the regulation.

A third factor in the evaluation of takings claims is whether the property owner had a reasonable investment-backed expectation of being able to use the property in a certain way. Property rights are created by the state, so by prospective legislation the state can shape and define property rights and reasonable investment backed expectations, and subsequent owners have less right to claim injury from lost value.¹⁵⁰ To the extent that property purchasers have notice of an existing policy or even the reasons (such as climate change and sea level rise) for a policy that is adopted subsequently, restrictions are less likely to be found a taking.

In addition to balancing the interests of the state, economic impact, and expectations of the landowner, courts will also consider other particular circumstances when deciding whether a taking has occurred. Even if a prohibition of a certain land use results in a complete loss of economic value, courts might not find a taking if allowing the use would cause a nuisance.¹⁵¹ The context also is important: a bulkhead ban applied to a small plot of land that would otherwise be inundated completely is more vulnerable to a

¹⁴² *Nollan v. California Coastal Commission*, 483 U.S. 825 (1987).

¹⁴³ *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003 (1992).

¹⁴⁴ *Tahoe-Sierra Preservation Council v. Tahoe Regional Planning Agency*, 535 U.S. 302 (2002).

¹⁴⁵ *Dolan v. City of Tigard*, 512 U.S. 374 (1994).

¹⁴⁶ Chesapeake and Atlantic Coastal Bays Critical Area Program, HB 1253 (passed Apr. 1, 2008), available at <http://mlis.state.md.us/2008rs/billfile/hb1253.htm>.

¹⁴⁷ Fischman, *supra* note 115, at 545 (protection of non-economic resources such as wildlife or aesthetic values arouses more judicial scrutiny).

¹⁴⁸ *Lucas*, 505 U.S. 1003.

¹⁴⁹ *White v. North*, 708 A.2d 1093, 1111 (1998).

¹⁵⁰ *Stansbury v. Jones*, 812 A.2d 312, 333 (2002) (however, subsequent purchasers can still claim injury in some cases. “The right to improve property, of course, is subject to the reasonable exercise of state authority, including the enforcement of valid zoning and land-use restrictions . . . [But a] blanket rule that purchasers [or subdividers] with notice have no compensation right when a claim becomes ripe is too blunt an instrument to accord with the duty to compensate for what is taken [by a regulatory action]”).

¹⁵¹ Fischman, *supra* note 118; See also *Penn. Coal v. Mahon*, 260 U.S. 393 (1922); *Lucas*, 505 U.S. 1003; *Belvoir Farms v. North*, 734 A.2d 227, 240 (1999).

takings claim than one applied to a large plot, a portion of which will remain dry even in the absence of a bulkhead.¹⁵²

V. Conclusions and Way Forward

Environmental law is founded on the now-discredited equilibrium model of the natural world.¹⁵³ Climate change has made clear that the natural and social realms governed by our laws are dynamic, and our laws must incorporate a similar dynamism. “Adaptation law” is necessary to provide a normative framework for adaptive management.¹⁵⁴ Adaptive laws can provide room for changing conditions and lessons learned. The legal framework can also prescribe requirements for monitoring, provide a mandate for adaptive management through testing of hypotheses, and mandate periodic assessment of progress to guide future management interventions, including regulatory reform.

To effectively transition to adaptive laws, it will be necessary to address a number of issues. First, it is necessary to build trust so that policymakers, regulated entities, and the public become comfortable managing in spite of sometimes significant uncertainty.¹⁵⁵ This trust can be developed through adaptive management pilot projects at various geographic and political levels. Second, mechanisms for collecting and sharing information need to be strengthened. Most states and local authorities have such mechanisms, but they often suffer from inadequate staff, funding, and technical resources.¹⁵⁶ Information gathering does not require adjustment of any philosophy; it simply requires reinvigorating and building up ongoing efforts. In addition, a clear legal framework for adaptive management can provide a mandate as well as address barriers to sharing information. Third, processes need to be developed to periodically assess the information that has been gathered. The processes for collecting, sharing, and assessing must be tailored to the underlying issues, and it is crucial to clearly and specifically articulate these issues. Finally, there needs to be an ability and willingness to periodically revise the laws, regulations, permits, and other measures based on the findings of the assessments.¹⁵⁷

Adaptation law, and particularly adaptive management, may be introduced gradually. A number of confidence-building measures can be undertaken without legal development or other governmental action. Such confidence-building measures can generate consensus for adaptive management, promote understanding of different constructs of adaptive management, and provide lessons learned to guide the subsequent development and implementation of adaptive management. Specific measures could include: dialogues on adaptive management for government officials, stakeholders, and other civil society members; improving information collection, for example, through an information clearinghouse; conducting periodic assessments regarding the state of natural resources; developing guidance, reference, and training resources on adaptation and adaptive management; and establishing and cultivating networks of stakeholders interested in adaptation.¹⁵⁸ Further, agencies could be required to report opportunities for

¹⁵² Fischman, *supra* note 115, at 601.

¹⁵³ P. Christopher D. Milly et al., *Stationarity is Dead: Whither Water Management?* 319 SCIENCE 573, 574 (Feb. 1, 2008).

¹⁵⁴ Donald T. Hornstein, *Complexity Theory, Adaptation, and Administrative Law*, 54 DUKE L. J. 913, 960 (2005); William J. Willand, *Evolving Strategies for Twenty-First Century Natural Resource Problems*, 81 N.Y. UNIV. L. REV. 1518, 1533 (2006); Bradley C. Karkkainen, *Adaptive Ecosystem Management and Regulatory Penalty Defaults: Toward Bounded Pragmatism*, 87 MINN. LAW REV. 943 (2003).

¹⁵⁵ *Id.*

¹⁵⁶ *Id.*

¹⁵⁷ *Id.*

¹⁵⁸ Public participation will also be crucial. Adaptation may entail some dramatic changes in how people live. Education and engagement will be essential in helping people to understand and accept the coming changes.

integration with existing programs, actions initiated, new programmatic efforts, and barriers to response.¹⁵⁹

Much work remains to reform environmental governance frameworks to adapt to climate change. It will be necessary to research lessons learned to date in building resilience and adaptive capacity; to identify, describe, and share types of adaptation strategies and resilient structures; pilot-test adaptation strategies and governance structures; share and, where appropriate, scale up particular approaches; and build capacity to develop, implement, monitor, and reform laws, regulations, and institutions to adapt to climate change.

One way or another, we will learn to adapt to climate change. The choice is whether we undertake progressive measures now, or are compelled through disasters later. Pay now, or pay more later. The good news is that there are numerous measures that can be taken now, many of them “no-regrets” measures. Moreover, with growing public attention to climate change, there is a political window within which communities, states, and the federal government can undertake these measures.

¹⁵⁹ See, e.g., *Comprehensive Strategy for Reducing Maryland’s Climate Change Vulnerability*, Report to the Maryland Commission on Climate Change (Adaptation and Response Working Group), May 22, 2008, at 30 [draft].

Legal and Policy Impacts of Sea Level Rise to Beaches and Coastal Property¹

Megan Higgins²

“The oceans are warming. Global mean sea level has been rising.”³

“Coastal property may present such unique concerns for a fragile land system that the State can go further in regulating its development and use than the common law of nuisance might otherwise permit.”⁴

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¹ This paper was presented during the Sea Grant Law and Policy Journal’s inaugural symposium on Coastal Resiliency held on March 25–26, 2008 at the University of Mississippi in Oxford, Mississippi. Coastal resiliency refers to the ability of coastal cities, towns, and communities to adapt to and recover from natural hazards, including hurricanes, tsunamis, floods, and disease epidemics. Seven authors were selected to present papers on a wide range of topics related to coastal resiliency. Powerpoint presentations and additional information about the symposium are available at <http://www.olemiss.edu/orgs/SGLC/National/SGLPJ/SGLPJ.htm>.

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³ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), CLIMATE CHANGE 2007 - THE PHYSICAL SCIENCE BASIS (2007).

⁴ Justice Kennedy’s concurrence in *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003, 1035 (1992).

I. Introduction

According to the Intergovernmental Panel on Climate Change (IPCC), there is an international scientific consensus that carbon dioxide emissions are causing and will continue to cause global warming.⁵ Among the international parties, consisting of the National Academy of Science of the United States, the National Scientific Academies of Brazil, Canada, China, France, Germany, India, Italy, Japan, Russia, and the United Kingdom, the consensus has emerged that “there is now strong evidence that significant global warming is occurring . . . It is likely that most of the warming in recent decades can be attributed to human activities. This warming has already led to changes in the Earth’s climate.”⁶

Climate change and variability have already resulted in extensive alterations of both the terrestrial and marine environments. For example, sea level rise is a direct consequence of global climate change. The impacts from sea level rise on beaches, such as erosion, net loss of shorefront, permanent wetland inundation, and storm surge, affect governments, coastal property owners, and the public. In fact, future acceleration of the rate of sea level rise will displace coastal populations, threaten infrastructure, intensify coastal flooding, and ultimately lead to loss of recreation areas and public access as well as private property. Consequently, in the United States, litigation has become and will continue to be more common as regulatory and policy responses are developed to address changing conditions and call into question Constitutional claims, as well as a host of other well-settled legal doctrines.

Under the federal Coastal Zone Management Program,⁷ it is the national policy “to preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation’s coastal zone for this and succeeding generations.”⁸ Under this policy, federally approved state coastal programs are directed to develop management plans for coastal development which “minimize the loss of life and property caused by improper development in flood-prone, storm surge, geological hazard, and erosion-prone areas and in areas likely to be affected by or vulnerable to sea level rise, land subsidence, and saltwater intrusion, and by the destruction of natural protective features such as beaches, dunes, wetlands, and barrier islands.”⁹ To fulfill the mandates of the Coastal Zone Management Act, coastal states and their coastal programs *must* develop effective policies in response to the implications of global warming (*e.g.*, sea level rise).

Many coastal programs currently address natural hazards, which provide a good foundation for additional policies to address sea level rise acceleration, climate change and variability. However, current coastal planning approaches and policy have the tendency to be shortsighted and reactive, without taking a proactive approach to coastal management.¹⁰ Policies which ignore the dynamics of coastal states and systems can be catastrophic when the focus is on human activities rather than the systems which sustain them. To be effective, coastal management policies must be based on sound science. These policies must take into account the limitations of natural systems, while balancing and integrating the demands of the various sectors and stakeholders, including property owners, fisheries, recreational users, industry, tourism, to name a few, which depend on these systems for their livelihoods.

⁵ IPCC, *supra* note 2, at 4; *see also* IPCC, CLIMATE CHANGE 2001: SYNTHESIS REPORT (2001).

⁶ Ken Alex, *A Period of Consequences: Global Warming as Public Nuisance*, Symposium: *Climate Change Liability and the Allocation of Risk*, 26A STAN. ENVTL. L. J. 77 (2007) (*citing* Academia Brasileira de Ciências, *et al.*, *Joint science academies’ statement: Global Response to Climate Change* (2005), at 1, available at www.royalsoc.ac.uk/displaypagedoc.asp?id=20742).

⁷ *See* National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, <http://coastalmanagement.noaa.gov/programs/czm.html>. Thirty-four coastal and Great Lakes states, territories and commonwealths have approved coastal management programs, protecting more than 99% of the nation’s 95,331 miles of ocean and Great Lakes coastline.

⁸ 16 U.S.C. § 1452(1).

⁹ *Id.* § 1452(2)(B).

¹⁰ Martin M. Randall, *Coastal Development Run Amuck: A Policy Of Retreat May Be The Only Hope*. 18 J. ENV. L. 145, 177 (2003) (*citing* TIMOTHY BEATLEY ET AL., AN INTRODUCTION TO COASTAL ZONE MANAGEMENT 2, 287 (2d ed. 2002)).

Furthermore, not every coastal state within the United States has adopted or has considered adopting sea level rise polices.¹¹ This delayed response may be due, in part, to the fact that sea level rise usually occurs at a slow pace, and a change in approximately one centimeter per year is imperceptible to most people. Consequently, the threat of sea level rise does not appear imminent to many state officials, and policy decisions regarding development reflect this view.¹² However, to be successful in adapting to the threats of sea level rise, governments must immediately enact policies which constrain development options in light of *anticipated* changes within the coastal zone. There has been a void in national (science-based) policy addressing such threats, as well as a minimal number of court cases over the last decade. To this end, this article will examine existing planned adaptation techniques, such as hard and soft armoring, beach renourishment, setbacks, and retreat.

As with any regulation, a balancing (of interests) test must be employed. State and local governments must evaluate both the economic impact of proposed regulations on property owners and the science which supports the conclusion that regulations are necessary to protect coastal resources and public health, safety, and welfare. The fear of litigation must not paralyze state and local governments.¹³ In fact, some states, as will be discussed, have been victorious in litigation.

With a national focus, but concentrating primarily on Rhode Island, this article will address the causes of sea level rise, impacts to beaches and coastal property, legal implications of existing sea level rise policies, and the current status of sea level rise litigation, and discuss the adaptation responses to the effects of sea level rise on beaches and coastal property.

This paper does not purport to include every solution for long-range coastal planning needs resulting from sea level rise. Rather, it will focus on state and, where appropriate, local policy measures which have proven successful in *litigation*. Sea level rise policies are continuously evolving as state coastal programs strive to achieve the successful balance of protecting human health, coastal resources, and private property. Due to the nascent nature of the policies, many legal claims having to do with loss or interference of property have yet to be litigated and are, therefore, not included in this article.

II. Measuring Sea Level Rise and Coastal Boundaries

A. Relative Sea Level Rise

Sea level rise refers to the change in mean sea level over time in response to global climate and local tectonic changes.¹⁴ Mean sea level is determined by a tide gauge measuring the distance of the water's surface above a reference point (or datum) averaged over a given period, usually at least a month. Sea level is a mean only for a particular time period and will vary over longer time periods, whether monthly, annually, or longer. A tidal datum defines a certain phase of the tide and measures changes when linked to land-fixed horizontal and vertical control points (geodetic datums), known as benchmarks. The horizontal location of where a tidal datum intersects the land at the exact elevation of the tidal datum is usually called a "mark" or "line."¹⁵ This variation in sea level is measured relative to the land (to which the

¹¹ See generally PAMELA RUBINOFF ET AL., SUMMARY OF COASTAL PROGRAM INITIATIVES THAT ADDRESS SEA LEVEL RISE AS A RESULT OF GLOBAL CLIMATE CHANGE (2008), available at http://seagrant.gso.uri.edu/ccd/slr/SLR_policies_summary_Mar6_final.pdf.

¹² *Id.*

¹³ See *supra* note 10, at 176 citing Beatley at 87 (discussing the legal confusion regarding regulatory takings and emphasizing that "[t]he Fifth Amendment does not deny the government proper exercise of its police power. States and municipalities may regulate property and its uses without the owner necessarily being entitled to compensation.").

¹⁴ NATHAN D. VINHATEIRO AND PAMELA RUBINOFF, THE SCIENCE OF SEA LEVEL RISE: OVERVIEW AND POLICY IMPLICATIONS FOR THE STATE OF RHODE ISLAND (2007) (publication forthcoming).

¹⁵ NATIONAL OCEAN SERVICE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, TIDAL DATUMS AND THEIR APPLICATIONS, NOAA Special Publication NOS CO-OPS 1 (2001), available at http://tidesandcurrents.noaa.gov/publications/tidal_datums_and_their_applications.pdf

benchmarks are permanently attached) and referred to as “relative sea level.” If the land sinks, it will appear that sea level is rising, and likewise if the land rises, it will look like sea level is falling.¹⁶ The relative sea level rise trends are the trends that affect our coasts and beaches and determine planning mechanisms for coastal communities. Two of the largest components of relative sea level trends are: (1) local vertical land movements and (2) changes in height of the sea surface relative to the geographic center of the earth.

Marine (both on- and offshore) boundaries are also determined by tidal datums. The beach itself may erode or accrete due to such factors as wind, waves, longshore drift, and storm surges. Although this change in shoreline does not affect the tidal datum itself, it does affect the tidal datum line. The tidal datum of mean high water may remain at a constant elevation, but the mean high water line (used as a coastal boundary) may move significant distances horizontally with erosion and sediment depositional processes due to such factors as wind, waves, currents, storm surges, etc. In considering avulsion, the sudden removal of land due to a major storm episode, some state courts have held that boundaries are not subject to change, thus preventing private landowners from losing their beach.¹⁷

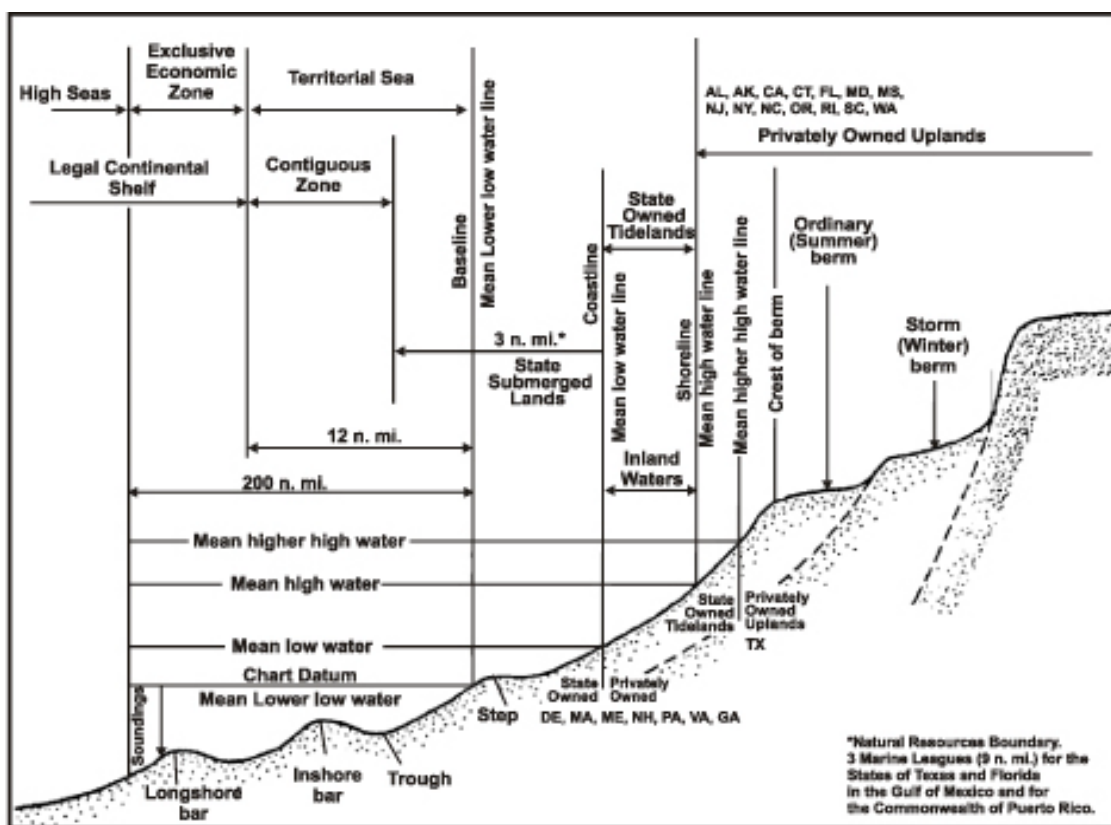


Figure 22. Coastal and marine boundaries from tidal datums.

Graph provided by NOAA's Center for Operational Oceanographic Products and Services (CO-OPS).

Coastal boundaries are formed by the intersection of the ocean surface with the land at the elevation of a particular tidal datum. To designate the boundary, the word “line” is used after the tidal datum name. For example, the boundary between private and state land, in most states, is the mean high water line. The mean high water line or “seaweed line” has historically been used as a proxy for the divide between private property and public trust lands, making the upper portion of the shore – typically the dry sand area in front of beachfront houses or other structures – private property and the wet sand areas public trust

¹⁶ STEACY DOPP HICKS, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, UNDERSTANDING TIDES 55-56 (2006), available at

http://tidesandcurrents.noaa.gov/publications/Understanding_Tides_by_Steacy_finalFINAL11_30.pdf

¹⁷ *Trepanier v. County of Volusia*, 965 S. 2d 276 (Fla. 2007).

lands.¹⁸ The figure below illustrates the many coastal and marine boundaries the United States presently uses.¹⁹ When drafting and adopting sea level rise policies, the legal differences between coastal states must be examined in addition to the geographic and geologic considerations.

B. Predicting Sea Level Rise: Which Estimate Is Accurate?

Various predictions of the global rate of sea level rise have been made (Table 1).

Table 1: Recent sea level rise projections

Report	Year of findings	Projections	Time Period
U.S. Environmental Protection Agency, <i>The Potential Effects of Global Climate Change on the United States: A Report to Congress</i> , EPA 230-05-89-052.	1989	0.5 to 2m	By 2100
U.S. Environmental Protection Agency, <i>Probability of Sea Level Rise</i> , EPA 230-R-95-008.	1995	34 to 65 cm	By 2100
IPCC, <i>Climate Change 2001: The Scientific Basis</i>	2001	10-90 cm	1990-2001
R.B. Alley et al., <i>Ice-sheet and Sea Level Changes</i> , 310 SCIENCE 456 (2005). ²⁰	2005	0.07m/year	
John A. Church and Neil J. White, <i>A 20th Century Acceleration in Global Sea-Level Rise</i> , GEOPHYS. RES. LETTER, 33, L01602, doi: 10.1029/2005GL024826.	2006	195 mm (equivalent to a 20 th century rate of SLR of 1.7± 0.3 mm/yr and a significant acceleration of 0.013± 0.006 mm/yr)	1870-2004
IPCC, <i>Climate Change 2007 – The Physical Science Basis</i>	2007	0.07 inches/year (1.8mm/yr) 0.12 inches/year (3.1mm/yr)	1961-2003 1993-2003
Stefan Rahmstorf, <i>A Semi-Empirical Approach to Projecting Future Sea-Level Rise</i> , 315 SCIENCE 368 (2007).	2007	55-125cm (0.5-1.4m above the 1990 level)	1990-2100
Stefan Rahmstorf et al., <i>Recent Climate Observations Compared to Projections</i> , 316 SCIENCE 709 (2007).	2007	3.3± 0.4 mm/yr (satellite data)	1993-2006

Since the rates of sea level rise have been fairly uniform, short-term projections are probably quite accurate;²¹ however, planning should be done for the longer term. The size and/or amount of shore protection structures and beach nourishment required to mitigate that portion of erosion due to storm surge, waves, coastal feature/underlying substrate (bedrock, unconsolidated gravel, sand, silt), and lack of

¹⁸ Megan Higgins, *Public Access to the Shore: Public Rights and Private Property*, in AMERICA'S CHANGING COASTS: PRIVATE RIGHTS AND PUBLIC TRUST (Diana M. Whitelaw and Gerald R. Visgilio eds, 2005).

¹⁹ *Supra* note 16.

²⁰ Although this steady increase is documented, scientists are concerned that the ice caps in Greenland and Antarctica could melt, causing even greater sea level rise. The collapse of the Larsen B Ice Shelf in 2002 was followed by an acceleration of its major tributary glaciers by two- to eight-fold, contributing about 0.07 mm per year to sea-level rise.

²¹ Short term projections are accurate over a short time period. In Rhode Island, for example, there has been an acceleration in sea level rise over the last twenty years.

sediment source exacerbated by sea level rise depends on the local trend and variability of sea level and local wave climate.²² Private property lines, as well as state and federal coastal and marine boundaries, depend on changes in sea level elevation. Future requirements for drainage pumping and saltwater intrusion prevention are a function of sea level trends. Finally, changes in trends enable physical oceanographers to detect the beginning of the predicted greenhouse-induced sea level rise and allow coastal managers to plan accordingly.²³

There is a disparity among the coastal states regarding which prediction of sea level rise is the most accurate, and for the purposes of this legal examination, which prediction is used for formulating sea level rise policy. The state of Washington, for example, refers to the Intergovernmental Panel on Climate Change while others, like Florida and Texas, refer to the Environmental Protection Agency's estimation of 4m (12 ft) by 2100.²⁴ No research indicates that the EPA requests or compels states to apply its findings.²⁵

C. Case Studies of Historical Trends of Sea Level Rise

The historical sea level data records are obtained from several hundred tide stations around the world, some of which have been operating for up to a century or more. These stations were installed primarily for navigational purposes, not to record global change, as this was certainly not a concern in the mid-1800s or early 1900s; the data were used to make tide predictions. Automated measurements were taken hourly – using a float inside a protective stilling well; now, these measurements are averaged for six-minute intervals. These measurements were related to permanent benchmarks on land and were accurate in comparison to other geophysical data. Comparison observations were made at a tide staff in order to tie the float gauge to the benchmarks, which were leveled directly to the tide staff (that is, the relative elevation of the benchmarks and the zero point on the tide staff was determined by surveying techniques). Since marine boundaries were determined by the mean low water datum (distinction between state and federal jurisdiction) and mean high water datum (boundary between state and private ownership), this process was important not only to the United States, but other governments as well. When offshore oil was discovered, these marine boundaries became even more critical.

The most important requirement for these data is datum continuity; that is, the maintenance of a direct relationship of the measurement to the benchmarks over time. There can be a variety of errors in the water level measurement, but they are generally random and tend to average out monthly or yearly. When trying to determine trends on the order of 1 or 2 mm/yr, however, it is vital that accurate datum continuity be maintained.

The large numbers of tide stations in operation in the United States have been of great benefit to the study of sea level rise. For example, the Newport, RI tide gauge, one of the longest data sets in the United

²² *Supra* note 11.

²³ *Id.*

²⁴ *See supra* note 14. *See also* GREENHOUSE EFFECT AND SEA LEVEL RISE AND CHALLENGE FOR THIS GENERATION (James Titus & Michael Barth eds. 1984), available at <http://www.epa.gov/climatechange/effects/downloads/greenhouse.pdf>.

²⁵ *See* EPA Global Warming Publications,

<http://yosemite.epa.gov/OAR/globalwarming.nsf/content/ResourceCenterPublicationsReference.html>. Specific state examples: “This study was funded in part by the United States Environmental Protection Agency in 1998 as part of a nationwide effort to develop a better understanding of the potential economic impacts of sea level rise on the nation's economy.” http://findarticles.com/p/articles/mi_m0EIN/is_2003_Sept_3/ai_107219783;

“Several communities have used EPA funding to develop studies and maps illustrating which areas will be in danger of erosion due to sea level rise.” www.epa.gov/climatechange/effects/downloads/Transportation_Paper.pdf;

“Funding for this project was provided by the Environmental Protection Agency (EPA) through a grant administered by the Southwest Florida Regional Planning Council. This project will use current EPA estimates of a 5-foot rise in sea level over a 200-year period to study the impacts on seven coastal counties in southeast Florida from Key West to Indian River County.” <http://www.sfrpc.com/gis/slr.htm>.

States in the marine environment, has recorded an increase of approximately 0.64 feet between 1930 and 2006.²⁶ The difference between 1970-1988 and 1989-2007 is 0.153 feet.²⁷

III. Impacts of Sea Level Rise

A. Beaches

Coastal ecosystems are changing. As the IPCC's report has made clear with "very high confidence," coasts are experiencing the adverse consequences of hazards related to climate and sea level.²⁸ Increased erosion is caused by longer storm surge and greater wave action from both tropical (especially on the southeast and Gulf Coasts) and extra-tropical storms which results in a constantly changing shoreline. Other impacts to beaches from sea level rise include permanent wetland inundation in low-lying areas, saltwater intrusion, decline in submerged aquatic vegetation, groundwater contamination, septic system failure, and more susceptibility to storm surge.

Sea level rise is a climate-related phenomenon with a major influence on coastlines. Given the evidence of global sea level rise (10-20 cm in the past century) and predictions for the future, regions where subsidence and erosion problems already exist will see the problems exacerbated. The Atlantic and Gulf Coast shorelines are especially vulnerable to long-term sea level rise, as well as any increase in the frequency of storm surges or hurricanes. Most erosion events on these coasts are the result of storms, and the slope of these areas is so gentle that a small rise in sea level produces a large inland shift of the shoreline. Texas, for example, loses approximately five to ten feet of beach per year, shifting the high water line landward approximately five to ten feet per year.

B. Coastal Property

People are moving to coastal areas due to a variety of factors: employment, recreation and tourism, waterborne commerce, and energy and mineral production. According to estimates in 2003, approximately 153 million people (53% of the nation's population) lived in the 673 U.S. coastal counties.²⁹ The coastal population was greatest in the Northeast and Pacific regions, followed by the Great Lakes, Gulf of Mexico, and lastly the Southeast.³⁰ In turn, coastal ecosystems are pressured by population growth, leaving them vulnerable to pollution, habitat degradation and loss, overfishing, invasive species, and increased coastal hazards, such as sea level rise.³¹

With the increase in population, even properties further inland are exposed to greater damage from hurricanes and storm surge as sea level rises. Properties now elevated, out of perceived harm's way, are affected both by higher storm surges and changes in shoreline/property boundaries. Private property lines, as well as state and federal coastal and marine boundaries, are based on sea level elevation.

Erosion impacts to both coastal property and existing infrastructure can also be greatly exacerbated locally by natural inlet dynamics or coastal engineering structures, such as groins or jetties. According to a Heinz Center report published in 2000, over the next sixty years, erosion alone may claim one out of four houses within 500 feet of the U.S. shoreline without coastal engineering projects.³² Flood insurance

²⁶ See <http://www.crmc.ri.gov/regulations/programs/redbook.pdf> (adapted from www.coops.nos.noaa.gov/sltrends).

²⁷ NOAA, Mean Sea Level Trend for Tidal Station 8452660 (Newport, Rhode Island), http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8452660.

²⁸ See generally IPCC, CLIMATE CHANGE 2007 - IMPACTS, ADAPTATION AND VULNERABILITY, available at <http://www.ipcc.ch/ipccreports/ar4-wg2.htm>.

²⁹ NOAA, POPULATION TRENDS ALONG THE COASTAL UNITED STATES: 1980-2008 (2004) available at http://oceanservice.noaa.gov/programs/mb/pdfs/coastal_pop_trends_complete.pdf.

³⁰ *Id.* at 3.

³¹ *Id.* at 1.

³² THE H. JOHN HEINZ III CENTER FOR SCIENCE, ECONOMICS, AND THE ENVIRONMENT, EVALUATION OF EROSION HAZARDS (2000).

maps do not inform current or prospective coastal property owners of erosion risks.³³ A one- to three-foot rise in sea level along four North Carolina coastal counties could mean billions of dollars in private property losses over the next seventy-five years.³⁴

Roads, rail lines, ports, airports, and other important infrastructure located along the coast are also vulnerable to the effects of sea level rise when coupled with storm surge and exacerbated in some locations by land subsidence.³⁵ The vulnerability of transportation infrastructure to climate change, however, will extend well beyond coastal areas. The need for immediacy of addressing this situation cannot be stressed enough, as the majority of the nation's infrastructure is in low-lying areas and the current sea level rise predictions of one to two feet by 2100 can cause the ordinary storm to become a catastrophe.

Experts recommend taking an inventory of all coastal areas, determining elevation and vulnerability to storm surge and starting to plan accordingly. Due to the enormity of the challenge of moving such infrastructure to higher elevations or replacing the infrastructure in order to avoid major catastrophes, experts are stressing that this action be taken within the next five years because the tasks will take decades to complete and will cost "tens of billions of dollars."³⁶

IV. States' Responses to Changes in Sea Level

Research suggests that adaptation to sea level rise should be incorporated into any response strategy.³⁷ Coastal flooding, more frequent severe storms, saltwater intrusion, and coastal erosion are increasing calls for policies to address coastal wetland protection; location and elevation of coastal homes, buildings, and infrastructure; and reflecting sea level rise in flood insurance rates.³⁸

Nearly two-thirds of the coastal states reported to the National Oceanic and Atmospheric Administration (NOAA) that "coastal hazards" were a high priority and that they have begun to develop five-year strategies by examining the social, environmental, and economic impacts of accelerated sea level rise scenarios to address flooding, shoreline erosion, and coastal storms.³⁹ Coastal programs have developed new policies to address public infrastructure siting, site-level project planning, wetland conservation and restoration, shoreline building setbacks, building elevations, and alternatives to shoreline "armoring."⁴⁰ However, only a handful of coastal states have "implementable policy or regulation" that directly addresses sea level rise (many others address shoreline changes, including shoreline setbacks based on local erosion rates – an indirect link to sea level rise).⁴¹

A. Regulatory Responses

While coastal states have been responsive to the *impacts* of sea level rise (i.e., erosion and flooding), most have not addressed the explicit theme of sea level rise, specifically acceleration. Some coastal states, however, have been proactive in anticipating sea level rise while others are just now drafting policies that

³³ *Id.*

³⁴ Appalachian State University. *North Carolina Coastal Economy Vulnerable To Sea Level Rise*. SCIENCE DAILY (2007). <http://www.sciencedaily.com/releases/2007/06/070622184644.htm> (Mar. 14, 2008).

³⁵ Cornelia Dean, *Government Reports Warn Planners on Sea-Rise Threat to U.S. Coasts*. N.Y. TIMES, Mar. 12, 2008.

³⁶ *Id.*

³⁷ Hilary Sigman, *Responses to Global Warming: The Law, Economics, and Science of Climate Change*, 155 U. PA. L. REV. 1953 (2007).

³⁸ *Supra* note 35.

³⁹ COASTAL STATES ORGANIZATION, *THE ROLE OF COASTAL ZONE MANAGEMENT PROGRAMS IN ADAPTATION TO CLIMATE CHANGE* (2007) available at <http://www.coastalstates.org/documents/CSO%20Climate%20Change%20Final%20Report.pdf>.

⁴⁰ *Id.*

⁴¹ *Supra* note 11, citing California, Maine, Massachusetts, New York, Rhode Island, Texas, and Wisconsin.

incorporate predicted changes.⁴² Such regulatory approaches refer to adaptive management strategies, such as erosion rate setbacks, hard and soft coastal armoring, and state building codes improvements.

1. Rolling Easements

Coastal managers are recognizing that large amounts of beaches and coastal wetlands are being lost because natural migration processes are being halted by engineered structures (*e.g.*, bulkheads, revetments, riprap, etc.). For example, Maine, Rhode Island, North and South Carolina, and Texas, in an effort to balance public versus private property rights, have implemented versions of rolling easements which take the natural shoreline processes into account and allow property owners to build near or on the beach, but only on the condition that the structure(s) will be removed if and when it becomes vulnerable to an advancing shoreline.⁴³ A rolling easement is a tool, derived from law (statutory or common) or regulatory authority, that allows publicly owned tidelands to migrate inland as the sea rises, thereby preserving ecosystem structure and function.

In Rhode Island, the Coastal Resources Management Council (CRMC) is responsible for implementing Rhode Island's coastal zone management program, known as the Coastal Resources Management Program. In doing so, CRMC's primary responsibility is "to preserve, protect, develop and where possible restore the coastal resources of the state for this and succeeding generations through comprehensive and coordinated long-range planning and management designed to produce the maximum benefit for society from such coastal resources."⁴⁴ Rhode Island, like Maine, Massachusetts, the Carolinas, and Oregon, has adopted variations of the rolling easement.⁴⁵ The requisite setback requirements for sites along the coast in Rhode Island are based on calculated long-term shoreline change rates. Such a setback is designed to allow the dune to roll back with sea level rise and with storm forces, yet allow a structure to maintain a three-year life expectancy.⁴⁶ Rolling easements and setbacks are not mutually exclusive; a single approach to coastal management will not be appropriate everywhere.⁴⁷

When carrying out its mandate, CRMC must develop regulations for post-coastal hazard events, such as severe storms and erosion. More importantly, CRMC must implement the regulations designed to minimize the *impact* of coastal hazards. Policies regulating where to build on a vulnerable property,⁴⁸ construction of shoreline protection facilities,⁴⁹ and beneficial reuse of dredged materials are a few examples of hazard mitigation measures. The CRMC recently adopted a policy addressing the acceleration of sea level rise, and the resulting erosion and inundation of coastal resources.⁵⁰ The Council recognizes that sea level rise is ongoing and its foremost concern is the accelerated rate of rise and the associated risks to Rhode Island coastal areas today and in the future. Accordingly, for planning and management purposes, it is the Council's policy to accommodate a base rate of expected three to five foot rise in sea level by 2100 in the siting, design, and implementation of public and private coastal activities

⁴² For an overview of coastal states' responses, see *CSO*, *supra* note 40. See also http://epa.gov/climatechange/effects/downloads/maine_b.pdf.

⁴³ James G. Titus, *Rising Seas, Coastal Erosion, and the Takings Clause: How to Save Wetlands and Beaches Without Hurting Property Owners*, 57 MD. L. REV. 1279 (1998).

⁴⁴ R.I. GEN. LAWS § 46-23-1.

⁴⁵ Meg Caldwell and Craig Holt Segall, *No Day at the Beach: Sea Level Rise, Ecosystem Loss, and Public Access Along the California Coast*, 34 *ECOLOGY* L.Q. 533 (2007).

⁴⁶ See *Puchalski v. Coastal Resources Management Council*, 2001 WL 1006699 (R.I. Super. Aug. 8, 2001).

⁴⁷ *Supra* note 43 at 1391 (explaining that setbacks are useful for protecting tidelands threatened over the next forty to seventy-five years, while rolling easements may be enforced to ensure that bulkheads are not subsequently built at the setback line).

⁴⁸ R.I. Coastal Resources Management Program (CRMP), Section 140: Setbacks, where a setback is defined as "the minimum distance from the inland boundary of a coastal feature at which an approved activity or alteration may take place." <http://www.crmc.ri.gov/regulations/programs/redbook.pdf> (2008).

⁴⁹ CRMP, see generally.

⁵⁰ CRMP, Section 145: Climate Change and Sea Level Rise adopted on January 15, 2008, effective on February 17, 2008.

and to insure proactive stewardship of coastal ecosystems under these changing conditions.⁵¹ Of note is the Council's authorization to collaborate with the State Building Commissioner and adopt freeboard calculations (a factor of added safety above the anticipated flood level), in accordance with R.I. Gen. Laws § 23-27.3-100.1.5.5.

2. Setback Requirements

Much of the Rhode Island shoreline is eroding, calculated by comparing the shoreline location from historic aerial photographs dating back to 1939 to the most recent shoreline position. Shoreline change maps indicate the annual rate of change using the wet/dry beach line.⁵² Sections of the south shore barriers have erosion rates of more than three feet per year. That is an average rate over time. In reality, the shoreline may erode tens of feet in a single storm, followed by some accretion. In critical erosion areas on barriers and headlands, all residential construction with less than six units must be set back thirty times the average annual erosion rate and commercial property sixty times. Erosion setbacks are very effective regulations that protect the homeowner and public resources. The farther the house or commercial structure is set back from the shore, the longer it will last. Because some of these regulations were enacted over thirty years ago, the CRMC recognizes that the time has come for the agency to consider adopting policy for situations when the setback no longer remains and the structure sits on the active beach.

Maine's Department of Environmental Protection's (MDEP) Coastal Sand Dune Rules takes rising sea level (approximately two feet in the next 100 years) into account when issuing permits for activities within sand dune systems.⁵³ Recognizing the dynamic nature of coastal sand dune systems in response to the changing conditions of water levels, waves, and winds, coupled with construction of structures which increase the likelihood of harm – to both the coastal sand dune system and the structures themselves – the Sand Dune Rules bar future bulkhead construction and require removal of new structures in the event of substantial damage or interference with dynamic sand dune systems.⁵⁴

3. Building Code Requirements

In Rhode Island, the CRMP developed and adopted regulations indicative of projected sea level rise and probable increased frequency of intense coastal storms due to climate change. The regulations have, for planning and management purposes, “accommodate[d] a base rate of expected three to five foot rise in sea level by 2100 in the siting, design, and implementation of public and private coastal activities and insure[d] proactive stewardship of coastal ecosystems under these changing conditions.”⁵⁵ The state's Building Code Standards Committee, taking climatic changes and sea level rise into account, adopted new regulations incorporating freeboard calculations promulgated by CRMC within flood velocity zones.⁵⁶

⁵¹ *Id.*

⁵² *Id.*, SHORELINE CHANGE MAPS: WATCH HILL TO NARRAGANSETT PIER AND NARRAGANSETT TO LITTLE COMPTON, <http://www.crmc.ri.gov/regulations/programs/redbook.pdf> ; and JON C. BOOTHROYD AND RACHEL E. HEHRE, SHORELINE CHANGE MAPS FOR NARRAGANSETT BAY, RHODE ISLAND: RHODE ISLAND GEOLOGICAL SURVEY REPORT 2007-1 FOR RI COASTAL RESOURCES MANAGEMENT PROGRAM (2007) available at <http://www.crmc.ri.gov/maps/shoreline.html>

⁵³ 06-096 ME. CODE R. Ch. 355 (2006).

⁵⁴ *Id.*

⁵⁵ R.I. GEN. LAWS. § 46-23 et. seq.; CRMP, § 145(C)(3): Climate Change and Sea Level Rise.

⁵⁶ *Id.* § 23-27.3-100.1.5.5 Hurricane, storm, and flood standards: The state building code standards committee has the authority in consultation with the building code commissioner, to adopt, maintain, amend, and repeal code provisions, which shall be reasonably consistent with recognized and accepted standards and codes, including for existing buildings, for storm and flood resistance. Such code provisions shall, to the extent reasonable and feasible, take into account climatic changes and potential climatic changes and sea level rise. Flood velocity zones may incorporate freeboard calculations adopted by the Coastal Resources Management Council pursuant to its power to formulate standards under the provisions of § 46-23-6.

4. No building areas

As sea level continues to rise, the result will be property on oceanfront dune or on the active beach. South Carolina regulations include a provision that “[a] structure cannot be constructed or reconstructed on a primary oceanfront dune or on the active beach, and in the event that the beach erodes so that in the future the permitted habitable structure is located on the active beach, the property owner agrees to remove the structure at his own expense.”⁵⁷

To prevent such a scenario on dunes, Maine’s regulations state that “no new seawall or similar structure may be constructed.”⁵⁸ Furthermore, “no existing seawall or similar structure may be altered or replaced,” with a few limited exceptions including no unreasonable interference with legal access to or use of the public resources. The MDEP will not permit a project if, “within 100 years, the property may reasonably be expected to be eroded as a result of changes in the shoreline such that the project is likely to be severely damaged after allowing for a two-foot rise in sea level over 100 years.”⁵⁹ Excluded from the requirement are beach nourishment and dune restoration projects.⁶⁰

B. Engineered Responses: Coastal Armoring and Beach Renourishment

1. Coastal Armoring

Shoreline protection structures, including revetments, bulkheads, seawalls, groins, breakwaters, jetties, and other structures, are built to control the erosion of coastal features.⁶¹ Hardened structures on the shoreline destroy the beach in a number of ways. The structures reflect wave energy onto the beach causing sand to be scoured away and erosion around the sides of the structure. Second, the structures disrupt sediment transport, both by sequestering sediment that would normally erode from a bank or dune behind the structure to form new beaches, and by physically blocking the sand movement along the shoreline.⁶² Shoreline armoring destroys the beach in a third way due to “occupation loss,” defined as simply the area of the public beach physically occupied by the seawall.⁶³ “Bulkheading and filling along the inland perimeter of a marsh prevents inland migration of wetland vegetation as sea level rises.”⁶⁴ Sea level rise will reduce the effectiveness of existing coastal engineering structures, such as seawalls and revetments, designed for a historically lower sea level. Other infrastructure (roads, bridges, dams) in the coastal zone will also be at risk.

Without vegetated buffers protecting property from storms, the dynamic boundary between public and private property for littoral owners is causing some property owners to take action. Armoring the shoreline with a bulkhead (including a seawall, riprap, rocks, sand-filled tubes, or other rigid erosion structure installed on or near the seaward perimeter of the property) is an example of hardening the shore to protect private property or forestall the inevitable. Some states, however, including Texas, have concluded that “interfering with shoreline movement by artificial means is not a recognized littoral right.”⁶⁵

⁵⁷ S.C. CODE R. § 30-15(F) (this requirement only applies to the approximately sixty-five houses constructed under a special permit (to build seaward of the baseline), not to all oceanfront houses).

⁵⁸ 06-096 ME. CODE R. Ch. 355.5(E).

⁵⁹ *Id.* at 355.5(C).

⁶⁰ *Id.*

⁶¹ See CRMP, § 300.7: Construction of Shoreline Protection Facilities.

⁶² See <http://www.crmc.ri.gov/coastalhazards/index.html> (2008).

⁶³ Orrin H. Pilkey & Howard L. Wright III, *Seawalls Versus Beaches*, 4 J. COASTAL RES. 41, 43 (1988) (a seawall located on a public beach will naturally prevent use of the beach that it is physically occupying).

⁶⁴ RICRMP § 210.3(B)(4), <http://www.crmc.ri.gov/regulations/programs/redbook.pdf>.

⁶⁵ *Lorino v. Crawford Packing Co.*, 175 S.W.2d 410, 414 (Tex. 1943); *Coastal Indus. Water Auth. v. York*, 532 S.W.2d 949, 952 (Tex. 1976); and *Brainard v. State*, 12 S.W.3d 6, 10, 19-23 (Tex. 2000).

In Rhode Island, hard structures are prohibited along shorelines abutting conservation areas (known as Type 1 waters) which make up more than half of the coast, except where they are used to protect historic structures listed on the National Register of Historic Places. Coastal geologists in Rhode Island recently conducted a study of shoreline change maps of Narragansett Bay, including the islands and Little Compton, finding that 30% of the shoreline (the equivalent to 125 km or 78 miles) is protected with a hard structure.⁶⁶ Boothroyd and Hehre referred to a similar study conducted in 1978 which recorded 25% of the shoreline as hardened, resulting in only a 5% increase in hardened shorelines in 29 years.⁶⁷

South Carolina's Beachfront Management Act (BMA) states that it is the policy of South Carolina to "protect, preserve, restore, and enhance the State's beach/dune system, the highest and best uses of which are declared to provide protection of life and property by acting as a buffer from high tides, storm surge, hurricanes, and normal erosion."⁶⁸ The BMA authorizes the South Carolina Office of Ocean and Coastal Resource Management to permit or deny alterations or development within a critical area, including coastal waters; tidelands; beaches; and the beach/dune system, which is the area from the mean high-water mark to the setback line as determined in Section 48-39-280.⁶⁹

Some states, like Texas, enforce regulations which require property owners to remove encroachments from the public beach easement.⁷⁰ The state owns land submerged under the Gulf of Mexico and navigable waters,⁷¹ which it holds in trust for the use and benefit of the public. The state may require the removal of structures from the active beach to enforce this public easement, which includes the unrestricted right of ingress and egress to an area extending from the line of mean low tide to the line of vegetation bordering on the Gulf of Mexico.⁷²

Even in instances where property owners claim that "[t]he protection of property from erosion is an essential right of property owners," such protection can be denied and will not constitute a Fifth or Fourteenth amendment violation where such takings claims are based on property owners' needs for "a permanent solution to the erosion that threatens its property."⁷³ North Carolina's hardened structure rule, adopted by the North Carolina Coastal Resources Commission, clearly states, in pertinent part "[p]ermanent erosion control structures may cause significant adverse impacts on the value and enjoyment of adjacent properties or public access to and use of the ocean beach, and, therefore, are prohibited. Such structures include, but are not limited to: bulkheads; seawalls; revetments; jetties; groins and breakwaters."⁷⁴ Courts have held that the littoral or riparian rights afforded to property owners do not include "a right to erect hardened structures in statutorily designated areas of environmental concern to protect their property from erosion and migration;" these "natural occurrences" do affect the property boundary, at times divesting landowners of their property – a direct consequence of being a riparian or littoral landowner.⁷⁵

⁶⁶ Boothroyd and Hehre, *supra* note 50.

⁶⁷ JON C. BOOTHROYD AND ABDULLAH AL-SAUD. SURVEY OF THE SUSCEPTIBILITY OF THE NARRAGANSETT BAY SHORELINE TO EROSION. UNPUBLISHED REPORT TO THE UNIVERSITY OF RHODE ISLAND COASTAL RESOURCES CENTER (1978). (The RI Coastal Resources Management Program rules preventing armoring within certain regions of the state went into effect in 1972).

⁶⁸ S.C.CODE ANN. § 48-39-260(1)(a).

⁶⁹ *Id.* § 48-39-10(J).

⁷⁰ TEX. NAT. RES. CODE ANN. § 61.001 defines "public beach" as "any beach area, whether publicly or privately owned, extending inland from the line of mean low tide to the line of vegetation bordering on the Gulf of Mexico to which the public has acquired the rights of use or easement to or over the area by prescription, dedication, presumption, or has retained a right by virtue of continuous right in the public since time immemorial, as recognized in law and custom."

⁷¹ *Id.* § 11.012(d).

⁷² *Id.* §§ 61.011(a) and 61.020.

⁷³ *Shell Island Homeowner's Association v. Tomlinson*, 517 S.E.2d 406 (N.C. App. 1999).

⁷⁴ 15A N.C. ADMIN. CODE 7H.0308(a)(1)(B) and 7H.0301.

⁷⁵ *Supra* note 73 at 414.

The Supreme Court of North Carolina has recognized that when a property boundary, demarcated by a body of water, has been altered by accretion, reliction⁷⁶ or erosion, the changed boundary remains the boundary line of the land, “which is extended or restricted accordingly.”⁷⁷ In other words, the riparian landowner loses title to eroded land that has been washed away or encroached upon by the water.⁷⁸

2. Beach Renourishment

Beach renourishment is the replacing of sand on a beach lost due to natural processes. According to some experts, it is the preferred method for erosion control along coastal United States.⁷⁹ The U.S. Army Corps of Engineers (Corps) is the federal agency designated by Congress to protect the U.S. coasts from flooding and erosion. Pursuant to the Water Resources Development Act of 1999, the Corps has the authority to conduct beach renourishment projects.

Presently the federal government pays 65% of the cost of beach renourishment projects, but the Bush Administration wants to reverse the proportion so that the recipient pays the greater amount.⁸⁰ Requiring that a private homeowner or state bear the cost of a renourishment project (although some may argue that coastal areas should bear most of the cost) will certainly deter owners/managers from doing so, considering costs of such multi-million dollar projects. The NOAA Office of Coastal Resource Management's (OCRM) policy concerning the use of funds available to states under Section 306A of the Coastal Zone Management Act (CZMA) does not generally support the funding of beach nourishment projects, given the limited amount of funds available under Section 306A. However, OCRM does allow states to spend Section 306A funds for planning beach nourishment projects in certain limited instances.⁸¹

Of the eighteen Atlantic and Gulf Coast states with approved coastal zone management programs, sixteen have beach nourishment policies; the other two states, Maine and Maryland, have no formal beach nourishment policies. Nine out of the eighteen states have a continuing funding program for beach nourishment. Six states fund projects on a case-by-case basis, and three have no source of state funding.⁸² The South Carolina Beachfront Management Act (BMA) encourages the use of beach renourishment and erosion control methods with soft technologies where appropriate while “severely restrict[ing] the use of hard erosion control devices to armor the beach/dune system.”⁸³ The BMA has been challenged extensively since the ruling of the state’s most notable case, *Lucas v. South Carolina Coastal Council*.⁸⁴

When promulgating regulations, coastal managers must determine the effectiveness of erosion rate setbacks versus beach renourishment. The Corps oversees federal beach renourishment projects, typically by dredging near shore areas for replacement sand, as federal law prohibits the importing of foreign sand.

⁷⁶ THE AMERICAN HERITAGE, DICTIONARY OF THE ENGLISH LANGUAGE (4th ed.2006) (“Gradual recession of water in a sea, lake, or stream, leaving permanently dry land”).

⁷⁷ *Supra* note 73 at 414.

⁷⁸ *Id.* at 415 (where title was divested by “the sledge-hammering seas the inscrutable tides of God”).

⁷⁹ Orrin H. Pilkey, *Beach Nourishment: Two Sides to Every Story*, Remarks at the Southeastern Section of the Geological Society of America’s 50th Annual Meeting (2001), available at <http://gsa.confex.com/gsa/2001SE/finalprogram/>.

⁸⁰ S. Fretwell, *Federal Funds for Beach Replenishment Appear Safe in the State*, The State-Record Co. (Columbia, S.C.), 2001.

⁸¹ OFFICE OF OCEAN AND COASTAL RESOURCE MANAGEMENT, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, STATE, TERRITORY, AND COMMONWEALTH BEACH NOURISHMENT PROGRAMS, A NATIONAL OVERVIEW, OCRM Program Policy Series Technical Document No. 00-01 (Mar. 2000).

⁸² *Id.*

⁸³ S.C. CODE ANN. § 48-39-260(3).

⁸⁴ 505 U.S. 1003 (1992) (Enforcement of the Beachfront Management Act did not effectuate a taking of a landowner's property where statutorily mandated setback lines prohibited the construction of any permanent structure (including a dwelling) on two vacant oceanfront lots, but the landowner conceded that the Act was properly and validly designed to preserve the valuable resource of the state's beaches by limiting new construction; the deprivation of all economically viable use of property does not amount to a "regulatory taking" when the purpose of regulation is to prevent serious public harm).

The Corps has the discretion to approve or deny beach renourishment projects “due to public interest factors and the availability of less environmentally damaging alternatives.”⁸⁵ For example, the Corps denied applicant Massachusetts Department of Conservation and Recreation’s permit for “a shoreline protection project using one-half million cubic yards of sand and gravel from an offshore site in Massachusetts Bay and placing it on 37 acres of Winthrop Beach, near Boston’s Logan Airport.”⁸⁶ The permit was denied because of the location of the source of the proposed beach fill (100 acres of gravel/cobble), which serves as essential fish habitat for Atlantic cod and other species.⁸⁷

C. Non-regulatory Responses

Non-regulatory approaches, such as state purchases of private property or easements, should be considered in the alternative or as a supplement of regulatory action.

1. Land Trusts and “Presumed Mobility”

While it is recognized that it may not be possible for states, land trusts or other entities to buy all of the coastal property that should be protected from development in the event of rising sea level, a hybrid approach may be employed. A more affordable option or a “presumed mobility” approach, which shifts the risk from the states to private property owners, proposes that the government buys the threatened property, either through eminent domain or a willing seller approach, and then leases it back to the owners for a period of time. The lease expires once the shoreline reaches a certain point (i.e., stable condition).⁸⁸ The rationale would allow current property owners to develop their land on the condition that the structures will not be protected against inundation and must be removed in the event of sea level rise, with the presumption that development will have to make way for migrating ecosystems.⁸⁹

2. Easements

A second non-regulatory approach is suggested by Professor Joseph Sax who recommends the public purchase of a future flooding easement coupled with the requirement that each owner have insurance sufficient to cover the costs of subsequent inundation with the government paying the premiums for the insurance.⁹⁰ The easements would prohibit interference with any flooding caused by sea level rise and would allow the easement holder to remove structures that interfere with natural sea level rise. The flood easements would be sold through negotiated sales or required as a condition on proposed development. The purchase price would be retained by the government and compounded over time, then distributed to owners in the event that a retreat from the shoreline is necessary.⁹¹

⁸⁵ Press Release, U.S. Army Corps of Engineers, *Corps of Engineers Public Interest Review Results in Permit Denial for Winthrop Beach*, Apr. 23, 2008, available at <http://www.nad.usace.army.mil/Winthrop%20Beach%20Permit%20News%20Release2.pdf> (a 60 day period in which to appeal the decision was commenced; as of the final day for appeal (June 23, 2008), no appeals were submitted).

⁸⁶ *Id.*

⁸⁷ Department of the Army Permit Evaluation and Decision Document, NAE-2005-4149 (http://www.nad.usace.army.mil/winthrop_decision.pdf).

⁸⁸ OFFICE OF POLICY, PLANNING, AND EVALUATION, U.S. ENVIRONMENTAL PROTECTION AGENCY, PLANNING FOR SEA LEVEL RISE ALONG THE COST OF MAINE, Ch. 6 - Legal Considerations for Maine’s Policy Response (1995), http://www.epa.gov/climatechange/effects/downloads/maine_6.pdf (referencing James G. Titus, *Greenhouse Effect and Coastal Wetland Policy: How Americans Could Abandon an Area the Size of Massachusetts at Minimum Cost*, 15 ENV’L MGT. 39 (1991)).

⁸⁹ *Id.*

⁹⁰ *Id.* referring to Joseph L. Sax, *The Fate of Wetlands in the Face of Rising Sea Levels: A Strategic Proposal*, 9 J. ENV’L L. 143 (1991) (where the insurance policy would be treated as an annuity payable at fixed sums in the event of rising sea level).

⁹¹ *Id.*

Encouraging removal of homes located on the beach by compensating property owners with conservation easement(s) for a minimal recreational use (e.g., unpaved parking area and small storage) is a third non-regulatory approach to dealing with sea level rise. Owners would have the option of a tax break on the property and would not lose all of the economic use and enjoyment of the particular property.

V. Legal Implications of Existing Sea Level Rise Policies

A. Public Trust Doctrine

Blocking landward migration of the shore by bulkheading or armoring interferes with a portion of the public's rights as enumerated under the public trust doctrine. The public trust doctrine is a body of law which states that public trust lands, waters, and living resources in a state are held by the state in trust for the benefit of all of the people and the principle establishes the right of the public to fully enjoy public trust lands, waters, and living resources for a wide variety of recognized public uses.⁹² Most coastal states have incorporated the public trust doctrine into their constitutions or statutes. The interests protected under the public trust doctrine continue to evolve as states recognize not only traditional uses of the submerged lands, such as navigation, commerce, and fishing, but also more modern uses of state-owned lands for aquaculture, recreation, and the preservation of tidelands in its original state for study, aesthetic value, and as marine mammal and waterfowl habitat.

The origins of the public trust doctrine may be traced back to the Justinian Institutes of Roman civil law where "they [the shores] cannot be said to belong to anyone as private property."⁹³ Furthermore, the Magna Carta specifically condemned interference with public access to navigable bodies of water, and prevented the King from giving favored noblemen exclusive rights to hunt or fish in certain areas.⁹⁴ Though the king was understood to own the land, he had an obligation to protect it for use by the general public.⁹⁵ Each state has the authority and responsibility for applying the public trust doctrine to trust lands and waters "within its borders according to its own views of justice and policy."⁹⁶ The boundary between private property and public trust lands has been defined as the mean high water line: the intersection of the plane of mean high water elevations over an 18.6 year period or Tidal Epoch.⁹⁷ Typically, with the exception of a few coastal states, the mean high tide line "boundary" is the swash or "seaweed" line.⁹⁸

Given the continual rise in sea level, the boundary between public lands and private properties can become problematic. Private property owners abutting the shoreline are afforded an array of rights enjoyed by the owner of the banks of a river or stream, or of a lake or seashore, referred to as riparian and littoral rights, respectively. The rights may include access to the water, the right to wharf out, the right to acquire accretions, the right to fill, the right to continued flow, and the right to preservation of the view of the water. However, these private rights are not without limitations imposed by the public trust doctrine, navigable servitude, and other such legal concepts. One must view these rights as balanced with the public interest.

⁹² For an overview of states incorporating strong public trust and environmental protection provisions into state constitutions, see Alexandra B. Klass, *Modern Public Trust Principles: Recognizing Rights and Integrating Standards*, 82 NOTRE DAME L. REV. 2 (2006). See also Matthew Thor Kirsch, Note, *Upholding the Public Trust in State Constitutions*, 46 DUKE L. J. 1169, 1176 (1997).

⁹³ COASTAL STATES ORGANIZATION, PUTTING THE PUBLIC TRUST DOCTRINE TO WORK (2d ed. 1997).

⁹⁴ Matthew Hale, *De Jure Maris et Brachiorum ejusdem*, in F. Hargrave (ed.), *A Collection of Tracts Relative to the Law of England* 1-44 (1787).

⁹⁵ *Supra* note 13.

⁹⁶ *Shively v. Bowlby*, 152 U.S. 1, 26 (1894).

⁹⁷ *Borax Consolidated Ltd. v. City of Los Angeles*, 296 U.S. 10, 22-23 (1935).

⁹⁸ Hawaii, for example, defines the boundary of lands held in trust by the state for the public as the vegetation line. Massachusetts, on the other hand, defines public trust boundaries as the low water line, giving deference to private property owners abutting the shoreline.

Of these, the right of access to the water is the “first and most basic right of the riparian owner,” under which other riparian rights are created and protected. The right of access ensures the riparian owner's “right to be and remain a riparian proprietor,” protects the riparian owner's ability to reach the navigable portions of adjacent waters without unreasonable impediment, supports the riparian's right to wharf out, and includes the right to erect structures in aid of navigation, all of which are now subject to state or local approval. This right also underlies the riparian owner's right to take title to lands that accrete beyond the mean high water mark for if such lands did not join those of the riparian, the riparian's access to navigable waters could be cut off.⁹⁹

Property owners may also lose out when erosion control lines become the new property boundary (if not located directly on the line of mean high water), thereby denying the upland landowners any property gained by accretion. Landowners, however, are still entitled to all of their riparian rights including the right of ingress, egress, view, boating, bathing, and fishing.¹⁰⁰ Under general common law, if the littoral or riparian owner can benefit from the process of accretion, then that same owner can lose the land to erosion.¹⁰¹ Whereas, if erosion or a storm event has caused the mean high tide line to shift, the boundary of public trust lands may change – asserting state ownership of public lands.¹⁰² The erosion analysis refers only to the issue of riparian rights and lost land; it does not establish options in the instance of where a house is seaward of the mean high tide line due to erosion or the encroachment of the sea, interfering with the rights afforded citizens under the public trust doctrine.¹⁰³

As the submerged lands continue to increase in size, and property owners resort to armoring or renourishing in order to control erosion, potential legal options arise for both private and public actions. Shoreline protection structures often impact lateral public access along the shoreline, a right protected under the public trust doctrine. They are a contributing factor in the narrowing and loss of beaches, and they inhibit the public's right to lateral shoreline access. Under the CZMA, approved state management programs include a definition of beach and a planning process for dealing with access to public coastal areas and adverse effects upon the coastal zone of land subsidence and of sea level rise.¹⁰⁴

B. Takings

Regulatory measures, particularly ones anticipating climate change-induced sea level rise and the restricting options of coastal property owners, may be challenged in court. The majority of actions are based on state and federal constitutional provisions prohibiting governmental “taking” of property through burdensome land use and environmental regulations. Claims brought directly under the Fifth Amendment of the United States Constitution or similar state constitutional provisions seek “just compensation” for the alleged prohibition of use, or “taking” of property.¹⁰⁵ Compensation may be inefficient, however, if it weakens the incentives to avoid harm and thus raises social costs of climate

⁹⁹ See *TH Investments, Inc. v. Kirby Inland Marine*, 218 S.W.3d 173 (Tex. App. 2007). (Title of ownership of submerged lands was acquired by the state, only after the once dry land subsided into navigable waters.)

¹⁰⁰ *Save Our Beaches v. Florida Dept. of Env. Protection*, 2006 WL 1112700 at 4 (Fla. App. Apr. 28, 2006).

¹⁰¹ JOSEPH KALO, ET. AL. *COASTAL AND OCEAN LAW: CASES AND MATERIAL* 51 (3d ed. 2007).

¹⁰² *Id.*

¹⁰³ *Id.* at 56.

¹⁰⁴ Coastal Zone Management Act, 16 U.S.C. § 1452. (§ 1452(2)(K) and (3) states, in pertinent part: “(2)(K) the study and development, in any case in which the Secretary considers it to be appropriate, of plans for addressing the adverse effects upon the coastal zone of land subsidence and of sea level rise; and to encourage the preparation of special area management plans which provide for increased specificity in protecting significant natural resources, reasonable coastal-dependent economic growth, improved protection of life and property in hazardous areas, including those areas likely to be affected by land subsidence, sea level rise, or fluctuating water levels of the Great Lakes, and improved predictability in governmental decisionmaking.”) (emphasis added).

¹⁰⁵ The Fifth Amendment to the United States Constitution states, in pertinent part: “. . . nor shall private property be taken for a public purpose without payment of just compensation.”

change.¹⁰⁶ One estimation of the costs of sea level rise in the United States is approximately 30% lower with private adaptation than without.¹⁰⁷

Regulatory changes should be expected by property owners where their rights are “subordinate” to the government’s ability to protect the rights afforded to the public.¹⁰⁸ In 1987, the State of Maine was successful in a challenge to the 1983 version of its prohibition of new construction or additions in the frontal dune or V-Zone.¹⁰⁹ The Maine Supreme Court found that significant beneficial uses remained for the property owner after the denial of a permit to build a house, when a 27-foot seasonal camper was being used on the property and thus no taking had occurred in violation of Maine’s Constitution.¹¹⁰ The State was successful in a subsequent case where the Court confirmed the vitality of the *Hall* decision and found that a property owner failed to prove that the denial of a permit for a “buildable” lot rendered the property substantially useless and stripped it of all practical value.¹¹¹

The Texas Open Beaches Act (TOBA), enacted in 1959, prohibits the construction of any obstruction, barrier, or restraint that will interfere with the free and unrestricted right of the public to lawfully and legally enter or leave any public beach if the public has acquired a right of use or easement to or over the area by prescription or dedication or has retained a right by virtue of continuous right in the public.¹¹² The boundary determining public (submerged lands) versus private (upland) rights is dynamic, subject to landward and seaward movement over time with erosion and accretion.¹¹³

Texas courts have ruled that the rolling easement enforced under state coastal legislation (i.e., TOBA) is not a compensable taking under the United States or Texas constitutions. A rolling easement applies even where a tropical storm damages property and eventually moves the vegetation line of the beach onto private property.¹¹⁴ The Court in *Arrington* relied on a lineage of cases to rule that a denial of a permit to repair a beachfront home was not a taking, holding that “once a public beach easement is established, it is implied that the easement moves up or back to each new vegetation line, and the State is not required to

¹⁰⁶ Hilary Sigman, *Responses to Global Warming: The Law, Economics, and Science of Climate Change*, 155 U. PA. L. REV. 1953 (2007), referring to R.H. Coase’s notion of the reciprocal nature of externalities where “The belief that it is desirable . . . to compensate those who suffer damage . . . is undoubtedly the result of not comparing the total product obtainable with alternative social arrangements,” see R.H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1, 40 (1960). See also Howard C. Kunreuther & Erwann O. Michel-Kerjan, *Climate change, Insurability of Large-Scale Disasters, and the Emerging Liability Challenge*, 155 U. PA. L. REV. 1795, 1840 (2007) (“Today, some insurers feel that the risks from hurricanes and other weather-related events in certain areas are uninsurable by the private sector alone due to the large catastrophic losses of recent years and the impact of global warming on weather patterns.”).

¹⁰⁷ *Id.* referencing Gary W. Yohe & Michael E. Schlesinger, *Sea-Level Change: The Expected Economic Cost of Protection or Abandonment in the United States*, 38 CLIMATIC CHANGE 447, 465-66 tbls. II & III (1998) (estimating transient costs for a 50 cm sea level rise in 2100 to be \$158.30 million with perfect foresight and \$221.81 million without foresight).

¹⁰⁸ *Slavin v. Town of Oak Island*, 160 N.C. App. 57 (2003) (plaintiff oceanfront property owners brought claim against town seeking compensation for limiting littoral right of access to the ocean as a result of a beach renourishment project; plaintiffs appeal was dismissed on constitutional question and denied for discretionary review).

¹⁰⁹ 06-096 ME. CODE R. § 355.2(B)(i)(amended January 4, 1988). See also *Hall v. Board of Environmental Protection*, 528 A.2d 453 (Me. 1987).

¹¹⁰ *Id.* at 456.

¹¹¹ *Wyer v. Board of Environmental Protection*, 747 A.2d 192 (Me. 2000) (“Because of the property’s close proximity to Higgins Beach in Scarborough, the Court properly considered the uses of the property for parking, picnics, barbecues and other recreational uses as beneficial uses available to Wyer despite the restrictive regulation”).

¹¹² TEX. NAT. RES. CODE ANN. §§ 61.001-.026.

¹¹³ *Brainard v. State*, 12 S.W.3d 6, 17-18 (Tex. 2000); *Coastal Indus. Water Auth. v. York*, 532 S.W.2d 949, 952 (Tex. 1976).

¹¹⁴ *Arrington v. Texas General Land Office*, 38 S.W.3d 764 (2001).

repeatedly re-establish that an easement exists up to that new vegetation line (but only that the line has moved).”¹¹⁵

The Texas General Lands Office (GLO) obtained three favorable rulings in 2007 regarding its authority to order the removal of houses on the public beach under the TOBA and state law authorizing removal orders for unauthorized structures on state-owned submerged land.¹¹⁶ Several property owners filed suit claiming that the enforcement of the TOBA violated their constitutional rights. Carol Severance purchased three houses in Galveston that were on the public beach, knowing at that time that the vegetation line could pose a problem.¹¹⁷ Through the Pacific Legal Foundation, a property rights activist group, she filed a federal lawsuit against Land Commissioner Patterson in his official capacity, claiming that the imposition of the rolling beach easement (which put her house on the beach) is a governmental taking of property for public use without just compensation. The Court, in May 2007, granted the GLO’s motion to dismiss Severance’s claims on a number of grounds, namely that the house removal claim was unripe for review.¹¹⁸ Severance appealed the District Court’s dismissal to the U.S. Court of Appeals for the Fifth Circuit.¹¹⁹

Brannan v. State, known as the “Surfside” case because the property rights being disputed are located along the Gulf of Mexico in the Village of Surfside Beach in Brazoria County, Texas has been ongoing since 2001;¹²⁰ it has yet to be decided. At issue is the property owners claim to invalidate the rolling easement, enforceable under the TOBA. The vegetation line is customarily recognized as the landward boundary of the public beach in Surfside. Due to erosion over the years, that “line” has been moved landward, in effect, moving Surfside’s beach landward and plaintiffs’ properties seaward of the line. The plaintiffs claimed that the potential enforcement of the TOBA (where plaintiffs’ properties are in the public beach easement and are subject to removal and penalties) based on the rolling easement is an unconstitutional taking.¹²¹ In September 2007, the Court granted the GLO’s motion for summary judgment, granting an injunction requiring removal by the owners of sixteen houses on the public beach.¹²²

In 2004, the GLO sued three homeowners in the Treasure Island subdivision of Brazoria County (a residential community on the Gulf of Mexico shore at the San Luis Pass end of the Brazoria County, Texas, beachfront), asking the court to order removal of the three structures located on public land.¹²³ In March 2007, State District Judge Margaret Cooper granted the GLO’s motion for summary judgment, ruling that the three Treasure Island houses are located on state-owned submerged land and, therefore, may be subject to removal orders.¹²⁴

¹¹⁵ *Id.* at 766 (citing *Feinman v. State*, 717 S.W.2d 106, 108-11 (Tex. App. 1986) (holding that it is implicit in the Act that a public easement, established by implied dedication, moves with the new vegetation line); and *Matcha v. Mattox*, 711 S.W.2d 95, 98-100 (Tex. Ct. App. 1986) (holding that the public easement established by custom shifts with the natural movements of the beach).

¹¹⁶ *Id.* and TEX. NAT. RES. CODE §§ 11.012(c), 11.041, 11.077, 51.302.

¹¹⁷ *Severance v. Patterson*, 485 F.Supp.2d 793, 797 (D. Tex. 2007). Where Court noted that the “public has established an easement over most of portions of the ‘dry beach,’ which is defined as the sandy land between the mean high tide mark and the vegetation line.” See also TEX. NAT. RES. CODE § 61.001(5) defining line of vegetation as “the extreme seaward boundary of natural vegetation which spreads continuously inland.”

¹¹⁸ *Id.* at 802 (“Federal courts should not adjudicate constitutional limits on state power where the alleged harm is speculative and the judgment would hamper permissible enforcement activity”).

¹¹⁹ *Id.* Oral argument has not yet been scheduled in the appeal.

¹²⁰ *Brannan v. State*, Cause No. 15802 (Brazoria County District Court 2007).

¹²¹ *Id.* State Defendants’ Motion for Summary Judgment on Open Beaches Act Counterclaims, p. 8.

¹²² *Id.* The judge issued a letter ruling reflecting his decision, but a final order has not yet been issued.

¹²³ *State v. Guiberson, et al.*, Cause N. GV400584 (Travis County 201st District Court 2004).

¹²⁴ See TEX. NAT. RES. CODE § 51.302(a), “[n]o person may construct or maintain any structure or facility on land owned by the state, nor may any person who has not acquired a proper easement, lease, permit, or other instrument from the state as required by Chapter 33 of this code and who owns or possesses a facility or structure that is now located on or across state land continue in possession of the land unless he obtains from the [land] commissioner, the

The Supreme Judicial Court of Massachusetts issued a decision against a private landowner holding that the state (Department of Environmental Protection) may deny armoring even in an emergency situation without offending constitutional rights of the private property owner.¹²⁵ In *Wilson*, coastal property owners in Chatham, Massachusetts affected by a winter storm which caused the Nauset Beach to breach, thus exposing their properties to “higher tides and more destructive wave action than before the storm” sought permission from the Commonwealth “to erect protective barriers to prevent further erosion to their properties.”¹²⁶ The homeowners’ were denied permission and while their administrative appeal to build a revetment was pending, their homes were destroyed by the ocean. The Court held that such destruction of property by natural forces during the time of a reasonable administrative proceeding did not amount to a regulatory taking claim.

C. Nuisance

Historically, the legal response to the “environmental externalities” (e.g., public values associated with health, safety, comfort, and convenience) covered by federal environmental statutes has been citizen suits pursuant to the Clean Air Act and Clean Water Act.¹²⁷ However, the list of protected injuries suffered by the general public is not an exhaustive one as covered by the current statutory framework. Remedies for many of the effects of climate change, namely sea level rise, are not currently included in the comprehensive list afforded by federal statutes. Sea level rise causes harm to property produced, in part, as a result of human actions.

To seek recovery for damages suffered (monetary or otherwise), the common law action for public nuisance has begun to have traction, where the law of public nuisance aims to protect public rights/privileges from tortious injuries.¹²⁸ A public nuisance claim for damages for loss of coastal land (from erosion and inundation), buildings, structures, infrastructures, etc., particularly based on present costs of preventing future harms, is the most logical and expedient course of action. Such suits are more prevalently in use by both public officials and private citizens.¹²⁹

Harm caused by human activity, such as global warming, is central to the notion of tort law.¹³⁰ The most common environmental tort is public nuisance, defined by Prosser’s Handbook as “an act or omission which obstructs or causes inconvenience or damage to the public in the exercise of rights common to all.”¹³¹ Simply, public nuisance is “an unreasonable interference with a right common to the general public.”¹³² In determining the unreasonableness of the interference, courts consider: (1) whether the conduct involves significant interference with public health, safety, peace, comfort or convenience; (2) whether a statute or other law makes the conduct unlawful; and (3) whether the conduct is continuous or has a long-lasting effect, and whether the actor knows the conduct to have a significant effect on the public’s rights.¹³³ Although the actor’s state of mind is one factor in the unreasonableness analysis, to

board, or the board of regents an easement, lease, permit, or other instrument required by this chapter or Chapter 33 of this code for the land on which the facility or structure is to be constructed or is located.”

¹²⁵ *Wilson v. Commonwealth*, 413 Mass. 352 (1992).

¹²⁶ *Id.* at 353.

¹²⁷ Randall S. Abate, *Automobile Emissions and Climate Change Impacts: Employing Public Nuisance Doctrine as Part of a “Global Warming Solution” in California*, 40 CON. LAW REV. 591, 599 (2008).

¹²⁸ James R. Drabick, “Private” Public Nuisance and Climate Change: Working Within, and Around, the Special Injury Rule, 16 FORDHAM ENVTL. L. REV. 503, 518-519 (2005).

¹²⁹ *Id.* at 519 (In the 1960s, 57 public nuisance suits were brought nationwide to remedy environmental harms. That number increased to 150 in the 1970’s, 252 in the 1980’s, and 362 in the 1990s).

¹³⁰ See Eduardo M. Penalver, *Act of God or Toxic Torts? Applying Tort Principles to the Problem of Climate Change*, 38 NAT. RESOURCES J. 563, 569 (1998).

¹³¹ WILLIAM L. PROSSER, HANDBOOK OF THE LAW OF TORTS § 72, at 570 (1st ed. 1941).

¹³² Restatement (Second) of Torts § 821B(2) (1979).

¹³³ *Id.* See also Randall S. Abate, *Climate Change, the United States, and the Impacts of Arctic Melting: A Case Study in the Need for Enforceable International Environmental Human Rights*. 1 SELJ 26A (2007) (referencing *New York v. Waterloo Stock Care Raceway, Inc.*, 409 N.Y.S.2d 40, 44-45 (N.Y. Sup. Ct. 1978) (finding

prove a public nuisance, there is no need to show the actor was negligent or intended to cause the harm; only proof of unreasonable interference with public rights is required.¹³⁴ After all, nuisance principles form the basis of modern environmental statutes.¹³⁵

Given Prosser's definition of a public nuisance, the impacts of sea level rise (a chronic hazard) can pose a nuisance. Climate change, as a whole, meets the elements of a public nuisance for its effects are "an unreasonable interference with a right common to the general public."¹³⁶

Since global sea level rise is accelerating (some regions more inundated than others), coastal infrastructure will become increasingly susceptible as a result – residential and commercial structures, roads, and bridges will be more prone to flooding and the effectiveness and integrity of existing seawalls and revetments will be reduced because they were originally designed for historically lower water levels.¹³⁷ In response, coastal states must develop and adopt policies to manage coastal resources and protect life and property from hazards resulting from projected sea level rise and probable increased frequency and intensity of coastal storms due to climate change *even if* such policies infringe on property rights.¹³⁸

As Justice Kennedy stated in his concurrence in *Lucas v. South Carolina Coastal Council*, with regard to both the common law of nuisance and the takings clause, states "should not be prevented from enacting new regulatory initiatives in response to changing conditions . . . The Takings Clause does not require a static body of state property law."¹³⁹ Although the burden to prove a regulatory taking is on the aggrieved property owner, once this is demonstrated, the burden then shifts to the government to prove a background nuisance. Thus, where compensation to property owners is due, governments in some instances may have difficulty rationalizing regulations under the auspices of background principles of nuisance or the public trust doctrine.¹⁴⁰

In South Carolina, post-*Lucas*, there have been instances where landowners are allowed to repair existing erosion control devices as well as construct new ones, in an active beach area.¹⁴¹ On the other hand, there are instances where the landowner's application for permits to bulkhead and backfill two noncontiguous lots located in predominantly critical area wetlands was denied.¹⁴² Here, the South Carolina Supreme Court in *McQueen* reversed the Court of Appeals decision by finding no compensatory taking of lots had

unreasonable interference existed where the actor's conduct lasted for decades and recurred on a weekly basis, and dismissing the conduct's compliance with zoning ordinances as immaterial); *Flo-Sun, Inc. v. Kirk*, 783 So.2d 1029, 1036 (Fla. 2001) (stating that public nuisances may exist even if the actor complies with pollution laws)).

¹³⁴ *Id.* (referencing *Copart Indus. Inc. v. Consol. Edison Co. of N.Y.*, 362 N.E.2d 968, 971 (N.Y. 1977) (explaining that "nuisance, as a general term, describes the consequences of conduct, the inconvenience to others, rather than the type of conduct involved")).

¹³⁵ *Cox v. Dallas*, 256 F.3d 281, 289 (5th Cir. 2001) ("The nuisance action originated in the twelfth century.")

¹³⁶ David A. Grossman, *Warming up to a Not-So-Radical Idea: Tort-Based Climate Change Litigation*. 28 COLUM. J. ENVTL. L. 1, 53. (2003). (referencing Restatement (Second) of Torts §§ 821B(1), 834 (1979), "One is subject to liability for a nuisance caused by an activity, not only when he carries on the activity but also when he participates to a substantial extent in carrying it on.").

¹³⁷ CRMP, Section 145 (2007).

¹³⁸ *See id.*

¹³⁹ *Lucas v. South Carolina Coastal Council*, 505 US 1003, 1034-1035 (1992).

¹⁴⁰ *Id.* *See also Hirtz v. Texas*, 773 f. Supp. 6 (S.D. Tex. 1991) (state may not prohibit owners from repairing and reinforcing existing structures which, due to erosion, are left seaward of vegetation line); Compare *Mikeska v. City of Galveston*, 328 F. Supp 2d 671 (S.D. Tex. 2004) (city did not have to reconnect utilities and sewers to houses left on dry sand beach); Compare *Slavin v. Town of Oak Island*, 160 N.C. App. 57 (2003) (the legislature in the exercise of its powers may prescribe for the protection of the public rights that appurtenant littoral rights are subordinate to public trust protections); *Gove v. Zoning Board of Appeals of Chatham*, 831 N.E.2d 865 (2005) (where the owner has a legitimate property interest compensation may be required when the taking is tantamount to a direct appropriation or ouster).

¹⁴¹ *See South Carolina Coastal Conservation League v. South Carolina Department of Health and Environmental Control*, 582 S.E.2d 410 (S.C. 2003).

¹⁴² *McQueen v. South Carolina Coastal Council*, 580 S.E.2d 116 (S.C. 2003).

occurred, as lots had reverted to tidelands and tidelands were public trust property subject to the control of the State.¹⁴³ The Court elaborated by stating “[a]ny taking McQueen suffered is not a taking effected by State regulation, but by the forces of nature and McQueen’s own lack of vigilance in protecting his property.”¹⁴⁴

California courts have ruled that coastal armoring encroaching upon the public’s land constitutes a nuisance *per se* and forcible removal is not recoverable as inverse condemnation. In *Scott v. City of Del Mar*, because “the legislature has the power to declare certain uses of property a nuisance and such use thereupon becomes a nuisance *per se*,” governments can also simply define armoring in vulnerable locations as a nuisance.¹⁴⁵ In fact, the court upheld such a legislative definition where the city of Del Mar, using its police power, removed coastal armoring because the city found that a seawall constituted a public nuisance. The court, however, did not reach the question of whether erosion caused by the structures at issue was a nuisance, instead deciding the case on public access grounds.

In Massachusetts, a new standard of liability among littoral owners was created as a result of neighbors feuding over a groin and displaced sand.¹⁴⁶ *Lummis v. Lilly* examined the proximate cause of the conditions of which the plaintiff complains and the appropriate remedy by inquiring as to whether the defendants had made reasonable use of their property as such use affected the plaintiff’s property with the following factors to be considered: “(a) the licenses issued by the Department of Public Works and the [Corps] to construct the groin below mean high water mark and whether the conditions have been met; (b) the purpose for which the groin was constructed; (c) the suitability of the use to the watercourse; (d) the economic value of the use; (e) the social value of the use; (f) the extent and the amount of harm which the use causes; (g) the practicality of avoiding the harm by adjusting the use or method of use of one owner or the other; (h) the practicality adjusting the quantity of water used by each owner; (i) the protection of existing values of water uses, land, investments and enterprise; and (j) the justice of requiring the user who is causing harm to bear the loss.”¹⁴⁷

In Florida, coastal construction lines are established by the Department of Environmental Protection and governed by the Beach and Shore Preservation Act (BSPA) where construction within 50 feet of the mean high water line is prohibited by BSPA and any coastal construction and other activities seaward of the established control line violates the statutory provisions and is considered a public nuisance.¹⁴⁸ Structures that existed or are under construction before the establishment of the control line are exempt from these requirements.¹⁴⁹ However, when a property in existence prior to the establishment of (and located seaward of) the control line is considered to be a public nuisance, the state may use its police powers to deny a permit to build on that property if that use “will injure adjacent property owners and the community at large.”¹⁵⁰ The State of Florida has recognized that “coastal areas form the first line of defense for the mainland against both winter storms and hurricanes, that the dunes of coastal areas perform valuable protective functions for public and private property and that placement of permanent structure in these protective areas may lead to increased risks to life and property and increased cost to the public . . .”¹⁵¹ A Florida district court held that the danger the proposed construction posed to others by destroying the dune justified a denial of a building permit, even though it denied the property owner all economically viable use of the beachfront lots.¹⁵²

¹⁴³ *Id.* at 120 (Court found that an artificial waterway designation is irrelevant because it is considered the “functional equivalent of a natural waterway” citing *Hughes v. Nelson*, 303 N.C. 102, 399 (1990)).

¹⁴⁴ *Id.*

¹⁴⁵ *Scott v. City of Del Mar*, 58 Cal.App.4th 1296, 1305-6 (Ct. App. 1997).

¹⁴⁶ *Lummis v. Lilly*, 385 Mass. 41 (1981).

¹⁴⁷ *Backman v. Lilly*, 1992 WL 12151916, *1 (Mass. Land Ct. May 29, 1992).

¹⁴⁸ See FLA. STAT. § 161.052.

¹⁴⁹ *Id.* § 161.053.

¹⁵⁰ *McNulty v. Town of Indialantic*, 727 F.Supp. 604, 610 (M.D.Fla., 1989).

¹⁵¹ *Id.*

¹⁵² *Id.*

VI. Conclusion

Given the predictions of the accelerated rate of sea level rise, state governments along the coast should be developing policies anticipating the results of climate change. In particular, those states in the most at risk areas, such as Alabama, Louisiana, Mississippi, and Georgia, should consider proactive versus reactive measures in coastal management planning.

The gap in science and national leadership on sea level rise adaptation for over a decade is apparent and needs to be rectified via long-term coastal management planning. There are a number of potential solutions for addressing sea level rise: setbacks, rolling easements, armoring prohibitions, financial incentives, and elevation and new construction techniques in vulnerable areas. Such adaptive management techniques have been, and will continue to be, upheld in court decisions. Therefore, coastal management agencies should not be hesitant to enforce stringent regulations for sustainable long-term planning. The effects of climate change will continue to impact those areas most susceptible to storms, flooding, and other natural hazards. In addition, if the scientific predictions are correct, surrounding areas are also at risk.

When property boundaries along the coast are determined by the ocean, something far beyond the control of the respective state's courts, an increase in sea level rise litigation is inevitable. Particularly, as property owners react to regulations enacted to reduce the hazards of sea level rise. By enforcing setback and building code requirements, purchasing rolling easements in critical areas and upholding the prohibition of shoreline protection structures in vulnerable areas, local and state governments have the tools to plan for long-term coastal management while avoiding harm to property owners.

Eroding Long-Term Prospects for Florida's Beaches: Florida's Coastal Construction Control Line Program¹

Thomas K. Ruppert²

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I. Setting the Stage: Florida's Beaches and Sea Turtles

Turtles have survived over 100 million years during which sea levels have changed dramatically.³ Nonetheless, current predictions for sea-level rise (SLR) present greater challenges than ever to sea turtles. Beaches are naturally dynamic, moving in response to winds, waves, currents, storms, and sea level.⁴ During past SLR, dynamic beaches migrated along with the ocean. Today, beaches providing dynamic sea turtle nesting habitat face the risk of being squeezed out of existence between migrating shorelines and coastal development.⁵ While beaches move even without SLR, SLR makes it more urgent than ever that we begin to plan for the long-term preservation of dynamic beaches as sea turtle nesting habitat and avoid human interruption of sea turtle survival that has spanned millennia.

Florida enjoys 825 miles of sandy beaches.⁶ These beaches serve as nesting habitat for five species of threatened or endangered sea turtles.⁷ Florida's beaches host the densest sea turtle nesting in the United States, the largest aggregation of loggerhead nesting in the world,⁸ and the second highest density of green sea turtle nesting in the hemisphere.⁹ Florida's beaches also provide habitat for hundreds of other species as well. In addition to providing recreational and esthetic values to residents, Florida's beaches attract millions of tourists – and billions of dollars – each year.¹⁰ An estimated \$1 trillion of coastal property in Florida¹¹ fills local government coffers through ad valorem tax assessments. Beaches and their dunes also act as the first line of protection for human development from storm impacts.

Even as Florida's beaches contribute so much to the state, they have become the focal point for tension between beach dynamics and development. Ever-increasing development on Florida's shorelines provokes commensurate increases in the amount of property threatened by erosion, or shoreline migration. Shoreline migration is a natural phenomenon occurring in response to sea level, wave energy, and sand supply dynamics. Shoreline migration becomes a problem and is called "erosion" when shoreline migration threatens human structures or property interests along the coast.¹² Currently over 485

³ See Harold Wanless, *Sea Level Rise: So What?* 52 JOURNAL OF SEDIMENTARY RESEARCH 1051 (1982) (noting ancient sea-level changes).

⁴ Charles H. Peterson and Melanie J. Bishop, *Assessing the Environmental Impacts of Beach Nourishment*, BIOSCIENCE 55(10): 887 (Oct. 2005).

⁵ See, e.g. ROBERT T. WATSON, ET AL., IPCC SPECIAL REPORT ON THE REGIONAL IMPACTS OF CLIMATE CHANGE: AN ASSESSMENT OF VULNERABILITY § 8.3.6.3 (1998), available at <http://www.grida.no/climate/ipcc/regional/index.htm>; see also L.A. Hawkes, et. al., *Investigating the Potential Impacts of Climate Change on a Marine Turtle Population*, GLOBAL CHANGE BIOLOGY (OnlineEarly Articles), available at <http://www.blackwell-synergy.com/doi/abs/10.1111/j.1365-2486.2006.01320.x>.

⁶ FLORIDA COASTAL MANAGEMENT PROGRAM, FINAL ASSESSMENT AND STRATEGIES: FY 2006-2010, 1.

⁷ Loggerhead sea turtle (*Caretta caretta*), threatened; green sea turtle (*Chelonia mydas*), endangered; kemp's ridley sea turtle (*Lepidochelys kempii*), endangered; hawksbill sea turtle (*Eretmochelys imbricata*), endangered; leatherback sea turtle (*Dermochelys coriacea*), endangered.

⁸ See Florida Fish and Wildlife Conservation Commission (FFWCC), *Loggerhead Nesting in Florida*, available at http://floridamarine.org/features/view_article.asp?id=2411.

⁹ See FFWCC, *Green Turtle Nesting in Florida*, available at http://floridamarine.org/features/view_article.asp?id=2496.

¹⁰ See, e.g. ROBERT R. TWILLEY, PEW CENTER ON GLOBAL CLIMATE CHANGE, COASTAL WETLANDS & GLOBAL CLIMATE CHANGE: GULF COAST WETLAND SUSTAINABILITY IN A CHANGING CLIMATE (Dec. 2007) (listing 86 million Florida visitors, the majority visiting coastal resources, spending \$62 billion in 2005).

¹¹ FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS, COASTAL HIGH HAZARD STUDY COMMITTEE FINAL REPORT 9 (Feb. 2006).

¹² BUREAU OF BEACH AND COASTAL SYSTEMS, FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION, CRITICALLY ERODED BEACHES IN FLORIDA 3 (June 2007), available at bcs.dep.state.fl.us/reports/crit_ero.pdf.

miles, or approximately 59%, of the state's beaches are experiencing erosion, and about 392¹³ of the state's 825 miles of sandy beaches are subject to what is called critical erosion, a level of erosion that threatens development, recreational, cultural, or environmental interests.¹⁴ Principal causes of erosion and beach migration in Florida are inlet management, storms, sea-level rise, and armoring.

A. Causes of Erosion: Inlets

Inlet management refers to practices used to keep inlets – or passages – through barrier islands open to water traffic. Such management often includes long jetties, which are semi-permeable or impermeable structures constructed perpendicular to the shoreline and designed to protect the inlet from filling in with sand. Inlets have been recognized as a major cause of erosion on Florida's beaches.¹⁵ A 1994 study examined the “types of erosion patterns that should be found on the downdrift side of the inlets.”¹⁶ The paper's results, which were based on numerical modeling, were later tested against actual inlet erosion patterns and confirmed.¹⁷ Jetties trap sand on the side from which the net flow of sand along the shore comes. For example, on Florida's east coast, most areas experience a net movement of sand from north to south, meaning that jetties catch sand on the north side. Even with jetties, inlets often need to be dredged of sand that builds up in the channel. Both jetties and dredging exacerbate erosion by depriving beaches on the downdrift side of sand that they would have received absent the jetty and dredging.

Florida's 2008 Legislature passed a bill that further recognizes the erosive effects of inlets.¹⁸ If signed into law, the bill will require assignment of responsibility for erosion caused by inlets and specifying what the Florida Department of Environmental Protection (FDEP) must do in the case of disputes between property owners and local governments regarding amount of sand bypass.

B. Causes of Erosion: Storms

Storms constitute a central fact of life for Florida. Data compiled by the National Oceanic and Atmospheric Administration on the 30 most powerful storms over the period 1900 to 1996 show that

¹³ BUREAU OF BEACHES AND COASTAL SYSTEMS, FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION, STRATEGIC BEACH MANAGEMENT PLAN 2 (May 2008), available at <http://www.dep.state.fl.us/beaches/publications/pdf/SBMP/Cover%20and%20Introduction.pdf>.

¹⁴ CRITICALLY ERODED BEACHES, *supra* note 12, at 3. Regulations define “Critically Eroded Shoreline” as “a segment of shoreline where natural processes or human activities have caused, or contributed to, erosion and recession of the beach and dune system to such a degree that upland development, recreational interests, wildlife habitat or important cultural resources are threatened or lost. Critically eroded shoreline may also include adjacent segments or gaps between identified critical erosion areas which, although they may be stable or slightly erosional now, their inclusion is necessary for continuity of management of the coastal system or for the design integrity of adjacent beach management projects.” FLA. ADMIN. CODE r. 62B-33.002(4).

¹⁵ FLA. STAT. § 161.142 (“The Legislature further recognizes that inlets alter the natural drift of beach-quality sand resources, which often results in these sand resources being deposited around shallow outer-bar areas instead of providing natural nourishment to the downdrift beaches.”). The law goes on to require that at least as much sand as would naturally move along the shore be placed on beaches on the downdrift side of inlets.

¹⁶ EMMETT R. FOSTER, P.E., FLORIDA DEPT. OF ENVIRONMENTAL PROTECTION, A GUIDE TO UNDERSTANDING INLET-INDUCED EROSION PATTERNS: EXPECTATIONS FROM NUMERICAL MODELING 2 (Sept. 1994).

¹⁷ EMMETT R. FOSTER, P.E., FLORIDA DEPT. OF ENVIRONMENTAL PROTECTION, THE COMMON THREAD IN INLET-INDUCED EROSION: BASIC THEORY AND FLORIDA EXAMPLES (1995). “The author contends that there are at least 33 inlets in Florida that exhibit essentially the same erosion pattern as determined here from theory. These appear to differ from the general case only in the details of the local conditions.” INLET-INDUCED EROSION PATTERNS, *supra* note 16, at 3.

¹⁸ An Act Relating to Beach Management (CS/HB 1427) (signed by Officers and presented to Governor June 18, 2008). Enrolled bill available at <http://www.myfloridahouse.gov/Sections/Documents/loaddoc.aspx?FileName= h1427er.xml&DocumentType=Bill&BillNumber=1427&Session=2008> (last visited May 19, 2008).

more than 40 percent of the damage they caused occurred in southeast Florida. Of the 158 hurricanes that hit the United States, 47 hit Florida and 26 of those struck the Southeast Florida coast.¹⁹ The 2004 and 2005 hurricane seasons were particularly hard on Florida. In 2004 hurricanes Charley, Frances, Ivan, and Jeanne hit Florida.²⁰ The 2005 season saw strikes on Florida by hurricanes Dennis and Wilma.²¹ Even storms that do not qualify as hurricanes can cause significant erosion.²² To make matters still worse, the intensity of tropical storms is projected to increase due to climate change²³ as will the cost of the damage due to the storms.²⁴

Hurricanes and other storms cause rapid loss of sand on Florida's beaches, leading to loss of property and damage to structures. Two key parts of Florida's response to storms and erosion have become placing sand on the beaches and armoring. The legal mechanisms and problems associated with these activities are more fully explored below.

C. Causes of Erosion: Sea-Level Rise

Florida is undoubtedly among the states in the United States with the most to lose in the face of SLR, and the State of Florida is beginning to admit that SLR jeopardizes Florida²⁵ and causes increased erosion.²⁶ Yet, Florida has not incorporated SLR into Florida's Coastal Management Program, including the coastal construction control line program. Because the state's topography is relatively flat, minor increases in sea level can cause the beach to migrate far landward. Estimates for this process, called shoreline recession, vary greatly for Florida and may also vary radically from place to place within Florida depending on local conditions. However, as a rule of thumb, scientific analyses indicate that shorelines in Florida may be subject to 500 to 1,000 feet of shoreline recession for each foot of sea level rise.²⁷

The International Panel on Climate Change (IPCC) estimates of sea level rise, excluding future rapid dynamical changes in ice flow, range from .18 to .59 meters over approximately the next 90 years.²⁸ However, three factors may make such estimates dramatically lower than what could occur. First, these estimates do not include observed changes in the rate of melting of ice sheets over Greenland and western Antarctica.²⁹ Second, recent studies demonstrate that the greenhouse gas emissions from India and China have risen faster than anyone anticipated, leading to the possibility of a six degree Celsius rise in

¹⁹ Insurance Information Institute, <http://www.iii.org/media/hottopics/insurance/catastrophes/>.

²⁰ See information at the Central Florida Hurricane Center, www.flhurricane.com.

²¹ *Id.*

²² For example, on May 14, 2007, Florida declared an emergency for certain portions of the eastern shoreline in response to the effects of subtropical storm Andrea. Office of General Counsel, Florida Department of Environmental Protection, Emergency Final Order, No. 07-0819 (May 14, 2007).

²³ INTERNATIONAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007 – SYNTHESIS REPORT § 3.2.2 (2007).

There is less certainty about the future frequency of tropical storms. *Id.*

²⁴ DR. JULIE HARRINGTON & DR. TODD L. WALTON, CLIMATE CHANGE IN COASTAL AREAS IN FLORIDA: SEA LEVEL RISE ESTIMATION AND ECONOMIC ANALYSIS TO YEAR 2080 (Feb. 2007).

²⁵ FINAL ASSESSMENT AND STRATEGIES, *supra* note 6, at 8.

²⁶ *Id.* at 32.

²⁷ These estimates for Florida are the mid-to-high range of a number of estimates of shoreline recession for Florida assembled in ROBERT E. DEYLE, *ET AL.*, ADAPTIVE RESPONSE PLANNING TO SEA LEVEL RISE IN FLORIDA AND IMPLICATIONS FOR COMPREHENSIVE AND PUBLIC-FACILITIES PLANNING (Sept. 1, 2007).

²⁸ IPCC, *supra* note 24, table SPM 1. This amounts to about .59 to 1.9 feet, or approximately 7 to 23 inches.

²⁹ *U.N. Report Describes Risks of Inaction on Climate Change*, NY TIMES, Nov. 17, 2007. While the IPCC report does discuss the Greenland ice sheet, the report acknowledges it relies on "current" models. IPCC, *supra* note 24, at § 3.2.3. The "current" models, however, do not correspond to more recent observations on the increased rate of ice melt. *Id.* at § 5.2. Estimates of the impact of the melting of the Antarctic and Greenland ice sheets on ocean levels vary dramatically. One researcher estimates the impact as high as eighty meters of sea level rise. E. LYNN USERY, MODELING SEA-LEVEL RISE EFFECTS ON POPULATION USING GLOBAL ELEVATION AND LAND-COVER DATA, available at <http://cegis.usgs.gov/pdf/aag-2007.pdf>.

temperature by 2030 instead of the IPCC's modest estimate of one to four degrees by the end of this century.³⁰ Third, the estimates provided by the IPCC do not include the effects of carbon-climate cycle feedbacks,³¹ and the effects of these feedbacks vary greatly in different climate models. In any case, the 2007 IPCC estimates of sea level rise are regarded as too low by many scientists, but higher numbers were not used because of on-going uncertainties of how much more sea level will rise due to carbon-cycle feedback effects, increased CO₂, and ice sheets melting faster than anticipated. In addition, some scientists have done calculations asserting that even the higher numbers cited in the IPCC report are far too conservative.³² As these numbers are already quite conservative, this paper will take the upper end of the IPCC projections (1.9 feet) as its estimate of sea level rise. Using two feet of sea-level rise (approximately the IPCC prediction for the next 90 years) at the assumed recession rates of 500 to 1,000 would result in approximately 1,000 to 2,000 feet, or almost 2/10 of a mile to more than 1/3 of a mile of beach recession if beaches are allowed to move naturally.

Experts know, however, that SLR will not occur uniformly over the entire globe. Multiple local factors can influence relative SLR. Predictions for various areas of Florida have been developed as illustrated by the following table.

Location	2025	2030	2050	2080	2100	2200
Florida, generally ³³					10.4" (90%)	21" (90%)
					19.8" (50%)	44.2" (50%)
					15" ³⁴	
Monroe County ³⁵		0.0845 m		0.310 m		
Escambia County ³⁶		0.0887 m		0.343 m		
Dade County ³⁷		0.0845 m		0.310 m		
Dixie County ³⁸		0.0714 m		0.275 m		
Duval County ³⁹		0.0730 m		0.254 m		
Wakulla County ⁴⁰		0.0827 m		0.310 m		
Treasure Coast Region ⁴¹ (Indian River, St. Lucie County, Martin County, & Palm Beach County)	2.8" (90%)		5" (90%)		10.4" (90%)	53" (90%)

³⁰ U.N. Report Describes Risks of Inaction on Climate Change, NY TIMES, Nov. 17, 2007.

³¹ IPCC, *supra* note 24.

³² See, e.g., ROBERT E. DEYLE, KATHERINE C. BAILEY, & ANTHONY MATHENY, ADAPTIVE RESPONSE PLANNING TO SEA LEVEL RISE IN FLORIDA AND IMPLICATIONS FOR COMPREHENSIVE AND PUBLIC-FACILITIES PLANNING 8 (2007) (citing to the work of scientist Stefan Rahmstorf, who asserts that accounting for the uncertainties not included in the IPCC report conclusions would add more than 1 foot of sea level rise to IPCC estimates and that it cannot be ruled out that oceans could rise as much as 4.6 feet by 2100); *Id.* at 9 (citing to Hansen's critique that ice sheet melting is non-linear and increasing, meaning that past observations of sea level rise inherently underestimate future trends and suggesting that, while impossible to accurately predict, sea level could rise by as much as 16.5 feet by 2100). The Miami-Dade County Climate Change Advisory Task Force's scientific assessment was that the IPCC's estimates of sea-level rise were "alarmingly conservative." MIAMI-DADE COUNTY CLIMATE CHANGE ADVISORY TASK FORCE, SECOND REPORT AND INITIAL RECOMMENDATIONS, APPENDIX 1 (Apr. 22, 2008).

³³ Jeremy Cox, *Environmentalists Concerned State Lawmakers not Taking Threat of Sea-Level Rise Serious Enough*, NAPLES DAILY NEWS, Jan. 29, 2006.

³⁴ Union of Concerned Scientists, http://www.ucsusa.org/gulf/gcstateflo_cli.html.

³⁵ Harrington and Walton, *supra* note 25.

³⁶ *Id.*

³⁷ *Id.*

³⁸ *Id.*

³⁹ *Id.*

⁴⁰ *Id.*

⁴¹ TREASURE COAST REGIONAL PLANNING COUNCIL, SEA LEVEL RISE IN THE TREASURE COAST REGION, 4 (2005).

D. Causes of Erosion: Armoring

Florida has a long history of confronting shoreline migration where permanent structures have been built near the beach.⁴² Early confrontations led to armoring,⁴³ often resulting in loss of the beach, its ecosystem and the human values associated with the beach.

Armoring beaches exacerbates erosion.⁴⁴ Many Coastal Construction Control Line (CCCL) permit files contain analysis that acknowledges that armoring contributes to erosion on adjacent, non-armored property.⁴⁵ In fact, in many instances, part of the justification for armoring on one property is the erosive effect of neighboring armoring.⁴⁶ In some more recent permits, the DEP and the Bureau of Beaches and Coastal Systems (BBCS) have taken a new approach: assume no adverse impacts to neighboring property from armoring-induced erosion if the return walls for the armoring are five feet or more from the adjacent property.⁴⁷

How does Florida address the various causes of shoreline migration? What is the legal framework for addressing erosion and beach construction? This article discusses these questions in the context of the long-term effect of the state's permitting program for construction of major habitable structures⁴⁸ and armoring⁴⁹ on Florida's beaches.⁵⁰ The article first briefly reviews beach nourishment and Florida Beach Management Policy generally before examining the process for permitting construction along Florida's beaches, including a description of the program, examples of problems, trends identified in permitting, and suggestions for reform in the program that respond to the realities of shoreline migration, decreasing sand supply, increasing costs of nourishment, and sea-level rise. Due to limitations on the scope of this article, conspicuously absent is any discussion of Fifth Amendment takings law or Florida's statutory taking law.⁵¹

⁴² For example, construction on Ft. Clinch began in 1843. By 1886 groins were constructed to arrest shoreline migration. Three subsequent major sets of shoreline protection structures have been built to protect the fort, as well as a beach nourishment project in 2001. DAVID M. BUSH, *ET AL.*, *LIVING WITH FLORIDA'S ATLANTIC BEACHES: COASTAL HAZARDS FROM AMEILA ISLAND TO KEY WEST 1-2* (Duke University Press 2004).

⁴³ Armoring is defined as "a manmade structure designed to either prevent erosion of the upland property or protect eligible structures from the effects of coastal wave and current action. Armoring includes certain rigid coastal structures such as geotextile bags or tubes, seawalls, revetments, bulkheads, retaining walls, or similar structures but does not include jetties, groins, or other construction whose purpose is to add sand to the beach and dune system, alter the natural coastal currents, or stabilize the mouths of inlets." FLA. ADMIN. CODE r. 62B-33.002(5).

⁴⁴ See, e.g., paragraph 11, DEP Final Order IN RE: Petition for variance from or waiver of Rules 62B-33.002(32), 62B-33.0051(1)(a), 62B-33.0051(1)(a)2, and 62B-33.0051(1)(d), Florida Administrative Code, by Thomas G. Tomasello, P.A., on behalf of Gary L. and Caren L. Marder, and Janina Radtke in Palm Beach County; File Number PB-787 (Variance); Memo to Permit file VO-1018 AR (October 10, 2005). To oversimplify, armoring exacerbates erosion for two reasons. First, armoring locks up sand behind it, keeping sand from the dunes from sloughing down and becoming part of the active movement of sand on the beach. Since the system cannot get sand from behind the armoring, the system needs to take more sand from someplace else. Second, during a significant erosion event, much sand that is carried offshore is eventually redeposited on the beach through natural processes, but armoring can interfere with this process and prevent sand from naturally accumulating again on the beach.

⁴⁵ See, e.g., Analysis of Impacts, FDEP Permit File No. FR-816 AR ATF; Analysis of Impacts, §§ II, III.B.3, FDEP Permit File No. CH-531 AR.

⁴⁶ See, e.g. Analysis of Impacts § IV, FDEP Permit No. FR-816 AR ATF

⁴⁷ See, e.g. Analysis of Impacts § IV.B, FDEP Permit No. WL 925 AR M1.

⁴⁸ FLA. ADMIN. CODE r. 68B-33.002(59)(c).

⁴⁹ *Id.* r. 68B-33.002(5).

⁵⁰ Other than beach nourishment, this analysis excludes discussion of construction below the mean high water line. Construction below mean high water that is primarily intended for shoreline protection requires a permit pursuant to FLA. STAT. § 161.041.

⁵¹ Florida's statutory takings law is known as the Bert J. Harris, Jr., Private Property Rights Protection Act. *Id.* §§ 70.001-70.80.

II. Florida Coastal Management Policy

A. Introduction and Statutory Basis for Beach Management

Three causes of beach migration have been identified: inlets, wave action/storms, and SLR.⁵² The available responses to beach migration usually are considered to include no action, protection (through armoring and nourishment), and relocation away from the shoreline. The no-action alternative has very seldom been used in Florida as it results in human development falling into the sea – a lose/lose situation both for the property owner and the beach-dune system that is then littered with the remains. Protection through armoring has been successful in protecting human structures in many instances, but continued shoreline migration up to the armoring leads to loss of the beach, its ecosystem functions, and human benefits such as tourism. Foreseeable loss of the beach due to armoring also may represent a failure of the State of Florida to fulfill its duty to protect the public's interest in the beach via the public trust doctrine. Furthermore, loss of beaches would have severe economic consequences for Florida because of reduced tourism. Relocation of development away from the shoreline would avoid loss of the beach and protect species and ecosystems dependent on the beach, but this strategy has only rarely been used in Florida. Property owners often feel that any failure of state or local government to provide them with some sort of protection from migrating shores is unfair. Thus, beach nourishment has emerged as Florida's default policy for beach management because it offers protection to property, wildlife habitat, and the recreational value of beaches.

Florida statutes declare that it is “a necessary governmental responsibility to properly manage and protect Florida beaches fronting on the Atlantic Ocean, Gulf of Mexico, and Straits of Florida from erosion,” including erosion caused by improvement, modification, or alteration of inlets.⁵³ Florida's Department of Environmental Protection (FDEP) acts as Florida's beach and shore preservation authority⁵⁴ through the Beach Erosion Control Program. The program has developed a long-range management plan for Florida's beaches.⁵⁵

The plan implements active management strategies such as beach and dune restoration and nourishment, feeder beaches, inlet sand bypassing, and other actions to mitigate effects of erosion. Currently about half of Florida's 391.5 miles of critically eroded beaches are under active management.⁵⁶ An increasingly significant portion of the strategic beach management plan focuses on the sand supply for beach nourishment.⁵⁷ The plan also includes monitoring programs to evaluate management projects.⁵⁸

⁵² Florida's Department of Environmental Protection emphasizes the role of inlets in coastal erosion and minimizes the role of natural processes and other human construction. *See, e.g.*,

http://www.dep.state.fl.us/beaches/programs/bcherosn.htm#view_rules (“While some of this erosion is due to natural forces and imprudent coastal development, a significant amount of coastal erosion in Florida is directly attributable to the construction and maintenance of navigation inlets.”).

⁵³ FLA. STAT. § 161.088 (2007). Sections 161.088 – 161.211 govern beach nourishment and preservation activities. FDEP must also develop a multiyear repair and maintenance strategy which encourages regional approaches to ensure the geographic coordination and sequencing of prioritized projects, reduces equipment mobilization and demobilization costs; maximizes the infusion of beach-quality sand into the system; extends the life of beach nourishment projects and reduces the frequency of nourishment; and promotes inlet sand bypassing to replicate the natural flow of sand interrupted by improved, modified, or altered inlets and ports. *Id.* § 161.091(2)(a)-(e).

⁵⁴ *Id.* § 161.101(2).

⁵⁵ The long-range management plan is in various documents divided up by regions of the state. They are available at <http://www.dep.state.fl.us/beaches/publications/gen-pub.htm>.

⁵⁶ *Id.*

⁵⁷ *Id.*

⁵⁸ *Id.*

While not the focus of this article, it is necessary to consider the rise of beach nourishment as the default policy response to beach migration since nourishment appears to contribute to further development in areas currently subject to beach migration and areas where beach migration is occurring and will occur with SLR. Even as nourishment enables at-risk development, nourishment itself faces increasing challenges.

B. *Nourishment: Dredging Up New Problems?*

With a total of 140 beach nourishment projects, Florida has conducted the largest number of beach nourishment projects of all Gulf and Atlantic states in the United States. Nourishment has become the dominant beach policy management of Florida since the 1980s.⁵⁹ Since then, nourishment has enjoyed substantial support from a broad array of interests. Recently, the wall of almost unanimous support for beach nourishment has begun to show cracks. Property owners whose property is being protected by beach nourishment have complained that nourishment violates their property rights,⁶⁰ and environmental interests have increasingly voiced concern about the environmental impacts of beach nourishment. Concerns exist for impacts to sea turtles directly⁶¹ as well as to marine ecosystems generally.⁶²

Nourishment has also been undermined by recent coastal storms in Florida. The 2004 and 2005 hurricanes both removed large amounts of nourished beach and gave rise to a flurry of nourishment activity. While some nourished beaches fared reasonably well, others were rapidly lost, leading to questions about the financial feasibility of such an approach. Financial issues with nourishment will only multiply as the energy costs for nourishment increase.

Federal, state, and local governments contribute to nourishment as well as private parties in some cases. The federal government is estimated to have contributed about \$680 million to nourishment in Florida through 2002, not including emergency funding after hurricanes for dune construction and not including the large amount of nourishment and federal funding provoked by the active hurricane seasons of 2004

⁵⁹ FLA. STAT. § 161.088.

⁶⁰ *Save Our Beaches v. FDEP*, 937 So.2d 1099 (Fla. Dist. Ct. App. 2006), review granted by *FDEP v. Save Our Beaches*, 937 So.2d 1099 (Fla. Sep 25, 2006).

⁶¹ Promotion of beach nourishment as a strategy to protect nesting habitat for sea turtles, C.R. LEBUFF & E.M. HAVERFIELD, NESTING SUCCESS OF THE LOGGERHEAD TURTLE (*CARETTA CARETTA*) ON CAPTIVA ISLAND, FLORIDA—A NOURISHED BEACH 69, in Proceedings of the Eleventh Annual Workshop on Sea Turtle Biology and Conservation (1992), available at <http://www.nmfs.noaa.gov/pr/pdfs/species/turtlesymposium1991.pdf>, has given way to the realization that nourishment initially causes a decrease in successful nesting. D. G. Rumbold *et al.*, *Estimating the Effect of Beach Nourishment on Caretta caretta (Loggerhead Sea Turtle) Nesting*, 9 RESTORATION ECOLOGY 304 (2001). Such results remain preferable, however, to a loss of habitat due to erosion if the beach is not allowed to migrate. KELLY A. BROCK, EFFECTS OF A SHORE PROTECTION PROJECT ON LOGGERHEAD AND GREEN TURTLE NESTING ACTIVITY AND REPRODUCTION IN BREVARD COUNTY, Florida. M.S. Thesis, University of Central Florida, Orlando, Florida (2005). Dredging may impact the sea turtles' marine habitat, and it can also kill sea turtles by sucking them into the dredging equipment. In 2006 and 2007, the United States Army Corps of Engineers documented take of seventy-two sea turtles by dredging operations. See United State Army Corps of Engineers, Total Turtle Takes by Calendar Year, available at <http://el.erdc.usace.army.mil/seaturtles/takes.cfm?Type=Calendar>.

⁶² Over 325 species of invertebrates alone have been identified on nearshore reefs buried by nourishment projects, in addition to the numerous star corals, fire corals, and other species commonly buried by the dumped fill that is nourishment. BUSH, *supra* note 43, at 109. Nearshore and onshore plants are also impacted by nourishment projects. For example, a 1987 nourishment project at Key Biscayne directly buried more than twenty acres of seagrass beds. These direct effects have the potential to alter many components of primary or secondary production, which in turn may result in potentially significant changes at higher levels of the food chain. For example, one study found a roughly 85%, 97%, and 86% drop in the number of species, the mean abundances of species, and species per transect respectively after the burial caused by a nourishment project. Kenyon C. Lindeman & David B. Snyder, *Nearshore Hardbottom Fishes of Southeast Florida and Effects of Habitat Burial Caused by Dredging*, FISH. BULL. 97: 508-525 (1999), available at <http://fishbull.noaa.gov/09lindem.pdf>.

and 2005.⁶³ “Through the fiscal year 2006, over \$582 million has been appropriated by the [Florida] Legislature for beach erosion control activities and hurricane recovery.”⁶⁴ Local governments also spend considerable funds for beach nourishment,⁶⁵ and even private parties spend substantial funds trying to keep sand on the beach.⁶⁶ Even assuming available energy and funding for nourishment, Florida is running short of sand. South Florida has run out of readily available sources of beach-quality sand, giving rise to talk of going as far as the Bahamas in search of sand.⁶⁷

Making matters yet worse, shoreline migration affecting human structures will only increase in the coming years as the rate of SLR increases in response to global warming. Arguably no “solutions” to SLR exist, only differing management options. While many commentators have made valuable suggestions on options for managing the conflict between migrating shorelines caused by rising seas and human development, the best option from an economic and environmental perspective is to avoid the conflict by not placing human development in the way of migrating beaches. If development is placed in the way of migrating beaches, such development should have the technical, legal, and financial ability to move back from the migrating beach.

For much of Florida it is already too late to avoid the conflict between development and migrating shorelines. This article suggests that even as we develop strategies to manage such conflicts, we must urgently seek to avoid incurring tremendous additional costs and losses inherent in such conflict by acting now to preserve areas where allowing shoreline migration is most reasonable. While local governments may be the best poised to make difficult, site-specific decisions addressing the conflicts between development and beach migration, they may lack the resources and political will to act, in part because local governments use new development to expand their ad valorem tax base.⁶⁸

Local-level impediments to action dictate looking to the State for leadership and guidance in preservation of areas where shorelines may naturally migrate. Unfortunately, Florida’s regulatory system for coastal construction continues to allow rapid development in coastal areas. Private and public investment in infrastructure, new development in undeveloped areas, and increases in the density of existing development all continue to erode the reasonable management options for future responses to beach migration and SLR. For example, current and near-future development patterns and approvals often determine whether beaches that might have been allowed to migrate naturally at a lesser cost will instead

⁶³ COASTAL SERVICES CENTER, NATIONAL OCEANOGRAPHIC HISTORICAL EXPENDITURES FOR BEACH NOURISHMENT PROJECTS: GEOGRAPHICAL DISTRIBUTION OF PROJECTS AND SOURCES OF FUNDING, Figure 3.

⁶⁴ www.dep.state.fl.us/beaches/programs/bcherosn.htm.

⁶⁵ For example, Gulf County will contribute almost \$12 million for the St. Joseph Peninsula Beach Restoration Project, and the State of Florida will contribute almost \$13 million. (Information on file with author). Lee County estimated total beach nourishment costs for a ten-year period to be \$73,996,437, of which the state would directly pay \$26,249,414, the federal government would pay \$12,056,466, a local bed tax would pay \$18,056,625, and property owners would pay \$17,633,931.

www.leevcb.com/shore/Erosion_Control_Budget_Plan_updated_August05.pdf.

⁶⁶ For example, the owner of a small hotel in Brevard County said that she spent \$40,000 on trucking in sand after the 2004 and 2005 hurricanes but that the sand rapidly disappeared. Jim Waymer, *On the Edge: As Ocean Creeps Near, Residents are Left in Tight Spot*, FLORIDA TODAY, Oct. 6, 2007 at A1. Similarly, a property owner in St. Johns County is reported to have spent \$47,000 on sand that washed away within two weeks. Christina Abel, *Seawall Waivers Granted to 5 Beach Homeowners*, TIMES-UNION (electronic addition), (April 12, 2008) available at http://www.jacksonville.com/tu-online/stories/041208/met_267694953.shtml.

⁶⁷ See, e.g. Amy Green, *Would It Still Be Miami Beach With Foreign Sand?*, CHRISTIAN SCIENCE MONITOR, (May 16, 2007). Also in 2007, the Florida Legislature acknowledged that “beach-quality sand for the nourishment of the state’s critically eroded beaches is an exhaustible resource” FLA. STAT. § 161.44 (2007).

⁶⁸ Cf. JUSTIN R. PIDOT, GEORGETOWN ENVIRONMENTAL LAW & POLICY INSTITUTE, COASTAL DISASTER INSURANCE IN THE ERA OF GLOBAL WARMING: THE CASE FOR RELYING ON THE PRIVATE MARKET, 35-37 (2007).

need to be protected at far greater cost.⁶⁹ Florida's statewide process for permitting construction near beaches should be modified to serve as an immediate first line of defense in maintaining an array of options for responding to SLR and concomitant shoreline migration.

Despite increasing recognition of its problems and limitations, beach nourishment remains Florida's reaction to coastal migration. Many factors gathering on the horizon may come together to limit the future usefulness of nourishment as a way to satisfy the desire for both a dynamic beach and coastal development next to the beach. Thus, it behooves us to maintain maximum management options for addressing beach migration and SLR by minimizing new development near the beach.

III. The Coastal Construction Control Line Program: Determining the Long-Term Fate of Florida's Beaches

A. Overview of Statutory Provisions

In 1965 Florida passed the Beach and Shore Preservation Act (BSPA) in recognition of the importance of Florida's beaches to the state's economy and ecology. Regulation under the BSPA⁷⁰ began in 1970 with establishment of a 50-foot setback line for construction on the state's sandy beaches. In 1971, the Florida Legislature created the coastal construction setback line (CCSL),⁷¹ which in 1978 was altered to become the coastal construction control line (CCCL). While the CCSL had been a line seaward of which construction was prohibited, the CCCL does not prohibit construction seaward of the line but does subject such construction to additional regulation of siting and design.⁷² In 1985, the Florida Legislature again added a setback line for areas with an established CCCL. This line is the 30-year erosion projection (30-yr. EPL).⁷³ The 30-yr. EPL prohibits construction of major habitable structures seaward of the line, with the notable exception of single-family homes under some circumstances.

The CCCL program, with significant changes, continues today. The stated purpose of the CCCL program is "to preserve and protect [Florida's beaches] from imprudent construction which can jeopardize the stability of the beach-dune system, accelerate erosion, provide inadequate protection to upland structures, endanger adjacent properties, or interfere with public beach access."⁷⁴ The CCCL program is administered by the BBCS.

The CCCL program states that no one "shall construct any structure whatsoever seaward [of the CCCL]; make any excavation, remove any beach material, or otherwise alter existing ground elevations; drive any vehicle on, over, or across any sand dune; or damage or cause to be damaged such sand dune or the vegetation growing thereon seaward thereof" except with a permit or pursuant to an exemption in the CCCL program.⁷⁵ CCCLs are established on a county basis along the sandy beaches of the state.⁷⁶ While the CCCL regulatory program does regulate construction of any structure in the CCCL zone, the focus in

⁶⁹ East Central Florida Regional Planning Council, *supra* note 82, at 56 (noting that timely planning will make adjustment to sea-level rise less costly).

⁷⁰ FLA. STAT., ch. 161, Parts I and II (§§ 161.011-.45).

⁷¹ FLA. STAT. § 161.053 (1971).

⁷² *See, e.g.* BUREAU OF BEACHES AND COASTAL SYSTEMS, FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION, THE HOMEOWNER'S GUIDE TO THE COASTAL CONSTRUCTION CONTROL LINE PROGRAM 2 (Feb. 2006).

⁷³ 1985 FLA. LAWS ch. 85-55.

⁷⁴ FLA. STAT. § 161.053.

⁷⁵ *Id.* § 161.053(2)(a).

⁷⁶ *Id.* § 161.053(1)(a). Sandy beaches in counties that do not have an established CCCL continue to use the 50 foot setback line established by § 161.052. *Id.* § 161.053(11).

this review is on major habitable structures⁷⁷ and coastal armoring structures⁷⁸ as these are the structures that have the greatest direct effect on beach management options in the face of shoreline migration.⁷⁹

The CCCL demarcates the extent of “the beach-dune system subject to severe fluctuations based on a 100-year storm surge, storm waves, or other predictable weather conditions.”⁸⁰ Construction seaward of the CCCL requires special siting and design considerations as established by statute and rule. The substantive standard by which to measure the effect of the potential impacts for issuance of permits is not very clear. Statutes require that the evidence, in DEP’s opinion, “clearly justif[ies]” the requested permit.⁸¹ DEP should examine whether the proposed activity will “ensure the protection of the beach-dune system, proposed or existing structures, and adjacent properties and the preservation of public beach access.”⁸² If adjacent structures have established a reasonably continuous and uniform construction line closer to mean high water than consideration of the above criteria might permit, and such structures have not been unduly affected by erosion, a permit may issue to construct up to the line of construction. A permit may limit the nature, timing, and sequence of construction to protect sea turtles, native salt-resistant vegetation, and endangered plant communities. If the evidence presented does not clearly justify the permit under these standards, the permit should not be issued.

The 30-yr. EPL prohibits construction seaward of the 30-yr. EPL except for shore protection structures, piers, other minor structures, intake/discharge structures, or certain single-family homes.⁸³ The 30-yr. EPL represents the line, based on site-specific historical trends and topography, of where the mean high water line will be in thirty years. The 30-yr. EPL does not account for likely future movements of the beach due to SLR, thus sometimes resulting in a determination that the 30-yr. EPL is at the current water line.⁸⁴

The state’s policy on rigid coastal armoring specifies that armoring permits may be granted to protect private structures or public infrastructure vulnerable to frequent coastal storms, to close gaps of less than 250 feet in existing armoring, and for use of geotextile tubes in dune reconstruction. This section also grants local governments the authority to install or permit temporary, emergency armoring. Armoring below the mean high water line is subject to the provisions of § 161.041, which requires a permit for such construction⁸⁵ and allows issuance upon consideration of engineering data related to shoreline stability and stormtides, design features of the proposed structure, and the potential impacts of the proposed structure. Armoring above the mean high water line is subject to § 161.053, which allows for issuance of permits after consideration of a virtually identical list of factors.

⁷⁷ These include structures such as houses, condominiums, multi-family dwellings, restaurants, and hotels. FLA. ADMIN. CODE r. 62B-33.002(59)(c)1.

⁷⁸ Coastal armoring includes revetments, bulkheads, seawalls, and geotextile tubes.

⁷⁹ Development of infrastructure such as roads and sewer lines also contribute significantly to the demand for and growth in major habitable structures.

⁸⁰ FLA. STAT. § 161.053(1)(a).

⁸¹ *Id.* § 161.053(5)(a)(3).

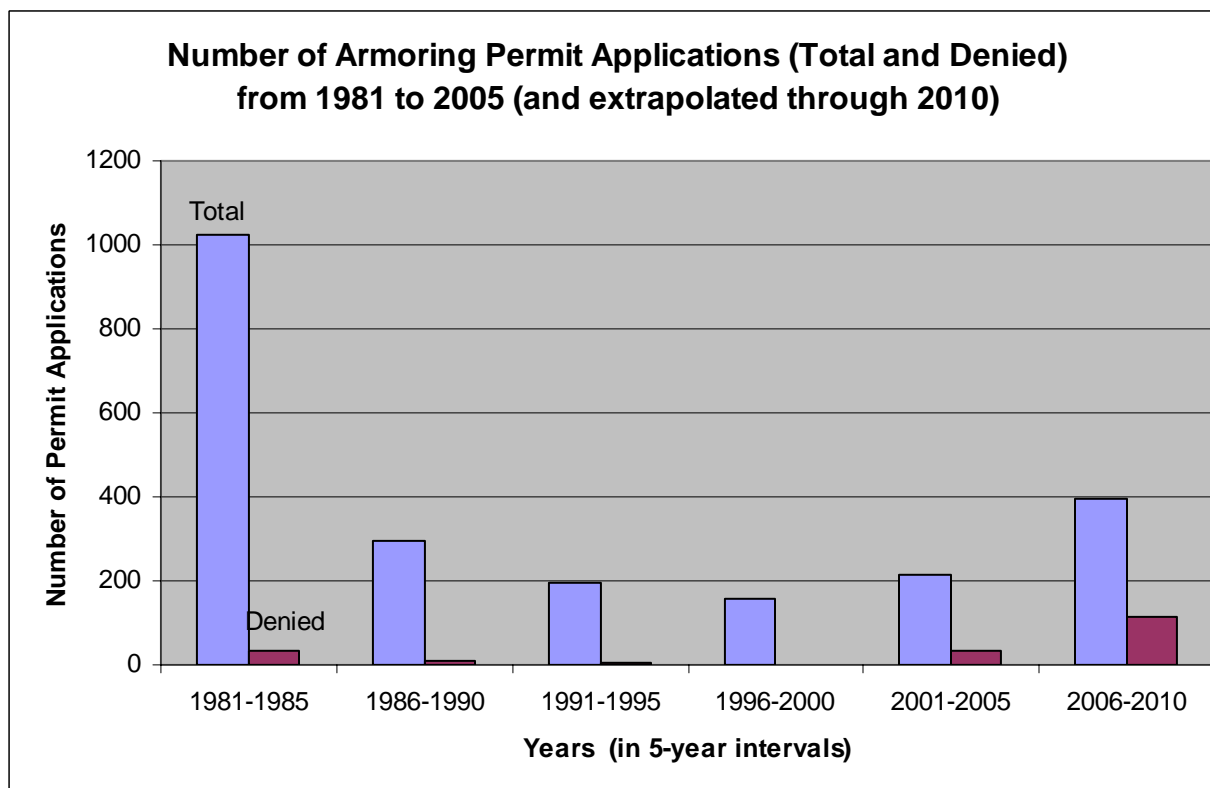
⁸² *Id.* § 161.053(1)(a). The substantive standard applied by DEP in its permitting review is “no significant adverse impact.” FLA. ADMIN. CODE r. 62B-33.005(3)(a) (“After reviewing all information required pursuant to this rule chapter, the Department shall: Deny any application for an activity which either individually or cumulatively would result in a significant adverse impact including potential cumulative effects.”).

⁸³ FLA. STAT. § 161.053(6).

⁸⁴ *See, e.g.*, FDEP memorandum to FDEP Permit File No. ST-1137 from S. Muthuswamy, Ph.D. (Dec. 16, 1996).

⁸⁵ FLA. STAT. § 161.041(1). Beach nourishment projects are also permitted under § 161.041.

B. Trends in CCCL Permitting



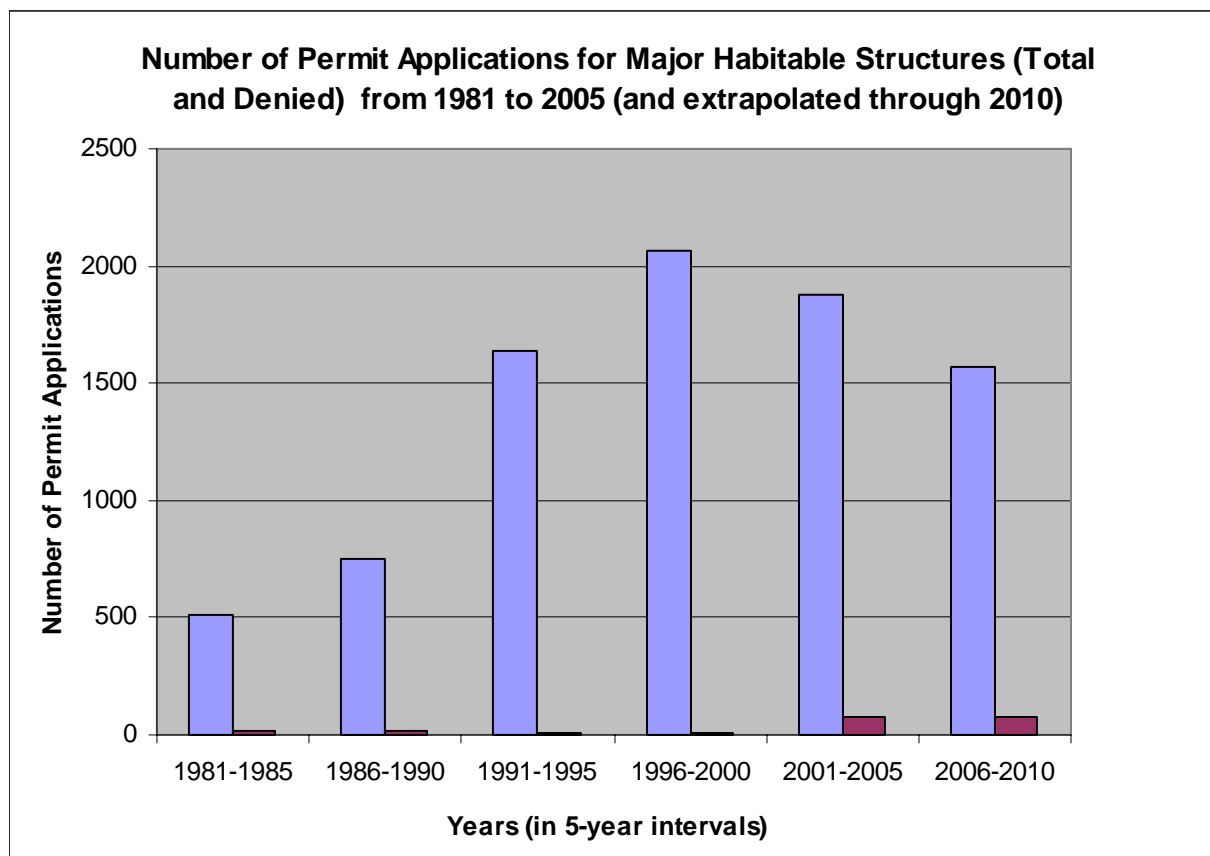
The permitting of armoring structures along Florida beaches declined dramatically after 1985 as illustrated by the above table.⁸⁶ Much of the decrease is likely due to the new emphasis on beach nourishment coupled with changes to the permitting criteria. An increase in permit applications that began in the 2001-2005 period and continued into 2006-2007 will lead to almost a doubling of issued permits from the 1996-2000 low if the current trend continues through 2010. A large part of this increase in permit applications and denials stems from the very active 2004 and 2005 hurricane seasons and much of the activity is centered in Walton County in Florida's panhandle.⁸⁷ The situation in Walton County, Florida receives further consideration below in the context of emergency permitting of armoring.

Even as the total number of armoring permits around the state has decreased, the average length of armoring requested in each permit application has increased. During the 1981-1985 period, the average length of new armoring granted per issued permit was 176.1 feet. During the initial twenty-one months of the 2006-2010 period, the average length of new armoring granted per permit issued was 269.2 feet,

⁸⁶ Extrapolations were completed through 2010 using permit information from the first twenty-one months of the 2006-2010 period and the following ratio: $[(21 \text{ months}/60 \text{ months}) \times \text{Unknown}/(\text{Total \# of applications in first 21 months of 2006-2007})]$. While this chart only shows total applications and denied permits, research demonstrated that it has historically been quite accurate to assume virtually all permits that were not denied were issued. Beginning in 2005 this has begun to change somewhat with the increase in permits in "waived" status for long or indefinite periods. See discussion in Part IV.C, *infra*.

⁸⁷ This research used final orders of FDEP as its source of information. Two factors contribute to armoring constructed in response to 2004 and 2005 hurricane seasons being included in the 2006-2010 timeframe. First, those that armored under local government permits issued in response to emergency conditions in 2004 and 2005 have a window during which to file for state permits. Second, final orders in response to a permit application sometimes issue long after the permit application was filed.

meaning that today's average armoring permit allows more than 50% more linear feet of armoring than the average permit in 1981-1985. The increasing length of armoring per permit is in part a function of multiple property owners applying for a single armoring permit.



The trend for permits for major habitable dwellings is virtually the inverse of the pattern for armoring. Permits consistently and dramatically increased from 1981 to 2000. From 2001 to the present they have been decreasing. The reasons for the increase and decrease are not clear. Current state regulations prohibit the issuance of armoring permits for major habitable structures permitted after 1985.

C. *Key Provisions and Issues in CCCL Permitting*

Issuance or denial of permits occurs largely on the basis of a limited number of statutory and regulatory provisions. Some of these key provisions, problems with them, and suggestions for reform are discussed below.

1. **Construction Landward of Existing Armoring**

Section 161.053(2)(b) provides an exemption from certain siting and design criteria for structures located landward of existing armoring. Structures may be built landward of existing armoring and seaward of the CCCL if the structure is sited to allow for maintenance of the armoring, located at or landward of the existing line of construction, is designed to comply with the windload requirements of the BSPA, and is sited and designed to protect marine turtles.⁸⁸

⁸⁸ It is hard to imagine how any siting requirements could help protect sea turtles from a structure behind armoring. Assuming that the armoring is exposed, the armoring itself may affect sea turtles because it may eliminate prime

This provision should be modified or eliminated. The exception may have its place before when little was known about SLR and its potential impacts. But now that we understand that SLR is occurring and is expected to *dramatically* increase in speed and magnitude, exempting major habitable structures landward of existing armoring from siting and design criteria makes no sense since it promotes development behind structures that will not, in light of SLR, be capable of offering the level of protection required by the exception. In addition, the increase in investment in coastal development makes it increasingly difficult to relocate development to preserve a dynamic beach.

2. Cumulative Impacts

Florida law specifies that cumulative impacts are to be considered in reviewing a permit application.⁸⁹ Unfortunately, consideration of cumulative impacts appears almost useless. As noted in a report required by the federal Coastal Zone Management Act,

Addressing the indirect consequences of individual projects has a limited effect on managing the broad-based environmental impacts commonly associated with accelerated growth and development and other significant land use changes.⁹⁰

Similarly, up until recently, “cumulative impacts” assessment had been of little value in protecting wetlands.⁹¹

3. “Line of construction”

The “line of construction” provision⁹² allows that if there is a “reasonably continuous and uniform line of construction closer to the mean high water than the foregoing. . .,” a proposed major habitable structure may be permitted along this line. The DEP has interpreted this to mean that, absent exceptional circumstances, applicants are entitled to a permit up to the line of construction.⁹³

DEP and the BBCS do not have any written policy on how to apply the line of construction provision or determine a “reasonably continuous and uniform” line.⁹⁴ Those familiar with the CCCL program indicate that it may be applied differently in different cases. Various officials involved in permitting indicate that a reasonably continuous and uniform line of construction can be established by a minimum of two structures: one structure on each side of the applicant’s lot. There is also some indication that structures farther away from the applicant’s lot and not even in line with adjacent structures might be used to establish a line of construction. Thus, uncertainty clouds how a “reasonably continuous and uniform line

nesting habitat and may cause increased “false crawls” in which a sea turtle fails to lay her eggs. The only design requirement that could help protect sea turtles in such a situation would be to eliminate lighting affecting the beach.

⁸⁹ FLA. STAT. §161.053(5)(a).

⁹⁰ FINAL ASSESSMENT AND STRATEGIES, *supra* note 6, at 38.

⁹¹ *Id.*

⁹² FLA. STAT. §161.053(5)(b). This provision only pertains to applications for major habitable structures such as houses, hotels, motels, and condominiums but does not affect armoring permits.

⁹³ FLA. ADMIN. CODE r. 62B-33.005(9) (“If in the immediate area a number of existing major structures have established a reasonably continuous and uniform construction line and if the existing structures have not been unduly affected by erosion, except [where the 30-year erosion projection applies], the Department **shall** issue a permit for the construction of a similar structure up to that line.” (emphasis added)). *Also cf.*, e.g., FDEP Permit No. ST-1653.

⁹⁴ One memo in BBCS files about a dispute over the line of construction emphasized that the line is a very subjective one. Memorandum to Gene Chalecki from Ken Erlick and Tom Tomasello, dated April 2, 2007, found in FDEP Permit File No. ST-1653.

of construction” is determined and questionable application may effectively be advancing the line of construction seaward and more immediately into the path of harm and beach migration.

The statute limits application of the line of construction provision to cases in which “the existing structures have not been unduly affected by erosion.”⁹⁵ “[U]nduly affected by erosion” has not been defined; conversations with various permitting officials resulted in conflicting opinions. One official maintained that the presence of armoring protecting adjacent structures indicated that they had been unduly affected by erosion; otherwise the structure would not have needed armoring. Another official opined that armoring, because it protects the adjacent structures, would indicate that the structures are not unduly affected by erosion. In making a permitting decision, this official would look at whether the proposed structure would be landward of the 30-year erosion projection line and whether the adjacent structures had received permits under the CCCL program. It seems axiomatic that the most seaward buildings on a developed beach, if the beach has been nourished by state funds based on erosion threats to upland development, should be considered to have been unduly affected by erosion.

Application of the line of construction provision in statute may effectively advance the line of construction in some cases. Furthermore, allowing construction up to the existing line of construction promotes increased investment and proportionally greater difficulty in adjusting to future movements of the beach-dune system. Building to the line of construction may make the difference between an area where policies of moving back from the migrating shoreline would be adopted and one where the beach will be entirely lost along with its habitat, ecosystem, and all the recreational, esthetic, and other benefits it provides.⁹⁶

Application of the line of construction provision should be eliminated or its use at least limited to the most densely developed areas which are already likely to be protected in the short-term. However, even in such instances, development should be conditioned on recordation of deed restrictions limiting rebuilding of the property and requiring removal of any structures that interfere with the dynamic beach. In addition, if the provision is not eliminated, the most seaward buildings on a developed beach nourished by state funds should be assumed to be unduly affected by erosion since a developed beach typically must be “critically eroding” to receive state funds.⁹⁷

4. Close the Gap

The so called “close-the-gap” provision states that FDEP may issue permits for armoring if the applicant seeks to armor an existing gap of less than 250 feet of shoreline in between existing armoring.⁹⁸

The “close-the-gap” provision is very important for various reasons. First, since armoring accelerates erosion, parcels located in between armoring structures are subject to greater erosive forces than if the armoring to each side did not exist. Second, the provision also appears to profoundly affect sea turtle nesting. Evidence indicates that the small, isolated beaches found in between existing armoring structures support a disproportionately large share of sea turtle nesting sites in heavily armored areas. Third, gap

⁹⁵ FLA. STAT. §161.053(5)(b).

⁹⁶ This has already happened in some areas. For example, Male, the capital island of the Maldives, had its beach eliminated entirely by a \$60 million armoring project. See Jon Hamilton, *Maldives Builds Barriers to Global Warming*, NATIONAL PUBLIC RADIO, Jan. 28, 2008, available at <http://www.npr.org/templates/story/story.php?storyId=18425626>.

⁹⁷ Cf., e.g. FLA. ADMIN. CODE r. 62B-36.003; 62B-36.006(1)(a)&(b). The only case in which this would not be true is when the critically-eroding status of the beach and the state-funded nourishment were based on threats to recreation, wildlife habitat, or important cultural resources that did not include buildings establishing the line of construction. See CRITICALLY ERODING BEACHES, *supra* note 16.

⁹⁸ FLA. STAT. §161.085(2)(c).

closing promotes increased investment that works against efforts to allow dynamic movement of the beach-dune system over the long-term. It does this by allowing major habitable structures to be built closer to the beach than they otherwise might have been, since once the gap is closed new major habitable structures may be built behind the armoring closer than they otherwise could have been to the beach.⁹⁹

The gap closure provision applies even when the sea walls creating the gap have no permits.¹⁰⁰ This raises the possibility that a gap might be the result of illegal armoring. Absence of a permit does not indicate that armoring is illegal as the armoring may predate Florida's permitting program for armoring. However, there is currently no method to assure that existing sea walls were legally constructed. Permitting officials expressed little concern about this today as they believe the large number of sea turtle advocates that now watch Florida beaches serve as an effective source of information for identifying current illegal construction activities. Nonetheless, permit applications are pending under the close-the-gap provisions where the armoring creating the gaps has applied for, but not received, a permanent permit for the armoring. In most of these cases, the "close-the-gap" applicant has waived their right to a timely permit decision while waiting to see if the neighboring armoring will receive permits. BBCS officials stated that they would not knowingly approve a close-the-gap permit where the gap was created by illegal armoring.

5. Protection of Public Access

Florida law dictates that construction of structures which limit public access shall be limited.¹⁰¹ According to BBCS officials, protection of public access only includes the immediate impacts on public access, not the future losses. Continued and increased SLR and limitations on nourishment will likely combine to destroy public access in the future as the result of permits being issued today. In addition to this failure to comply with the statutory requirement of limiting structures which limit public access, state permitting activities which lead to the long-term destruction of Florida's beaches arguably violate the State's fiduciary duty under the public trust doctrine to preserve the beach for the citizens of the state.

6. 30-yr. Erosion Projection Line (EPL)

The 30-yr. EPL is intended to prevent issuance of permits for non-shore-protection structures "proposed for a location which, based on . . . projections of erosion in the area, will be seaward of the seasonal high-water line within 30 years."¹⁰² The 30-yr. EPL may not include any areas landward of the CCCL,¹⁰³ is based on historic shoreline change,¹⁰⁴ and must consider existing beach nourishment projects or those projects for which funding has been secured and permits have issued.¹⁰⁵

Research into the 30-yr. EPL has been hampered by a lack of organized information on the 30-yr. EPL. The BBCS database does not allow for any searches related specifically to the 30-year erosion control line. The only method researchers had to gather information on the 30-year erosion control line was to contact BBCS and use a random sample of permits. Statutes require that DEP annually report to the Legislature on the status of the 30-yr. EPL,¹⁰⁶ but, for over twenty years, no such report has ever been written or submitted to the Legislature pursuant to this statutory requirement. In addition, only one

⁹⁹ See discussion in Part III.C.1, *supra* (discussing construction behind existing armoring).

¹⁰⁰ As an example of a close the gap permit issued where the adjacent sea walls had no permits, see DEP Permit No. PB-880 AR, memo from Perry Ponder.

¹⁰¹ FLA. STAT. § 161.053(5)(e).

¹⁰² *Id.* § 161.053(6)(b).

¹⁰³ *Id.*

¹⁰⁴ FLA. ADMIN. CODE r. 62B-33.024(2)(a)1.

¹⁰⁵ FLA. STAT. § 161.053(6)(d).

¹⁰⁶ *Id.* § 161.053(6)(e).

person, who also has other job responsibilities, is charged with creating and maintaining 30-yr. EPL estimates for all of Florida's beaches.

Even as the CCCL program's only setback line, the 30-yr. EPL fails to effectively protect the beach-dune system due to a number of inherent deficiencies. First, the planning horizon for the 30-yr. EPL is flawed. The line is based on estimates of erosion for the next thirty years. Since most buildings last much longer than 30 years (with some infrastructure assumed to last up to 100 years), it unclear why the Legislature chose this timeframe to serve as a measurement of a safe distance from the seasonal high water line.

Second, the 30-yr. EPL requires putting a structure behind where the seasonal high water line (SHWL) will be in 30 years.¹⁰⁷ This fails to protect the dynamic beach system since, even in the best-case scenario (i.e. accurate assessments of average erosion, no major storms, no recession due to sea level rise), a structure built behind the 30-yr. EPL will be at the SHWL in 30 years, meaning the structure will be forward of the primary dune and harming this critical portion of the beach-dune system. Dune systems provide sand storage for the coastal system, and failure to protect the long-term integrity of the dunes constitutes failure to protect the beach-dune system. The weakness of using the SHWL as a reference point is especially acute in the panhandle area of Florida where the beach profile leaves the SHWL so far out from the toe of the dune that even relatively high average annual erosion rates multiplied by 30 years would still place the 30-yr. EPL at or seaward of the dune bluff. Thus, the 30-yr. EPL offers no beach-dune protection in such a situation. In addition, structures located on the active beach have no protection from coastal storms.

Third, the eight possible methods for calculating the 30-yr. EPL listed in Florida's administrative code look only to "historical measurements."¹⁰⁸ Historical measurements do not effectively incorporate future changes due to SLR, creating a problem with the fundamental measuring stick of the 30-yr. EPL. Yet shoreline recession due to SLR could prove substantial in Florida, leading to loss of up to 1,000 to 2,000 feet of shoreline over the next 90 years.¹⁰⁹ Even breaking this down into 30-year periods would result in the 30-yr. EPL being located 333 to 666 feet landward of the current SHWL after 30 years. Yet, under current methodologies, the BCS may apply default erosion rates of 1 foot per year or even less if nourishment is occurring.¹¹⁰

Use of historical rates of erosion in an area may also not be accurate due to increased development and armoring in the area. If coastal development and armoring have increased, the erosion rate will also have increased as armoring contributes to erosion by locking up sand behind the armoring.

BBCS officials readily admitted that buildings permitted behind the 30-yr. EPL routinely suffer from erosion. Since the statutorily-required reports on the 30-yr. EPL have never been written, no resource listing instances of the failure of the 30-yr. EPL was available. Nonetheless, here are two representative examples of failure of the 30-yr. EPL to protect the beach and structures. First, FDEP Permit No. SJ-550, issued in 1996, allowed for construction of a residence at 3500 Coastal Highway A1A, Vilano Beach, St. Johns County, Florida. According to the property appraiser's website, the house was built in 2000. A nor-easter in early April of 2008 brought the beach escarpment to the edge of the house, and the owner applied for an emergency armoring permit and now has a permit application pending for a variance to the eligibility requirements for coastal armoring. All this only eight years after being built. Second, FDEP Permit No. GU-355, issued in 2002, allowed for construction of a house in Gulf County (in Florida's panhandle). Within four years of construction, coastal erosion had caused extensive damage under the

¹⁰⁷ The seasonal high water line is "the line formed by the intersection of the rising shore and the elevation of 150 percent of the local mean tidal range above local mean high water." FLA. STAT. § 161.053(6)(a)2.

¹⁰⁸ FLA. ADMIN. CODE r. 62b-33.024.

¹⁰⁹ See discussion on Part 1.C, *supra* (discussing SLR and shoreline recession).

¹¹⁰ FLA. ADMIN. CODE r. 62b-33.024(2)(d).

house, including damaging the septic system. The owner installed illegal armoring between pilings, but was forced to remove it.

The calculations of the 30-yr. EPL in areas being nourished deserve particular mention. The BBCS maintains very broad discretion in how nourishment gives credit to the 30-yr. EPL calculation.¹¹¹ In essence, nourishment allows the BBCS to move the 30-yr. EPL further seaward than it would otherwise be located.¹¹² BBCS officials currently give 50 years credit in the 30-yr. EPL calculation for federally-funded nourishment projects and state-funded projects usually receive around 10-15 years credit in the calculation.

Additionally, rules state if a pre-project erosion rate cannot be determined, the 30-yr. EPL shall be set along a “reasonably continuous and uniform line of construction that has shown to be not unduly affected by erosion.”¹¹³ The rules do not provide a definition of “unduly affected by erosion.” One would assume the definition of “unduly affected” would include areas so affected by erosion that they are in need of nourishment. However, since no definition is provided, and since this definition of “unduly affected” would prevent any use of this subsection, this is not the interpretation used by DEP.

As another weakness, the role storm events play in determining “the average annual shoreline change rate” has not been clearly determined. For example, no policy exists for how to incorporate into the 30-yr. EPL the fact that some areas may have lost dozens of feet of beaches during the 2004-05 hurricanes in Florida. Do such storm events qualify as “prevailing coastal processes acting on or likely to act on the site”?¹¹⁴ If they are deemed not to be, they “shall not be used”¹¹⁵ in calculation of the 30-yr. EPL, which would mean that the “average” erosion rate under the 30-yr. EPL would not include storms.

Finally, a significant exception to the 30-yr. EPL setback allows construction of a single-family home seaward of the 30-yr. EPL on certain parcels.¹¹⁶ This exception likely owes its existence to the U.S. Supreme Court case of *Lucas v. South Carolina Coastal Council*.¹¹⁷

Thus, the 30-yr. EPL fails to protect the beach-dune system from imprudent construction for the next 30 years in many cases, much less well into the future. The rules for the 30-yr. EPL should be modified to incorporate a much longer time frame and take into account the crucial importance of protecting the dune structure by siting structures behind the line of the projected location of a dune structure, if present, or a safe landward location instead of the seasonal high water line. The shoreline change rates should also account for SLR and should contain a “severe storm safety measure” on top of the average shoreline change rates to account for inevitable hurricanes and tropical storms.

7. Rebuild

¹¹¹ FLA. ADMIN. CODE r. 62b-33.024(2)(d)2.

¹¹² See, e.g. DEP document “30-Year Erosion Recommendations for St. Lucie County” (original document date 1/26/05) (in DEP Permit File No. SL-223).

¹¹³ FLA. ADMIN. CODE r.62B-33.024(2)(d)(4).

¹¹⁴ *Id.*

¹¹⁵ *Id.*

¹¹⁶ FLA. STAT. § 161.053(6)(c). To be eligible for this exemption, all the following criteria must be met: (1) The parcel must have been platted or subdivided by metes and bounds prior to 1985; (2) the owner of the parcel must not own another parcel which is adjacent and landward of the parcel where the proposed house would be located; (3) the proposed house must be landward of the frontal dune; and (4) the structure will be as far landward as practicable.

¹¹⁷ 505 U.S. 1003 (1992).

Florida law specifically addresses the rebuilding of existing structures.¹¹⁸ Rebuilt structures receive blanket exemptions from whatever limitations the 30-year erosion projection may have imposed on the location of a structure.

Policy on rebuilding of storm-damaged or simply old, out-dated structures has tremendous impact on the feasibility for more economically-rational and measured movement back from dynamic beaches. Rebuilding structures not only increases development investment in at-risk areas but also undermines the concept that buildings are allowed in an area based on assumptions about the structure's typical lifespan.

Current statutes provide that FDEP may issue permits to rebuild a structure "within the confines of the original foundation" or may permit "a more landward relocation or rebuilding of a damaged or existing structure if such relocation or rebuilding would not cause further harm to the beach-dune system. . . ."¹¹⁹ FDEP may not issue permits for "repairs or rebuilding that expand the capacity of the original structure seaward of the 30-year erosion projection."¹²⁰ In addition, when "reviewing applications for relocation or rebuilding, [FDEP] shall specifically consider changes in shoreline conditions, the availability of other relocation or rebuilding options, and the design adequacy of the project sought to be rebuilt."¹²¹

To the average reader the rebuild provisions appear to limit rebuilding to the confines of the original foundation of a structure, or, alternatively, to allow rebuilding or repair of the existing building at a more landward location. The ordinary observer might also think that such "repairing" or "rebuilding" would reflect the size and type of structure that was present before the need for "repairing" or "rebuilding" arose. Such is not the case.

In 2000, the Florida Legislature amended the Florida Building Code¹²² to make it uniform across the state.¹²³ The legislation also modified the BSPA to incorporate provisions on design and construction of structures into the Florida Building Code and gave authority to the Florida Building Commission to adopt rules to implement such provisions.¹²⁴ Prior to the 2002 changes, applicants for a CCCL permit needed to submit a form from a local building official who determined that the "rebuild" was not "substantial."¹²⁵ This limited what could be considered a "rebuild." After the effective date of the updated Florida Building Code, March 1, 2002, applicants no longer needed to supply a local government statement as to

¹¹⁸ FLA. STAT. § 161.053(13). This section provides that: Notwithstanding the coastal construction control requirements defined in subsection (1) or the [30-year] erosion projection determined pursuant to subsection (6), the department may, at its discretion, issue a permit for the repair or rebuilding within the confines of the original foundation of a major structure pursuant to the provisions of subsection (5). Alternatively, the department may also, at its discretion, issue a permit for a more landward relocation or rebuilding of a damaged or existing structure if such relocation or rebuilding would not cause further harm to the beach-dune system, and if, in the case of rebuilding, such rebuilding complies with the provisions of subsection (5), and otherwise complies with the provisions of this subsection.

¹¹⁹ *Id.*

¹²⁰ *Id.*

¹²¹ *Id.*

¹²² Florida Building Code (FLA. STAT. §§ 553.70 – 553.898)).

¹²³ 2000 Laws of Florida ch. 141.

¹²⁴ FLA. STAT. § 161.053(22).

¹²⁵ FLA. ADMIN. CODE r. 62B-33.008(4). Rule 62B-33.002(50) defined "rebuilding" as "a substantial improvement of the existing structure as defined in [FLA. STAT. §] 161.54." The long definition at § 161.54 includes more than just rebuilding, leading to an argument that the rule defining "rebuilding" is beyond the scope of the statute that includes rebuilding. In addition, the definition of "substantial improvement" excludes large parts of the actual costs of a substantial improvement as it excludes "nonstructural interior finishings. . . ."

whether the proposed construction is a substantial improvement if the application is to repair, rebuild, improve, or add to an existing structure.¹²⁶ Thus, rebuilding is not limited to work that is not “substantial.”

Removal of the “substantial” requirement for rebuilding has led to additional confusion, which is evident in the case of *Atlantis at Perdido Association v. Bobby L. Warner*.¹²⁷ In *Atlantis at Perdido*, the plaintiff applied for a “rebuild” permit to replace an existing one-story quadriplex and one-story duplex with a fifteen-unit, nine-story condominium. In addition to the new proposed project being substantially larger in surface area and square footage, it was also located more seaward and added a pool, concrete parking lot and other ancillary structures.¹²⁸ FDEP justified granting Permit No. ES-540 by arguing that the proposed project constituted a rebuilding of the existing structure, and thus held that it was not subject to CCCL requirements.¹²⁹ The administrative law judge rejected this argument and found that the proposed nine-story condominium, pool, deck, and parking lot constituted new development.¹³⁰

The *Atlantis at Perdido* case arguably reached the correct outcome in rejecting FDEP’s interpretation of “rebuild.” FDEP’s interpretation stood poised to allow almost any increase in size and density of existing coastal construction. While this would be a boon to coastal landowners in the short term, it would prove disastrous for efforts to protect dynamic beaches as sea turtle nesting habitat and adapt to changes due to SLR since every increase of density of coastal development leads to more future loss, leading to ever greater political pressure by powerful coastal property owners to use the public’s money – and coastal resources – for the protection of their private property. Thus, the first step in making rebuilding more rational is to establish that it cannot be used as a way to increase development and investment in areas already at danger from a moving beach.

Rebuilding should be limited to 50% of the value of the structure and should *always* be limited to the original foundation and type of structure unless being relocated landward. The state should identify a zone (based on erosion rates and/or proximity to the mean high water line or the landward toe of dune, when present) seaward of which rebuilding would simply be prohibited or allowed only once with a permit condition that the property must have a recorded deed restriction to this effect. If this policy is not implemented, a similar policy would be for the state and local governments to begin a project whereby they purchase the rebuild rights from properties.

IV. Problems with the CCCL Program

Several problems with the CCCL have already been addressed above in the context of specific provisions of the CCCL permitting program. This section addresses additional general and overarching issues with the CCCL program.

A. Administrative Problems

A fundamental problem in evaluating the effects of the CCCL program is the lack of clarity in the analysis that leads to permit decisions. Despite pages of statutes and rules, final agency action by FDEP usually consists of one long paragraph of boiler-plate language concluding that “the activities indicated in the project description of this permit are of such a nature that they will result in no significant adverse impacts to the beach/dune areas or to adjacent properties; that the work is not expected to adversely

¹²⁶ See FDEP Form 73-100 (Updated 12/06), available at http://www.floridadep.org/beaches/data/forms.htm#CCCL_App_Form.

¹²⁷ Case No. 1D05-4069, 31 Fla. L. Weekly D1827c (July 6, 2006).

¹²⁸ Respondents’ Proposed Recommended Order at 4-5, available at <http://www.doah.state.fl.us/docdoc/2005/000035/05000035RPRO-051705-08591259.PDF>.

¹²⁹ See generally Respondents’ Proposed Recommended Order at 15.

¹³⁰ Case No. 1D05-4069, Benton, J. at 11.

impact nesting sea turtles, their hatchlings, or their habitat; that the work is expendable in nature and/or is appropriately designed in accordance with Sections 62B-33.005, Florida Administrative Code; and that it is an activity or type of construction which the designee of the Chief of the Bureau of Beaches and Coastal Systems has authority to approve or deny.”

Under current BBCS practice, various and often-unspecified information is reviewed by a permit reviewer. Application files that involve an analysis of vulnerability of a structure typically contain the figures and statistics from the computer model used to ascertain vulnerability. Files also contain extensive information about engineering for structures. The area with the least information, however, is about the impact to the beach. In many permit files it is impossible to tell how the permit reviewer took into account different factors, such as the existing line of construction, to conclude that the proposed activity would result in no significant adverse impact to the beach-dune system. In many instances, permit files do not contain sufficient information to give an outside reviewer detailed information on the status of the site as of application (or prior status of the site in the case of “after-the-fact” permits), the impact to existing vegetation, the history of use of the site for sea turtle nesting, and larger development context for the area. Each of these usually has some limited amount of information available in the permit file, but BBCS lacks clear guidance and documentation procedures in its review process to create a traceable trail of the specific evidence used to determine compliance of the application with all applicable statutory and regulatory criteria. This lack of guidance makes it almost impossible in many instances to verify how the permit reviewer analyzed the proposed project.

BBCS should have a standardized format for review of each permit application wherein the reviewer first lists the evidence (including pictures, diagrams, plant surveys, etc.) that support a judgment as to which statutory and rule criteria should be applied. The permit reviewer should then be required to include all documentation and evidence considered in making a judgment on each relevant statutory or regulatory criterion. This would increase the size of permit files and would also require more careful organization of information and materials. At the same time, such a process would allow reasonably intelligent, informed individuals to review a permit application file and understand the application, the context of the proposed site, and how the final permit decision is reached. The current process is an opaque morass of limited documents in permit files which often leave a person reviewing the permit file with far more questions than answers about how permit decisions were reached.

B. Out of Date CCCLs

The calculation of the CCCL takes into account numerous factors, many of which change over time. Therefore, it is necessary to continually update the CCCL to maintain its purpose as a line of protection. Papers relied on by the FDEP state that the long-term erosion calculation included in the CCCL allows for an estimation of five years of long-term erosion.¹³¹ Therefore, the CCCL would need to be updated at least every five years to maintain the accuracy of the long-term erosion calculation. The CCCL that is not updated this often is drastically out-of-date.

Re-establishment of the CCCL is governed by FLA. STAT. §161.053(2)(a), which states:

Control lines established under the provisions of this section shall be subject to review at the discretion of the department after consideration of hydrographic and topographic data that indicate shorelines changes that render established coastal construction control lines to be ineffective for the purposes of this act or at the written request of officials of affected counties or municipalities.

¹³¹ CHIU, T.Y., AND R.G. DEAN, BEACHES AND SHORES RESOURCE CENTER, METHODOLOGY ON COASTAL CONSTRUCTION CONTROL LINE ESTABLISHMENT 70 (June 2002) *available at* <http://bcs.dep.state.fl.us/reports/method.pdf>.

This statute indicates that two events must occur before a CCCL will be changed: 1) consideration of the line is performed via a study revealing data that indicates need for a new line, or the municipality requests such consideration and 2) the department must decide to review the line for re-establishment. The impetus for either of these actions is not clear. Neither the statute nor the rules provide a timeline within which each CCCL must be reviewed, nor do they provide a timeline for studies that may indicate need for review. Currently, Gulf and Walton counties are in the process of re-establishing the CCCL, at the recommendation of the Governor's Coastal High Hazard Study Committee.

History Of The Reestablishment Of Coastal Construction Control Lines pursuant to Section 161.053, Florida Statutes:

COUNTY	FLORIDA ADMINISTRATIVE CODE	DATE RE-ESTABLISHED
Broward	62B-26.013	November 1981
Dade	62B-26.012	February 1982
Walton	62B-26.001	December 1982
Nassau	62B-26.005	April 1983
Franklin	62B-26.014	April 1984
Charlotte	62B-26.006	January 1985
Martin	62B-26.015	July 1985
Gulf	62B-26.016	February 1986
Escambia	62B-26.002	June 1986
Brevard	62B-26.017	December 1986
Indian River	62B-26.018	March 1987
Manatee	62B-26.008	August 1987
St. Johns	62B-26.019	January 1988
Flagler	62B-26.020	April 1988
St. Lucie	62B-26.021	September 1988
Sarasota	62B-26.009	January 1989
Collier	62B-26.022	June 1989
Volusia	62B-26.023	January 1991
Lee	62B-26.007	May 1991
Okaloosa	62B-26.003	December 1991
Duval	62B-26.004	July 1992
Bay	62B-26.024	February 1997
Palm Beach	62B-26.010	August 1997
Pinellas	62B-26.011	December 2001

Source: <http://www.dep.state.fl.us/beaches/publications/worddoc/reestabh.doc>

C. *Definitions of Eligibility*

Current regulations allow armoring for a structure vulnerable to erosion if the structure is “eligible,” meaning that it was *not* constructed pursuant to a CCCL permit after March 1985. As erosion rates in some areas push the beach ever closer to the CCCL, buildings constructed *behind* the CCCL can be threatened by erosion. Since such structures were built without a CCCL permit, they qualify as structures “eligible” for armoring. Assuming a scenario in which SLR leads to increased recession rates, the problem of relatively new structures without CCCL permits being armored looms large.

FDEP Permit File No. FR-878 AR ATF serves as an example of what the future holds when out-of-date and unrealistic CCCLs combine with shoreline migration and eligibility requirements. The structure, although right on a bluff overlooking the beach, was built *without* a CCCL permit in 1985 because it was behind the CCCL that had been established in Walton County in 1982. Thus, though the structure was built in 1985,¹³² it is “eligible” for armoring.¹³³



Picture of building at issue in file # FR-878 AR ATF

In addition to the problems associated with the definition of “eligibility,” more and more applications for armoring are beginning to seek variances to the definition of eligibility. Allowing variances to the need for eligibility would mean that the CCCL program serves little protective function to the beach-dune system as it first allows poor siting and then allows the landowner to armor to make up for the poor siting too close to the water. In addition, allowing armoring as a result of a variance to the definition of “eligible” will further promote the belief of property owners that the risk of erosion to coastal property must be borne by the public and the coastal system via a loss of public beach rather than by the coastal property owner via loss of the coastal property. Yet precisely this attitude must change if Florida is to move toward better coastal management.

D. Waiver of Permit Deadlines

A “waived” permit is one in which the applicant has waived the applicant’s right to have BBCS make a decision on the permit within the statutory timeframe of ninety days from the date the permit is deemed complete.¹³⁴ An applicant will often do this if BBCS has indicated it may deny the permit. The waiver gives the applicant time to amend the application, wait for changed circumstances, or take some action to encourage issuance of the permit. DEP in some instances recommends that staff initiate the waiver process with applicants.¹³⁵

In some cases waivers serve as mechanisms that allow a permit to remain pending and ultimately receive approval rather than being rejected. For example, in one case several permit applications to construct single-family homes were going to be denied because the homes would fall seaward of the 30-year erosion projection line and did not meet the criteria for the exceptions to this setback. The permit applicants waived the permit deadlines and supported a beach nourishment project in the area. After the nourishment project, DEP issued permits for the single-family homes based on the credits generated by the nourishment project and applied to the 30-yr. EPL.

¹³² Information from a real estate listing on the internet. The ad also states that “Beach restoration and additional white sand have been installed beach front to Palms of Dune Allen”

¹³³ FDEP Permit No. FR-878 AR ATF was denied by DEP on multiple grounds, including non-vulnerability of the structure according to DEP rules, “take” of sea-turtles through habitat modification, and failure of the armoring to comply with design standards in rule.

¹³⁴ Information in this section comes primarily from interviews with BBCS officials.

¹³⁵ BUREAU OF BEACHES AND COASTAL SYSTEMS, FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION, PROCEDURES MANUAL FOR PERMIT MANAGERS 25-26 (Sept. 2006).

As of August 15, 2007, there were seventy-eight waived permits. Forty-two appeared to be indefinite waivers with twenty-six of these in Walton County and all but six being after-the-fact (ATF) permits.¹³⁶

E. Political Problems

Coastal property in Florida carries tremendous value. High property values and the wealth of many coastal property owners often translate into political connections for those interested in building along Florida's coast. Such political clout can translate into the ability of some to get permits. During research, numerous individuals familiar with the CCCL program asserted that enough political pressure can result in the issuance of almost any permit.

The lack of clarity in how factors are weighed in making permit decisions may contribute significantly to the vulnerability of the permitting process to political influence. CCCL statutes and rules should be modified to clarify the standards and criteria and how they interact in making a determination of "no significant adverse impact." Modifications could include development of a matrix of different factors to consider for each permit. Each factor would be weighted and rated according to defined formulas with a minimum overall score necessary for issuance.¹³⁷ There is also the possibility of setting a lowest possible score on one or more factors.

F. Variances

Two statutes allow variances to the limitations on coastal construction.¹³⁸ These variances rely on the authority of state agencies to grant variances to their regulations when the purpose of the statute will be or has been achieved by other means and literal application of the rules would cause substantial hardship or would affect a particular person in a manner significantly different from that of other similarly situated persons subject to the rule.¹³⁹ A search of permits revealed nine variance applications as of late 2007.¹⁴⁰

Permit application WL 883 AR V gives an example of a variance request. The property owner was originally denied an after-the-fact permit for armoring constructed pursuant to a local government emergency armoring permit. The permit was denied for four reasons. The structure was not deemed "eligible" for armoring¹⁴¹ the structure was not considered vulnerable; the sea wall was not located as far landward as practicable; and construction of the sea wall constituted a "take" of marine sea turtles.¹⁴² The

¹³⁶ For example, one of the non-ATF waivers is file # CH-531 AR. This is a permit to fill the gap between existing armoring. DEP analysis indicates that adjacent armoring is exacerbating erosion, but the Florida Fish and Wildlife Conservation Commission concluded that the armoring would cause a "take" of sea turtles due to destruction of nesting habitat. The permit has been waived multiple times, with the most recent waiver effective until October 31, 2008.

¹³⁷ This could be modeled after the ranking system for beach management funding in the current Florida Administrative Code. See FLA. ADMIN. CODE r. 62B-36.006.

¹³⁸ FLA. STAT. § 120.542 (2007) (allowing variances to agency rules under certain circumstances); *Id.* § 161.052 (allowing for variances to the fifty-foot setback line under certain circumstances).

¹³⁹ *Id.* § 120.542.

¹⁴⁰ The permits were IR 522 V; LE 887 V; PB 787 AR V; OK 327 V; WL 822AR V (file has been listed as inactive and incomplete, thus "undetermined"); WL 831AR V (application complete yet indefinitely waived by bureau chief); WL 868AR V (application complete yet indefinitely waived by bureau chief); WL 872AR V (application complete yet indefinitely waived by bureau chief); and WL 883AR V.

¹⁴¹ In the case of a house, the structure is eligible if it is "non-conforming." FLA. ADMIN. CODE r. 62B-33.0051(1)(a)1. A non-conforming structure is "any major habitable structure which was not constructed pursuant to a permit issued by the Department [of Environmental Protection] pursuant to Section 161.052 or 161.053, F.S., on or after March 17, 1985." *Id.* r. 62B-33.002(43).

¹⁴² FDEP, Final Order for Permit Application WL-883 AR ATF (October 18, 2006).

variance application sought a variance to the “eligibility” criterion and argued that the structure is “vulnerable.”¹⁴³

As mentioned above, the variance could be granted upon a showing of hardship and that the purpose of the statute has been met. The variance petition argued that continued erosion without the sea wall would cause hardship because future erosion could:

- sever utilities to the structure, requiring expensive repairs,
- destroy air conditioning units
- destroy landscaping and a hot tub
- cause loss of use of the structure during repairs occasioned by erosion
- cause loss of part of the parcel

The applicant claimed further losses contributing to hardship, including the substantial cost for removal of the armoring and loss of the investment in installation of the armoring.¹⁴⁴ The applicant estimated that the total economic hardship due to these factors could rise to almost \$2.6 million. The applicant also asserted a “technological” hardship since removal of the unpermitted sea wall would make it difficult to retain sand under the structure, and the sand was necessary to support service infrastructure for the house. This offers an example of how even pile-supported structures built according to CCCL design standards cannot realistically be expected to remain useful when subject to the erosive forces of a migrating beach.

In addition, the variance requires that the purpose of the statute be met. The applicant emphasized that one purpose of the statute is to allow for protection of private property and asserted that the sea wall does exactly this. The applicant then acknowledged the intent of other portions of relevant statute to protect the beach-dune system, native vegetation, and public access from imprudent construction. The petitioner asserted that the sea wall would protect the dunes behind it and that the sea wall did not affect native, salt-tolerant vegetation. Thus, said the applicant, the sea wall accomplishes the statutory goal of protecting the beach-dune system. Permit Application WL 883 AR V is undetermined and waived indefinitely.

As another example of a variance request, one can look to a variance application received May 1, 2008 by DEP for a house in St. Johns County.¹⁴⁵ A newspaper article describing the plight of the owner and four others in St. Johns County stated that “U.S. Rep. John Mica, R-Fla., and St. Johns County officials announced Friday afternoon that five Vilano Beach homeowners can install permanent seawalls to stop their homes from toppling into the ocean.”¹⁴⁶ However, St. Johns County officials may only issue “temporary” armoring permits, and DEP must issue the permanent permits. The appearance of a U.S. representative and assertions that the armoring will be “permanent” gives the appearance that politics might be at play in the permitting process since current DEP rules do not allow armoring for these houses.¹⁴⁷ The push to grant evermore variances to protect property built after 1985 will only grow as more and more houses built with a CCCL permit are threatened by coastal erosion. DEP has continued to

¹⁴³ The petition states that a habitat conservation plan that is under development would alleviate the “take” problem and that the petitioners would meet with the agency to discuss the claim that the armoring was not cited as close as practicable to the structure.

¹⁴⁴ Petition for Variance or Waiver, FDEP Permit File No. WL-883 V.

¹⁴⁵ FDEP application SJ-1029 AR V.

¹⁴⁶ Christina Abel, *Seawall Waivers Granted to 5 Beach Homeowners*, TIMES-UNION (electronic addition), Apr. 12, 2008, available at http://www.jacksonville.com/tu-online/stories/041208/met_267694953.shtml.

¹⁴⁷ *Id.*

receive variance requests since the nine already received by late 2007 and those familiar with the CCCL program expect many more to be coming, mostly from Walton County.¹⁴⁸

Granting of variance requests such as this one would erode the few fundamental protections for the beach-dune system incorporated into the CCCL program. The requirement that a structure cannot be armored unless it was not built pursuant to CCCL permit should serve as notice to property owners building on Florida's beaches since 1985 that the risk of erosion of their property resides with them and that the risk should not be borne by the public and ecosystem due to the loss of the natural beach.¹⁴⁹ To make this even stronger, CCCL permits for new or rebuilt major habitable structures should be conditioned on recording a deed restriction that the property will never be armored and that the structure will be removed at the property owner's expense if the structure ends up interfering with the active beach. This also puts the applicant on notice that future movement of the beach is at the risk of the property owner rather than the public or the species and ecosystem that depend on the beach. Without this fundamental limitation, DEP would further guarantee the loss of our beaches to armoring every time it issued a permit for a major habitable structure. The prohibition on armoring for structures built pursuant to the program recognizes that such structures are built to *not* lock up the sand underneath them and interfere as little as possible with the beach-dune system.

G. Emergency Permitting

BBCS and local governments can issue emergency armoring permits, but local government emergency permitting for armoring has generated significant controversy in both cases where it has seen extensive use. The first widespread use of this authority was Indian River County, which issued a number of emergency armoring permits after Hurricane Erin in 1995. The potential for "take" of sea turtles by emergency armoring led Indian River County to work with the U.S. Fish and Wildlife Service to develop a habitat conservation plan under the federal Endangered Species Act, which then allowed Indian River County to receive an incidental take permit that would allow the county to issue future emergency armoring permits.

The severe erosion during 2004 and 2005 in Walton County again led to extensive granting of emergency armoring permits by a local government. Walton County issued about 250 emergency armoring permits. Many of these are now applying for after-the-fact (ATF) permits. Eighteen ATF permit applications for armoring have been denied as of March 13, 2007, and all but one of these has filed a challenge to the permit denial (see following sub-section on after-the-fact permits). The experience of Walton County can help shed light on some of the problems with local government authority to grant temporary emergency armoring permits.

Fla. Stat. § 161.085 governs local governments' issuance of temporary emergency armoring. The statute stipulates that it shall only be authorized when a private structure or public infrastructure is threatened. Local governments should also take into account a list of criteria similar to the ones considered by FDEP in the CCCL program. These include protecting the beach-dune system, siting and design of the structure, impacts on adjacent properties, preservation of public beach access, and protection of native coastal vegetation, nesting threatened or endangered species, and nesting marine turtles and their hatchlings.

¹⁴⁸ For example, a letter to FDEP requesting a variance for a home in Walton County stated that within the neighborhood concerned, "All [those that armored] are currently requesting variances . . ." Petition letter of Keith R. Jackson, FDEP Permit File No. WL-999 AR V.

¹⁴⁹ In 2008 the Florida Legislature passed a bill that would create an exception to the idea that the risk of erosion resides exclusively with the property owner. CS/HB 1427, if signed into law, will require assignment of responsibility for erosion caused by inlets and specifying what FDEP must do in the case of disputes between property owners and local governments regarding amount of sand bypass. *See supra* note 18.

Local governments are required to inform FDEP when the local government issues an emergency armoring permit. However, it appears that local governments sometimes do not accurately inform FDEP when they issue emergency permits. For example, Walton County not only failed to accurately inform FDEP of all emergency permits it issued, but the county sometimes even said that no county permits existed for work that actually did have county permits. This seemed to be a symptom of a local permitting system operating without the administrative capacity to function properly. The county sometimes issued permits to different properties with the same permit number, and referenced properties inconsistently in documents, sometimes using a parcel number, sometimes address, or other methods. This has generated problems as the State attempts to come to grips with the armoring on Walton County beaches. Even if Walton County had submitted an accurate and detailed list of all the temporary emergency armoring permits it had granted, DEP does not maintain a database that contains such information.

Despite the requirement that emergency armoring be “temporary” in nature, those familiar with the issue inside and outside of FDEP acknowledge that there is usually no practical difference between “temporary” armoring and that which is intended to be permanent. If the armoring consists of sheet piling, the concrete cap that often covers the top might be left off as evidence that the sheetpiling is “temporary.” Nonetheless, once armoring is in the ground, everyone agrees that it would be very unusual for the armoring to be removed.

Due to extensive problems with emergency permitting, in 2006 the Florida Legislature provided FDEP with the authority to revoke the right of local governments to issue emergency armoring permits.¹⁵⁰

H. After-the-Fact Permitting

Sometimes activities take place within the CCCL jurisdictional area without a permit from the state. The most common cause of this is the authority of local governments to issue “temporary” armoring permits to protect from erosion that occurred during a storm event. In other cases, property owners may have engaged in construction without the benefit of a CCCL permit. In most cases, the party without a permit or with a local “temporary” permit will seek an ATF permit. Review of selected ATF permit files indicated that in some instances an applicant applies for a permit for a structure, builds the structure prior to receiving the permit, and FDEP converts the application to an ATF application.

Walton County has been the current center of ATF permitting due to issuance of about 250 emergency “temporary” armoring permits by Walton County in response to severe coastal erosion in 2004 and 2005. In addition, some armoring was constructed without even a local government permit.¹⁵¹ Most of the 250 local permit recipients have properly submitted permit applications to DEP to make their armoring permanent. Some ATFs have been granted and others denied. A denial of an ATF permit does not lead to an immediate order to remove the armoring. If the permit applicant challenges the denial of the permit, the armoring is not considered a violation during the legal process, because the applicant complied with the law by applying for a permit. On the other hand, if the ATF application is denied and not challenged, the armoring is to be removed. Researchers were unable to verify that this has happened with any armoring in Walton County despite the passage of several years since installation of most of the

¹⁵⁰ 2006 Laws of Florida Ch. 99, § 1.

¹⁵¹ These include: James E. Mountjoy- FDEP violation #VWL 05-07/WL-844 AR ATF; Lee Shook- FDEP violation #VWL 06-02/WL-888 AR ATF; John Higdon- FDEP violation #VWL 06-03/WL-911 AR ATF; Tony & Linda Hill- FDEP violation #VWL 06-04/WL-947 AR ATF; Silver Shells Townhomes- FDEP violation #VWL 06-07/WL-887 AR ATF; Palms of Dune Allen- FDEP violation #VWL 06-08/WL-878 AR ATF; Alan H. Nix- VWL 06-09/WL-928 AR ATF; Patrick Tylka- FDEP violation #VWL 06-10/WL-928 AR ATF; James & Michelle Spires- FDEP violation #VWL 06-11/WL-934 AR ATF; Stephen Chambers- FDEP violation #VWL 06-19/WL-975 AR ATF; Ed Foy- FDEP violation #VWL 06-21/WL-1002 AR ATF; Scott Bumpas- FDEP violation #VWL 06-22/WL-970 AR ATF.

“temporary” armoring. For example, Permit No. WL-841-AR ATF was denied Nov. 9, 2006, and the denial was not challenged. FDEP sent a warning letter April 27, 2007 requiring removal of the armoring, but the wall has not been removed. As of April 2008, FDEP had requested additional information and was in settlement talks; FDEP officials did not disclose what the settlement might include.

I. Enforcement Issues

Enforcement activities under the CCCL program include both compliance and violation activities. A compliance action results when a permit holder violates the permit; a violation occurs when a regulated activity takes place without a permit. FDEP has seven to eight field agents around the state. Field agents conduct monthly inspections of permitted activities and fill out reports on these inspections. Field agents may discover compliance issues at the site of the permitted activity or discover violations at nearby sites, but FDEP does not have anyone that regularly patrols the beaches to look for violations. FDEP stated that most of the violations it deals with are brought to its attention by the public, often by disgruntled neighbors or sea turtle advocates monitoring beaches.

Statutes and rules give significant authority to the FDEP to remove unauthorized construction and impose sanctions for unpermitted activities seaward of the CCCL. For example, unpermitted work is declared a public nuisance which is to be removed after notice.¹⁵² If the owner does not remove, FDEP may remedy the violation and place a lien on the property for FDEP’s cost in doing so.¹⁵³ Violations of permitting requirements can lead to criminal charges of a first degree misdemeanor.¹⁵⁴ In addition, statutes allow for administrative fines of up to \$10,000 per day for violations.¹⁵⁵ Fines go into the Ecosystem Management and Restoration Trust Fund,¹⁵⁶ which also supplies funds for beach nourishment.¹⁵⁷

Enforcement actions usually begin with a warning letter. The violator is apprised of the relevant law and why FDEP believes a violation has occurred. The violator will then typically apply for an ATF for the activity, apply for a modification to an existing permit, or otherwise remedy the violation. Application for an ATF permit will halt the enforcement action assuming that the violating activity (or construction constituting the violation) is halted during the pendency of the permit application. If an ATF permit is issued, the enforcement action is typically dropped.

From January 1, 2006 to March 25, 2008, FDEP dealt with, opened, and closed a total of one hundred and seventy-three enforcement actions.¹⁵⁸ FDEP seldom uses the great enforcement authority it possesses. For example, the current head of FDEP’s CCCL enforcement is not aware of a single instance in which FDEP has used its authority to prosecute a CCCL violation as a criminal offense. FDEP does sometimes use its authority to assess civil fines. From January 1, 2006 to March 25, 2008, FDEP issued twenty-two fines for a total of \$28,950.¹⁵⁹ Of this total, \$27,700 had been collected. Fines ranged from \$300 to \$10,000, with the average being \$1,315.91.

Arguably the most egregious cases of violations are those in which the violator clearly knew they were violating the law and intended to do so. For example, Permit File No. WL-878 AR ATF indicates that the

¹⁵² FL. STAT. § 161.053(7). In addition, FDEP may request that the Department of Legal Affairs institute proceedings to enjoin any regulated activity that does not have a proper permit. *Id.* § 161.081.

¹⁵³ *Id.*

¹⁵⁴ *Id.* § 161.053(8).

¹⁵⁵ *Id.* § 161.054(1).

¹⁵⁶ FLA. ADMIN. CODE r. 62B-54.004(5).

¹⁵⁷ FL. STAT. § 161.091(1).

¹⁵⁸ This number does not include enforcement actions that may have been pending prior to the dates included but which had not been resolved during the dates stated.

¹⁵⁹ Beaches and Coastal Management System Fines Report, March 25, 2008 (on file with author).

applicant had applied for a geo-tube armoring structure. Before the permit review process was completed, FDEP discovered that the applicant had installed an unauthorized armoring system different from the one in the pending application. The structure was ordered removed after denial of the application, but even with such a willful, major violation, FDEP did not recommend imposition of a fine since the “costs associated with removal of the [unpermitted armoring] will likely be significant.”¹⁶⁰ If the unpermitted armoring by some settlement or litigation is allowed to remain, imposition of a fine would be reconsidered.¹⁶¹ In most cases of illegal armoring, FDEP takes this approach of assuming that the cost of removing the armoring is penalty enough.

This leads one to ask how often illegal armoring is removed. During research the rumor often surfaced that no armoring in the state had ever been removed despite many denials of ATF permits over the years. Working with FDEP officials, researchers proved that this is not entirely true. Research revealed three instances in which a permit denial had an impact on existing armoring. In one instance, the owner of a structure that was not eligible for armoring¹⁶² had cement walls poured in between the piles supporting the house.¹⁶³ FDEP discovered the violation and denied an ATF application, and ordered removal. The owner of the house complied with the removal order. In another instance, a rock revetment was relocated landward due to an initial denial of a permit.¹⁶⁴ In the third instance, a sea wall was relocated landward.¹⁶⁵ FDEP has only one person in charge of CCCL enforcement for the entire state of Florida. This lack of staffing and resources may contribute to the small number of enforcement actions pursued and seen through to imposition of a civil fine.

As part of the review of enforcement activities, researchers conducted limited “ground-truthing”¹⁶⁶ of certain permits in Martin, Palm Beach, St. Lucie and Walton counties.

Martin County

In Martin County, five permits were slated for ground-truthing. Researchers were only able to visit two locations. One had armoring whose ATF application was “undetermined” at the time but subsequently approved.¹⁶⁷ The second site was denied an armoring permit, and no armoring was present on the property.¹⁶⁸

Palm Beach County

In the course of conducting ground-truthing activities, several structures were observed for which inquiries were made to the BBCS for permits associated with the properties. First, dune restoration was observed at 5540 N. Ocean Dr. in Palm Beach County, in front of a condominium building called Water Glades. The inquiry to BBCS yielded two permits associated with Water Glades condominium, neither of which was associated with the observed dune restoration. The first permit¹⁶⁹ was for a bulkhead or seawall, or return wall. The second permit¹⁷⁰ was for Vegetation, Native Salt Resistant for Beach/Dune Stabilization, or fill, but was from 1996. The observed dune restoration appears to have been conducted much more recently than 1996. Further research, however, revealed that DEP and BBCS had issued

¹⁶⁰ DEP Memorandum to VWL 06-08 from Jim Martinello, Environmental Manager, Bureau of Beaches and Coastal Systems.

¹⁶¹ *Id.*

¹⁶² The structure was not eligible because the house was built after 1985 with a permit under the CCCL program.

¹⁶³ FDEP Permit Application No. GU-450 AR ATF and violation file #VGU 06-03.

¹⁶⁴ FDEP Permit Nos. FR-816 AR ATF and FR-836 AR.

¹⁶⁵ FDEP Permit No. IR-511 M1 and IR-511 M2.

¹⁶⁶ Ground-truthing is a term taken from the remote sensing field and it refers to the practice of verifying data through fieldwork.

¹⁶⁷ FDEP Permit No. MI-461 AR ATF.

¹⁶⁸ FDEP Permit No. MI-484 AR.

¹⁶⁹ FDEP Permit No. PB-910.

¹⁷⁰ FDEP Permit No. PB-542.

emergency permit PB-875 M1 E for emergency beach restoration activities, including placement of sand, after sub-tropical storm Andrea in 2007.¹⁷¹

Second, a new sea wall was observed at 5440 N. Ocean Dr. in Palm Beach County, in front of a condominium building called Aquarius. Inquiry to BBCS yielded one permit associated with the address. In that permit, the restoration or repair of sand retaining walls was approved in July 2007.

Finally, a new sea wall was observed at 5420 N. Ocean Dr. in Palm Beach County, in front of a condominium building called Connemara. The inquiry to BBCS yielded two permits, PB 832 and 8021778. PB-832 was for a Bulkhead or Seawall and a Return Wall (all approved). 8021778 was for Vegetation, Native Salt Resistant for Beach/Dune Stabilization; Fences and Railings - Privacy, Safety, Security and Ornamental; and Walkways, Walkover Structures, Boardwalks and/or Stairs (all approved).

Researchers also observed that the sea wall constructed at 5420 N. Ocean Drive in front of the Connemara building extended to a large portion of the property of the Sea Dunes building, which applied for an armoring permit.¹⁷² This permit was not issued but was waived until March 22, 2008. Thus, the legal status of the seawall extending in front of the Connemara building was not clear.

Walton County¹⁷³

Inquiries indicated the existence of at least eleven ATF permits for coastal and shore protection structures that had been denied in Walton County, as of August 22, 2007. Ten of the properties corresponding to the permits contained the structures or dune restoration activity that had been denied. For example, at one property, for which an ATF armoring permit was denied on November 9, 2006, an armoring structure was observed in August 2007. The head of enforcement for BBCS said that all but one of the ten properties visited by researchers was permitted by Walton County, and, as of April 2008, all but one has challenged DEP denial of their ATF permits.

J. Structural Problems

The stated goal of the CCCL is “to preserve and protect [Florida’s beaches] from imprudent construction which can jeopardize the stability of the beach-dune system, accelerate erosion, provide inadequate protection to upland structures, endanger adjacent properties, or interfere with public beach access.”¹⁷⁴ While it appears common sense to assume that a program with the stated goal of protecting beaches would also protect the sea turtles that depend on those beaches for their habitat, this is not the case.

The CCCL program is a program designed to issue permits for coastal construction. Such construction is not supposed to be “imprudent construction which can jeopardize the stability of the beach-dune system.” but definitions of “imprudent construction” and “stability of the beach-dune system” seem to focus primarily on minimizing storm and erosion-related losses for people.

The storms of the very active 2004 and 2005 hurricane season produced similar, extensive damage. Most of the damage occurred to habitable structures (which include single and multi-family homes) constructed prior to the establishment of the state’s CCCL Program and as a result were not built to the more stringent construction standards of the current program. Habitable structures built to the CCCL Program’s standards (those constructed to withstand the wind and water forces experienced in a high hazard coastal zone) survived. Specifically, of the 1,992 major

¹⁷¹ It is unclear why the initial inquiry to BBCS did not reveal the existence of this permit.

¹⁷² Permit Application PB-904.

¹⁷³ University of Florida graduate student Lori Brinn conducted the onsite visits for groundtruthing in Walton County.

¹⁷⁴ FLA. STAT. § 161.053.

habitable structures impacted by Hurricane Opal, 768 (or 40%) were destroyed. On the other hand, of the 576 structures permitted by the CCCL Program, only 2 (or 0.2%) were destroyed. Experiences during the 2004 and 2005 hurricane seasons confirmed the importance of CCCL Program standards in reducing damage to structures and the beach and dune system.¹⁷⁵

While this quote has statistics to demonstrate that the CCCL program makes structures more resistant to storm damage, the assertion that the CCCL Program has reduced damage to the beach and dune system has no similar substantiation in the document. The focus on structures relegates the general ecosystems that relate to the beach to the status of poor cousins in determining whether proposed projects should be permitted. For example, while statutes and rules mention turtles in several places,¹⁷⁶ the only real reason for turning down a project due to turtle impacts is when the Florida Fish and Wildlife Conservation Commission determines that the construction would constitute a “take” of sea turtles. Yet it is hard to imagine that the continued construction of sea walls on beaches that continue to migrate towards those seawalls will leave sufficient beach habitat for sea turtle nesting.

As further evidence of the bias towards protection of property in the CCCL, it should be noted that sea turtles are not included as an integral part of “the beach-dune system” and that the statute allows BBS to modify the timing or nature of a project to protect sea turtles, but not the siting of the project.¹⁷⁷

V. Suggestions for Reform

Suggestions for reform included in this article are founded on the basic realizations that shoreline migration, whether natural or caused by human activity, will continue; that SLR is already occurring and will become more rapid; that nourishment will not be able to protect all sand beaches in Florida from all the effects of SLR; and that Florida wants to maintain at least some natural beaches. Another basic premise of the suggestions included here is that the risk for constructing in the coastal zone, especially for new construction, should rest with the property owners and not with the public who is forced to choose between protecting/purchasing threatened property or loss of the beach. Many suggestions for reform have already been touched upon when discussing specific weaknesses or problems in the CCCL permitting program. What follows is a summary of these and additional suggestions for reform of the CCCL program.

- Account for a significant amount and period of SLR in determination of the CCCL determination.
- Improve the transparency of the permitting process by creating detailed templates and matrices for analysis of impacts of proposed projects. The methods and evidence included in such analyses should be clearly represented in the permit file.
- Either eliminate the statute granting local governments authority to issue temporary armoring permits or reform it by specifying in the statute that issuance of a local permit does not assure issuance of a permanent state permit, that all risk of failure to receive a permanent state permit resides with the property owner, and that prior to construction a property owner must post a bond for removal costs should the state permit be denied.
- All permits for new, non-armoring construction should require a deed restriction noting that the property will never be allowed to armor.

¹⁷⁵ DIVISION OF BEACHES AND COASTAL SYSTEMS, FLORIDA DEPT. OF ENVIRONMENTAL PROTECTION, THE HOMEOWNER’S GUIDE TO THE COASTAL CONSTRUCTION CONTROL LINE PROGRAM (February 2006).

¹⁷⁶ See, e.g. FLA. STAT. §§ 161.053(2)(b)1.a; 161.053(5)(c); 161.053(18); 161.053(19); 161.053(22); 161.0531; 161.085; 161.085(9); 161.161(1)(i); 161.163.

¹⁷⁷ *Id.* § 161.053(5)(b).

- All new permits for non-armoring should require an easement whereby the property owner must remove any structure interfering with the natural dynamics of the beach-dune system.
- The “line-of-construction” provisions should be eliminated or should at least be modified to set minimum requirements to assure that it is only applied in situations of existing, high-density construction; the provisions should also set criteria defining a “reasonably continuous and uniform line of construction” that qualifies as the basis for exception.
- Eliminate the provision allowing for siting and design exceptions for structures behind existing armoring.
- The term “unduly affected by erosion” should be statutorily defined to include any property which has armoring, which has applied for armoring, which is on a nourished beach, or which lies seaward of the 30-year erosion projection line (as modified per suggestions below) in area classified as “critically eroding.”
- The current “eligibility” requirement for armoring should be modified to add that structures built without a CCCL permit are not eligible unless they are within a densely-developed area served by central water and sewer.
- Eliminate the 30-year erosion projection in favor of a strict state setbacks for construction; the setback could be tailored to regions or areas. If this option is not used, the 30-year erosion projection should be extended to consider a longer time frame that may account for SLR; the time frame for single family homes might be significantly shorter than that for major infrastructure, commercial, or multifamily dwellings.
- Use a far longer time horizon and incorporate SLR in calculation of the 30-year erosion projection line and set the line at the landward toe of the primary dune, when present, rather than at the seasonal high water line.
- Do not give credit for nourishment projects when calculating the modified 30-year erosion projection.
- Limitations on new development should be developed for areas that currently have primarily low-density residential development. Several possible options could serve this end:
 - New structures might be allowed in low-density or undeveloped areas seaward of the CCCL only if the building is designed to be disassembled and/or moved and if the property owner can demonstrate fee-simple ownership of an undeveloped lot (with deed restrictions limiting its use to relocation of the proposed structure) outside of the CCCL and within a reasonable distance of the proposed structure’s site.
 - Alternatively, a new structure might be allowed if the structure is built to fail in an extreme storm event and rebuilding would be dependent upon sufficient space remaining on the affected property. Any such permit should also require a bond or insurance policy to pay for clean up of a destroyed structure.
 - Alternatively, a new structure might be allowed if the proposed property has sufficient depth to allow relocation behind the projected location of the landward toe of the primary dune as determined by the modified 30-year erosion projection.

- Rebuilding of damaged structures should be limited and conditioned to discourage substantial new investment in existing properties, thus promoting possibility of eventual relocation out of highly hazardous areas.
 - A structure should be allowed to be rebuilt only once with the permit conditioned on recordation of a deed restriction noting that future rebuilding in the same location is prohibited.
- The “close-the-gap” provision should be modified to only apply in densely developed areas. The impact of excluding property in non-densely developed areas could be mitigated by a state law creating a right of action for property owners against neighboring property owners for damages due to the erosive effects of neighboring armoring. This reflects the same logic exhibited by the Florida Legislature when it passed CS/HB 1427 in 2008.
- The CCCL program should incorporate a significant program promoting accommodation of the dynamic beach-dune system by offering incentives for relocation of existing structures prior to the structure’s succumbing to forces of the beach or coastal storms.

VI. Conclusion

Avoiding the hazard is the best way to deal with coastal hazards. Construction sited sufficiently landward of the active beach to allow for natural shoreline migration effectively minimizes coastal hazards to development, protects natural ecosystems, and reduces the multi-million-dollar yearly cost of beach nourishment and armoring. In many instances, past developers built too close to the beach, resulting in high losses from storms and exorbitant costs for rebuilding, armoring, and nourishing of beaches. While Florida’s current CCCL permitting program has increased the safety of new structures built in the coastal zone, it fails to adequately protect the ability of the beach to migrate, fails to account for SLR, and encourages increased development due to beach nourishment. These failings have resulted in increased development subject to both immediate coastal hazards and the long-term problems of SLR.

Increasing beach erosion and SLR bring into question the feasibility of Florida’s current focus on beach nourishment as a means to avoid the conflict between development and beach migration. The CCCL program’s granting of erosion credits for nourishment projects and failure to account for SLR in current permitting decisions foster development that will require protection from beach migration and SLR or will be lost to the sea. In areas which are already densely developed, the incremental cost of such new development may be minimal as the area would likely already have been prioritized for shore protection from SLR anyway. However, new development in previously undeveloped areas and increasing density in sparsely developed areas is adding rapidly to the amount of land on Florida’s coast that will receive priority for protection from erosion and SLR.

Protection from SLR in the future will exact far higher costs than we have yet seen from shore protection efforts in Florida. As the speed and magnitude of SLR increase, nourishment alone will likely not be able to keep up due to cost and lack of sand as well as the increasing energy required for nourishment. Once nourishment is no longer feasible in a developed area, two choices will remain: either armor and lose the beach or move human development back from the beach and allow the shoreline to migrate. Such choices will be very difficult as the losses from either option will be tremendous.

Multiple federal, state, and local policies encourage or permit development that is or soon will be subject to severe fluctuations of the beach-dune system. While reforms are necessary in federal, state, and local

insurance; planning, disaster management and relief; and permitting policies, reforms to Florida's CCCL permitting program for coastal construction are also urgently needed to discourage new coastal construction or redevelopment in areas vulnerable to likely SLR and to ensure that redevelopment or new development that is permitted be conditioned to prevent its inclusion as justification for future armoring and loss of our beaches. Anything less amounts to the State of Florida abdicating its public trust duty to manage and preserve Florida's beaches for the good of all its citizens.



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The Spread of Fertilizer Ordinances in Florida¹

Richard Hartman,² Frank Alcock,³ and Chris Pettit⁴

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I. Introduction

Fertilizer composition and use has important implications for coastal resiliency. The concept of coastal resiliency has received increased attention in recent years in the context of climate change.⁵ Coastal resiliency refers to a given coastal system's adaptive capacity to external disturbances. That which enhances the ability of coastal ecosystems to prevent or cope with the impacts of external disturbances is understood as having a positive impact on coastal resiliency. Resiliency can be strengthened mainly by decreasing the probability of occurrence of coastal hazards or avoiding or reducing their potential effects.⁶

Harmful algal blooms (HABs) are a specific coastal hazard that have received increased attention over the past decade. Algal blooms involve high concentrations of photosynthetic algae, cyanobacteria and non photosynthetic protists.⁷ HABs are a subset of algal blooms that cause harm by releasing toxins, altering habitat, displacing indigenous species, or depleting oxygen in the water. The U.S national plan for algal toxins notes that recent years have been characterized by a dramatic increase in the number of HABs and the economic losses resulting from them.⁸ This increase can be linked, in part, to increased nutrient loading.⁹ Nitrogen loading resulting from fertilizer use is of particular concern.

¹ This paper was presented during the Sea Grant Law and Policy Journal's inaugural symposium on Coastal Resiliency held on March 25–26, 2008 at the University of Mississippi in Oxford, Mississippi. Coastal resiliency refers to the ability of coastal cities, towns, and communities to adapt to and recover from natural hazards, including hurricanes, tsunamis, floods, and disease epidemics. Seven authors were selected to present papers on a wide range of topics related to coastal resiliency. Powerpoint presentations and additional information about the symposium are available at <http://www.olemiss.edu/orgs/SGLC/National/SGLPJ/SGLPJ.htm>.

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⁵ INTERNATIONAL PANEL ON CLIMATE CHANGE (IPCC), CLIMATE CHANGE 2007 – IMPACTS, ADAPTATION, AND VULNERABILITY (2007).

⁶ IPCC, CLIMATE CHANGE 2001 – IMPACTS, ADAPTATION, AND VULNERABILITY (2001).

⁷ J.S. RAMSDELL, D.M. ANDERSON, AND P.M. GILBERT (EDS), ECOLOGICAL SOCIETY OF AMERICA, HARMFUL ALGAL RESEARCH AND RESPONSE: A NATIONAL ENVIRONMENTAL SCIENCE STRATEGY (HARNNESS) (2005).

⁸ Anderson, D.M., *et al.*, *Harmful Algal Blooms and Eutrophication: Nutrient Sources, Composition, and Consequences*, ESTUARIES 25:704-26 (2002); HARNNESS *supra* note 7.

⁹ *Id.*

Both the 2004 Report of the U.S. Commission on Oceans Policy¹⁰ and the 2003 Pew Oceans Commission¹¹ have identified nitrogen loading, coastal eutrophication, and the proliferation of HABs as major threats to our nation's coastal ecosystem health:

More than 60 percent of our coastal rivers and bays are moderately to severely degraded by nutrient runoff. This runoff creates harmful algal blooms and leads to the degradation or loss of seagrass and kelp beds as well as coral reefs that are important spawning and nursery grounds for fish. Each summer, nutrient pollution creates a dead zone the size of Massachusetts in the Gulf of Mexico. These types of problems occur in almost every coastal state and the trends are not favorable. If current practices continue, nitrogen inputs to U.S. coastal waters in 2030 may be as much as 30 percent higher than at present and more than twice what they were in 1960.¹²

With respect to nitrogen loading, global increases in total nitrogen fertilizer have been well documented.¹³ Glibert, *et al.*, also note the importance of changes in fertilizer composition, suggesting that a shift toward urea-based products has led to more than a 100-fold increase in the worldwide use of urea during the past four decades. The authors suggest that higher nitrogen loads and urea concentrations have stimulated the growth of some types of phytoplankton including the increased prevalence of species that are deleterious to the environment, like HABs.¹⁴

Concerns about nutrient loads, coastal eutrophication, and HABs are central to Florida's water quality regulations. A comprehensive effort is currently underway to bring Florida into compliance with federal water quality provisions. In 1998, several Florida environmental groups filed a lawsuit against the U.S. Environmental Protection Agency (EPA) for its failure to enforce the Total Maximum Daily Load (TMDL) provisions in the Clean Water Act. TMDLs are the amount of each pollutant a water body can receive without violating water quality standards. As a result of the lawsuit, a Consent Decree was issued in 1999 that required the EPA and the Florida Department of Environmental Protection (FDEP) to expedite its assessment of Florida waterways and establish TMDLs in those that are impaired. Florida responded to the Consent Decree by passing the 1999 Watershed Protection Act requiring the FDEP to establish a priority ranking and schedule for analyzing impaired waters along with a methodology for determining those water bodies that are impaired.¹⁵ Nitrates and dissolved oxygen are two measures of water quality that have been problematic in Florida to date.¹⁶ Fertilizer usage can affect both.

A number of Florida state agencies exercise regulatory authority over activities that affect Florida water quality, including FDEP, the Florida Department of Health (FDOH) and the Florida Department of Agriculture and Consumer Services (FDACS), with the FDACS taking the lead with respect to statewide fertilizer use policies. But while these state agencies and the federal government continue to sort through

¹⁰ U.S. COMMISSION ON OCEANS POLICY, AN OCEAN BLUEPRINT FOR THE 21ST CENTURY: FINAL REPORT OF THE U.S. COMMISSION ON OCEAN POLICY (2004).

¹¹ PEW OCEANS COMMISSION, AMERICAN'S LIVING OCEANS: CHARTING A COURSE FOR SEA CHANGE: A REPORT TO THE NATION (2003).

¹² *Id.* at vi.

¹³ Galloway, J.N., and E.B. Cowling, *Nitrogen and the World*, *AMBIO* 31:64-71 (2002); Galloway, J.N., *et al.*, *The Nitrogen Cascade*, *BIOSCIENCE* 53(4):341-56 (2003).

¹⁴ Glibert, P.M., *et al.*, *Escalating Worldwide Use of Urea – a Global Change Contributing to Coastal Eutrophication*, *BIOGEOCHEMISTRY* 77:441-63 (2006).

¹⁵ COMMITTEE ON NATURAL RESOURCES, FLORIDA SENATE, REVIEW OF THE PROGRESS IN IMPLEMENTING THE TOTAL MAXIMUM DAILY LOAD (WATER QUALITY IMPROVEMENT) PROGRAM BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION, Interim Progress Report 2003-136 (2003).

¹⁶ FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION (FDEP), FLORIDA'S TOTAL MAXIMUM DAILY LOAD PROGRAM: THE FIRST 5 YEARS, A REPORT TO THE LEGISLATURE AND THE GOVERNOR (Feb. 2005); FDEP, INTEGRATED WATER QUALITY ASSESSMENT FOR FLORIDA: 2006 305(B) REPORT AND 303(D) LIST UPDATE (2006).

their respective governance and oversight responsibilities, it is local communities that most often bear the brunt of HABs and other negative environmental impacts attributable to coastal eutrophication. As a result, local governments in Florida have recently become active in taking preventive measures, sometimes going beyond what is required by state and federal laws. In particular, a number of Florida municipal governments have adopted or are considering adopting ordinances that regulate the use of fertilizer by homeowners within their respective districts.

The remainder of this paper will focus on these fertilizer ordinances. Part II begins with a matrix that provides a comparative overview of all salient fertilizer ordinances enacted in Florida since 2003. A concise chronology of the evolution of these ordinances follows. The variation among the substantive components of these ordinances is examined, as well as the implications of developing trends. The crucial role that homeowner associations and related neighborhood and community organizations will have on the ultimate impact of fertilizer ordinances enacted by municipal governments is also explored.

II. Local Fertilizer Ordinances

A. Overview

A chronological matrix was populated with key components of fertilizer regulations adopted between 2002 and May 2008 to compare the different approaches taken by jurisdictions and organizations and to provide a historical context to the evolution of regulations. Regulatory issues generally fell into five categories: education, application standards, site planning, exemptions, and enforcement. This section concludes with a discussion of the problems with regulatory schemes being adopted at different levels of governance and the applicability of these fertilizer regulations to private property owners.

Jurisdiction/ Organization Adoption Date:	Florida Green Industries Manual (FGIM) June 2002	St. Johns County (Guana Basin) Mar. 2003	FDEP, et al. Model Ordinance September 2003	City of Naples June 2006	SWFRPC March 2007	City of Sanibel Mar. / Sept. 2007
Ordinance No.	Guidelines	2003-52	Guidelines	Res 06-11245	Resolution	07-003 / 07-012
EDUCATION/TRAINING	Occupational Licensing - Training	Occupational Licensing	Occupational Licensing - Training	Occupational Licensing for City Providers	Occupational Licensing - Training	IDRs & Occ. Licensing
SITE PLANNING	Landscape planning - Yes; Site planning - No	Landscape planning - Yes; Site planning - No	Site planning standards applied to new development and redevelopment	No	No	No
ENFORCEMENT	Not addressed	Occupational Licensing	Code enforcement fine &/or imprisonment	Occupational Licensing for city providers	Occupational Licensing	Code enforcement
Mandatory/Voluntary for private homeowners	Recommendation that standards be mandatory for homeowners	Mandatory for homeowners	Recommendation that standards be mandatory for homeowners	No, voluntary	Yes - Mandatory for BMPs, not certification	Yes - Mandatory for BMPs, not certification
APPLICATION						
Blackout period for applying Nitrogen and Phosphorous fertilizer	July 1 - Sept. 30 only when heavy rain is imminent	May 15 - Oct. 15	July 1 - Sept. 30 only when heavy rain is imminent	No prohibited period	July 1 - Sept. 30	July 1 - Sept. 30
Maximum P for turf or landscape	0-2%	NA	0-2%	NA	2%	2%
Maximum N per 1,000 Sq ft per application	0.5 lb. / 1,000 sq ft if <50% is slow release; 1.0 lb./1000 sq ft if >50% is slow release	0.5 lb. / 1,000 sq ft if <50% is slow release	0.5 lb. / 1,000 sq ft if <50% is slow release; 1.0 lb./1000 sq ft if >50% is slow release	NA	1 pound	1 pound
Maximum N per 1,000 Sq ft per year	Maintenance level (yr.): Basic: 0-2 lbs Moderate: 2-4 lbs High: 4-6 lbs	STA: 4 lbs. / 1,000 sq ft annual; BER: 1 appl / crit period w/ 50% slow release; Others: slow release	Maintenance level (yr.): Basic: 0-2 lbs Moderate: 2-4 lbs High: 4-6 lbs	NA	4 pounds	4 pounds
Maximum total N for turf or landscape	0.5 lb. / 1,000 sq ft if <50% is slow release; 1.0 lb./1000 sq ft if >50% is slow release	STA: 4 lbs. / 1,000 sq ft annual; BER: 1 appl / crit period w/ 50% slow release; Others: slow release	0.5 lb. / 1,000 sq ft if <50% is slow release; 1.0 lb./1000 sq ft if >50% is slow release	NA	20%	20%
Total # fertilizer applications per year	NA	every 20 days	NA	NA	6	6
CFN, required slow release N	0.5 lb. / 1,000 sq ft if <50% is slow release; 1.0 lb./1000 sq ft if >50% is slow release	50%	0.5 lb. / 1,000 sq ft if <50% is slow release; 1.0 lb./1000 sq ft if >50% is slow release	NA	70%	70%
Keeping fertilizer off impervious surfaces	Yes	Yes	Yes	NA	Yes	Yes
Use of deflectors shields required	Yes	Yes	Yes	NA	Yes	Yes
No fertilizer zone - waterbody/wetland buffer	10 ft without deflector, 3 ft with deflector	10 ft without deflector, 3 ft with deflector	10 ft without deflector, 3 ft with deflector	NA	25 feet	25 feet
Low/No maintenance adjacent to waterbody or wetland	None	None	6 ft. except when adjacent to seawalls, bulkheads, or for erosion prevention	NA	None	None
EXEMPTIONS						
Turf and landscape establishment period	N/A	N/A	N/A	NA	60 days	60 days
Vegetable gardens	N/A	N/A	N/A	NA	Conditional - if >25 ft from waterbody	Yes
Mulch and compost	N/A	N/A	N/A	NA	Yes	Yes
Golf Courses	N/A	N/A	N/A	NA	Yes	Yes
Agriculture	N/A	N/A	N/A	NA	Yes	N/A
Rense water buffer to waterbody and wetlands	N/A	N/A	N/A	NA	25 feet	None

Jurisdiction/ Organization/ Adoption Date:	City of Sarasota October 2007	Charlotte County March 2008	City of North Port December 2007	FDACS Florida Consumer Task Force January 2008	Lee County May 2008	Marion County Draft	City of Jacksonville Draft
Ordinance No.	Ordinance 07-4768	2008-28	07-45	Model Ordinance	08-08	Proposed 8.2.10(m-n) Referenced FGIM	Proposed
EDUCATION/TRAINING	Adopted into Code, not LDRs	LDRs & Occ. Licensing	Code & Occ. Licensing	LDRs	Landscape Regulation; not part of LDR	LDRs & Occ. Licensing	NA; Countywide as part of River Account
SITE PLANNING	No	Zoning code; allows for variances by administrative relief	No	No	Landscape code	LDRs; Landscape code	NA
ENFORCEMENT	Code enforcement	Occupational Licensing and Monetary Penalties	Code Enforcement	No	Occupational Licensing and Monetary Penalties	Code Enforcement	NA
Mandatory/Voluntary for private homeowners	Yes - Mandatory for BMPs, not certifier	Yes: Non-commercial Applicator	Yes	Follow IFAS recommendations	IFAS guidelines strongly recommended	Yes - All development	Yes
APPLICATION							
Blackout period for applying Nitrogen and Phosphorous fertilizer	June 1 - Sept. 30	June 1 - Sept. 30	June 1 - Sept. 30	Flood Watch/Warning; Trop. Storm Watch/Warning; 3-day Coe of Uncertainty; or if heavy rain is expected	June 1 - Sept. 30	No	June 15 - Sept. 15; allows >50% slow release
Maximum P for turf or landscape	<0.25 lbs P/1000 sf per application, <0.50 lbs P/1000 sf per year	<0.25 lbs P/1000 sf per application	0.25/1000 sf app; 0.50/1000 sf yr	2% (FGIM)	<0.25 lbs P/1000 sf per application, <0.50 lbs P/1000 sf per year	Not specified	Pending FDACS/FDEP statewide standard
Maximum N per 1,000 Sq ft per application	Not specified	None	NA	1 lb/1000 sf	NA	0.5 lb. / 1,000 sf if <50% is slow release; 1.0 lb./1000 sf if >50% is slow release	0.5 lb. / 1,000 sf if <50% is slow release; 1.0 lb./1000 sf if >50% is slow release
Maximum N per 1,000 Sq ft per year	4 pounds	Bahia: 2-4 lbs. Bermuda: 5-7 lbs. Centipede: 2-3 lbs. St. Augustine: 4-6 lbs. Zoysia: 4-6 lbs.	4 lbs	Bahia: 2-4 lbs. Bermuda: 5-7 lbs. Centipede: 2-3 lbs. St. Augustine: 4-6 lbs. Zoysia: 4-6 lbs.	NA	Bahia, Centi., St. Aug: 2 lbs. Berm., Zoys.: 3 lbs.	St. Aug: 4 lbs/1000 sf
Maximum total N for turf or landscape	Not specified	Bahia: 2-4 lbs. Bermuda: 5-7 lbs. Centipede: 2-3 lbs. St. Augustine: 4-6 lbs. Zoysia: 4-6 lbs.	4 lbs	1 lb/1000 sf	4 lbs/1000 sf.	0.5 lb. / 1,000 sf if <50% is slow release; 1.0 lb./1000 sf if >50% is slow release	0.5 lb. / 1,000 sf if <50% is slow release; 1.0 lb./1000 sf if >50% is slow release
Total # fertilizer applications per year	NA	NA	NA	NA	NA	Not specified	Max: 20 days
Of N, required slow release N	50%	50%	50%	Role SE-1003(2) FAC provides max amounts based on overall solubility.	50%	If, 50%, 0.5 lb per 1000 sf	NA
Keeping fertilizer off impervious surfaces	Yes	Yes	Yes	Yes for rotary spreaders; No for others; 3 ft. with shield	Yes	NA	NA
Use of deflectors shields required	Yes	Yes for broadcast spreaders along water & impervious surfaces	Yes	Yes	Yes	No	NA
No fertilizer zone - waterbody/wetland buffer	10 feet	10 feet	10 ft.	10 ft.	10 ft without deflector, 3 ft with deflector.	10 feet	NA
Low/No maintenance adjacent to waterbody or wetland	Voluntary Low Maintenance Zone	NA	6 ft voluntary	No, 6 ft. zone strongly recommends	Recommended: 6 ft	NA	NA
EXEMPTIONS							
Turf and landscape establishment period	60 days	certified applicator to apply one application of (N) fertilizer & 0% (P) during Restricted Season but not in 24 hrs. of known rain event!	60 days	Yes; one time use 1.0 lb /1000 sf	60 days	30 days new turf; 60 days damaged turf	N/A; FGIM standards
Vegetable gardens	No	No	No	Conditional - If >15 feet from waterbody	60 days	No	N/A; FGIM standards
Mulch and compost	No	No	No	No	Yes	No	N/A; FGIM standards
Golf Courses	Yes	Yes	Yes	No	Yes	Yes; Intensive recreation areas	IFAS standards
Agriculture	Yes	Yes	Yes	Yes	Yes	Yes	N/A; FGIM standards
Reuse water buffer to waterbody and wetlands	None	No	NA	NA	Yes	1/2 amount allowed if not reuse	N/A; FGIM standards

B. Chronology

Our analysis starts with the Florida Green Industries Manual (FGIM), published in 2002.¹⁷ The 66-page FGIM provided Best Management Practices (BMPs) for turfgrass and landscape maintenance to be used by professional landscapers statewide. The goal was to conserve and protect Florida's water resources. The FGIM authors acknowledged using the Professional Lawn Care Association of America's BMPs for Turfgrass document as a guide.

Prior to FGIM, two local governments, St. John County and the Village of Wellington, had promulgated fertilizer restrictions. Both of these actions targeted improved water quality for a deficient hydrological system. The Wellington provisions¹⁸ were aimed at decreasing phosphorous runoff from ranching operations into the Everglades Restoration Area. These provisions were considered too narrowly defined and for a purpose uncommon to coastal communities – livestock ranching – to provide adequate information for this article. The County of St. John's ordinance¹⁹ was tailored to improve the quality of the Guana River basin. Successfully challenged upon adoption in 2001, the provisions were later amended in 2003. The amended regulations incorporated many of the BMPs that were recommended in the FGIM. These revised regulations are summarized in the matrix.

The FDEP provided the first statutory guide in September 2003 with its publication of a model ordinance.²⁰ The provisions of the 2003 guidelines combined and incorporated "Florida-friendly" landscape concepts provided by the University of Florida Cooperative Extension Services' *Florida Yards and Neighborhoods*²¹ and *Environmental Landscape Management*²² programs and best management practices (BMPs) from the *Florida Green Industries Best Management Practices for Protection of Water Resources in Florida*.²³ The FDEP model ordinance could have provided a valuable statement of the state of fertilizer regulation at the time, but the agency largely limited its guidance to site planning techniques, only briefly addressing fertilizer regulation and incorporating the FGIM standards by reference.

Aside from a 2006 resolution adopted by the City of Naples, no new fertilizer ordinances were adopted until 2007.²⁴ 2007 brought a flurry of activity, however, with numerous jurisdictions in southwest Florida considering and adopting fertilizer use ordinances. The primary impetus for this wave of ordinances was the Southwest Florida Regional Planning Council's (SWFRPC) adoption of a resolution that provided a model ordinance for fertilizer use regulation that was approved by all 22-member jurisdictions on March 15, 2007.²⁵ The model ordinance was more stringent than the BMPs and adopted ordinances that came before it and served as the model for Sarasota County's ordinance. By the end of 2007, five of the SWFRPC's member jurisdictions enacted new fertilizer regulations: the City of Sanibel Island, Sarasota County, the City of Sarasota, the City of Cape Coral, and the City of North Port.²⁶ Charlotte County, Lee

¹⁷ FDEP, FLORIDA GREEN INDUSTRIES MANUAL: FLORIDA GREEN INDUSTRIES BEST MANAGEMENT PRACTICES FOR PROTECTION OF WATER RESOURCES IN FLORIDA (June 2002).

¹⁸ Village of Wellington, Fla., Municipal Code § 30-155.

¹⁹ St. Johns County, Fla., Ordinance 2003-52 (May 27, 2003).

²⁰ FDEP, GUIDELINES FOR MODEL ORDINANCE LANGUAGE FOR PROTECTION OF WATER QUALITY AND QUANTITY USING FLORIDA FRIENDLY LAWNS AND LANDSCAPES (Sept. 2003).

²¹ Florida Cooperative Extension Service, Florida Yards and Neighborhoods, <http://fyn.ifas.ufl.edu/>.

²² Hendry County (FL) Cooperative Extension Office, Environmental Landscape Management, <http://hchort.ifas.ufl.edu/EnviroLandscape.htm>.

²³ FGIM, *supra* note 16.

²⁴ Naples, Fla., Resolution No. 06-11245 (June 7, 2006).

²⁵ Southwest Fla. Regional Planning Council, Resolution No. 07-01 (March 15, 2007).

²⁶ Sanibel, Fla., Ord. No. 07-003 (March 6, 2007) and Sanibel, Fla., Ord. No. 07-012 (Sept. 18, 2007); Sarasota County, Fla., Ord. No. 2007-062 (Aug. 27, 2007); Cape Coral, Fla., Ord. No. 72-07 (October 29, 2007); Sarasota, Fla., Ord. No. 07-4768 (Oct. 15, 2007); North Port, Fla., Ord. No. 2007-45 (Nov. 26, 2007).

County, and the Town of Longboat Key adopted fertilizer use ordinances in the spring of 2008.²⁷ Three additional jurisdictions in southwest Florida were also considering fertilizer regulations at this time.²⁸ Many of these communities suffered from an especially severe Florida red tide bloom in 2005 and additional algal blooms in 2006.²⁹

Coastal communities in Charlotte and Lee Counties have experienced other HABs that have been linked to water releases from Lake Okeechobee and other forms of nutrient loading in the Peace River and Charlotte Harbor Watersheds. The Caloosahatchee River carries the nutrient-rich lake water into Charlotte Harbor, which then disperses along the Lee County coastline. Above-normal rainy seasons in 2004 and 2005 resulted in record level storage in Lake Okeechobee, leading to large releases of lake water into the river. As the releases traveled downstream, they combined with additional polluted runoff from non-point sources within the river basin. Some scientists have argued that this combination generated significant algal blooms along the coastline. Although not as physically debilitating as red tide, these other algal blooms had significant impacts on coastal habitat and wildlife.³⁰

Despite what appears to be increasing scientific data and public concern regarding fertilizer use and coastal resiliency, the momentum for increasingly stringent fertilizer ordinances seems to have stalled in the wake of an ordinance adopted by Sarasota County in August 2007, at least until Lee County recently adopted its ordinance. As will be discussed below, Sarasota County's ordinance went beyond its predecessors, primarily with respect to some of its substantive measures and mandatory nature. Since then some communities have witnessed a backlash from homeowners expressing property rights concerns. Many have expressed a preference for voluntary as opposed to mandatory measures and educational strategies as opposed to regulations requiring enforcement of sanctions.

Also important has been the fact that the fertilizer industry and other affected interest groups have sought to preempt the escalation of restrictions by harmonizing fertilizer regulations in the form of a new model ordinance for municipalities. A Florida Consumer Fertilizer Task Force established under the auspices of the FDACS released its final report in January 2008.³¹ The recommended provisions of the report and the associated model ordinance supported the standards promulgated by the FGIM. A proposed bill based upon this report failed to pass during the 2008 legislative session.

Finally, it seems likely that the heightened concerns about the ecological impacts of fertilizer use in the wake of severe HABs may have waned slightly in the presence of a drought that seems to have temporarily diminished HAB outbreaks in the southwest Florida region.³² Even in light of the recent occurrence of a persistent severe HAB that demonstrated the need to control and reduce nutrient runoff, Collier County recently withdrew their proposed fertilizer regulation ordinance from consideration.

²⁷ Charlotte County, Fla., Ord. No. 2008-28 (March 2008); Lee County, Fla., Ord. No. 08-08 (May 14, 2008); Town of Longboat Key, Fla., Ord. No. 2008-04 (May 5, 2008). The Town of Longboat Key ordinance was not part of this paper's analysis.

²⁸ City of Punta Gorda, Fla., City of Bonita Springs, Fla., Town of Ft. Myers Beach, Fla., per SWRPC 2007.

²⁹ National Oceanic and Atmospheric Administration (NOAA), Gulf of Mexico Harmful Algal Bloom Bulletin (Oct. 30, 2006) available at http://coastwatch.noaa.gov/data/hab_bulletins/HAB20061030_200674_SFL.

³⁰ LAPOINTE, B.E., AND B.J. BEDFORD, DRIFT RHODOPHYTE BLOOMS EMERGE IN LEE COUNTY, FL: EVIDENCE OF ESCALATING COASTAL EUTROPHICATION: FINAL REPORT TO LEE COUNTY AND THE CITY OF BONITA SPRINGS (Mar. 2006); LAPOINTE, B.E., ET. AL., HARMFUL ALGAL BLOOMS IN COASTAL WATERS OF LEE COUNTY, FL: BLOOM DYNAMICS AND IDENTIFICATION OF LAND-BASED NUTRIENT SOURCES: PHASE II FINAL REPORT (TO LEE COUNTY) (June 2006).

³¹ FLORIDA DEPT. OF AGRICULTURE AND CONSUMER SERVICES (FDACS), FLORIDA CONSUMER FERTILIZER TASK FORCE FINAL REPORT (Jan. 15 2008).

³² The North and Central East Coast of Florida was affected by a persistent red tide bloom during 2007, however.

C. Ordinance Components

The persistent HABs of the past few years lead local jurisdictions to seek ways they could protect local waters and diminish the impacts of HABs. As noted above, nutrient runoff from fertilizer had been linked to the proliferation of HABs and methods to decrease runoff had been established in BMPs and model ordinances. Standards for education of applicators, periods of non-application, intensity of fertilizer treatments, and regulation of use based on the location of water resources and drainage underpinned the effectiveness of the regulations. The unanswered questions for municipalities were the severity of the use restrictions and the scope of enforcement actions.

As several jurisdictions in close proximity sought to regulate fertilizer use over the past twelve months, proposed and adopted regulations often relied on ordinances already proposed by another jurisdiction. Sanibel Island adopted regulations similar to SWRPC's model. The City of Sarasota regulations explicitly mirrored Sarasota County. The City of Jacksonville delayed adoption pending the release of the model ordinance promulgated by FDACS' Consumer Fertilizer Task Force. However, the ordinances reviewed contained many similar key components including standards for fertilizer application, education and training, site planning, and exemptions for specific uses.

Twelve jurisdictions required education or training as part of their occupational licensing process to ensure that commercial applicators knew the new fertilizer use regulations or BMPs. A licensee must show that a staff person within its commercial enterprise completed the requisite number of credit hours or coursework on BMPs and the local regulations to receive an occupational license. This requirement was mandatory in all local jurisdictions, except the City of Cape Coral ordinance, which recommended education. FGIM, and the FDEP 2003 and the FDACS 2008 model ordinances recommended mandatory licensing based on continuing education.

Regulations almost unanimously provided for prohibited application or "blackout" periods, restrictions of the levels of phosphorous and nitrogen in the fertilizer, and the relative mix of slow release nitrogen in fertilizer. Blackout periods were enacted to prevent the spread of fertilizer washed from saturated soil into open waters during the rainiest months of the year, which coincided with the summer months in Florida. FGIM identified July 1 through September 30 as the window of likely high rainfall amounts. However, the manual suggested prohibiting fertilizer application only for an imminent threat of heavy rain. FGIM's recommendations mirrored those contained in the Institute of Food and Agricultural Sciences' (IFAS) *General Recommendations for Fertilization of Turfgrasses in Florida* published in 1991.³³ Although revised in May 2007, its original recommendations continued to be incorporated into manuals and ordinances seventeen years later. FDEP repeated these recommendations in its model ordinance.

FDACS' model ordinance followed a unique path, recommending non-application periods based on definable weather events, including flood and tropical storm watches and warnings, a three-day "cone of uncertainty," or in the expectation of heavy rain. The method by which to enforce non-application periods based on weather-driven benchmarks was not provided.

All local regulations maintained either a June 1 or July 1 start date for the blackout period and an end date of September 30/October 1, except the City of Jacksonville, which proposed a variation that allowed the application of fertilizers containing at least 70% slow release nitrogen between June 15 and September

³³ UNIVERSITY OF FLORIDA INSTITUTE OF FOOD AND AGRICULTURAL SCIENCES (IFAS), GENERAL RECOMMENDATIONS FOR FERTILIZATION OF TURFGRASSES IN FLORIDA, Document SL-21 (2007) available at <http://edis.ifas.ufl.edu/LH014>.

15. Local weather differences between the northeast corner of the state and the southwest coast may explain the variations.

In addition to blackout periods, intensity of fertilizer application formed the other overarching restriction among the jurisdictions. The intensity of fertilizer use enjoins three concepts: time, area, and strength of dosage. These concepts combined to form eight types of regulations as shown in the matrix: maximum phosphorous strength, maximum nitrogen per application, maximum applications of nitrogen per year, maximum nitrogen levels allowed per area per year, maximum nitrogen levels applied per year, maximum total nitrogen, restriction of total number of applications per year, and the required use and percentage of slow-release nitrogen. Many of the nitrogen restrictions overlapped.

FGIM recommended a phosphorous component of no more than 2%. This standard was followed by FDEP, SWRPC, and Sanibel Island. Neither St. Johns County nor the City of Naples regulated the use of phosphorous. Starting with Sarasota County in August 2007, all of the southwest Florida jurisdictions except the City of Cape Coral adopted a maximum phosphorous application standard of 0.25 pounds per 1,000 square feet per application and 0.50 pounds per 1,000 square feet per year. FDACS' standards and the proposed standards of Marion County and the City of Jacksonville returned to the 2% standard originally stated in the FGIM BMPs.

FGIM recommended that 0.50 pounds of nitrogen per 1,000 square feet per application as the standard for the maximum nitrogen used, unless a minimum of 50% of the nitrogen content was slow release nitrogen. If the 50% standard was met, then the recommended amount was one pound per 1,000 square feet per application. These standards remained consistent throughout the local regulations; however, the regulation was written in two different ways dependent on whether the ordinance required a minimum of 50% slow release nitrogen in all fertilizer. If a slow release minimum was required, then the standard required was one pound of nitrogen per 1,000 square feet per application. Those guidelines and ordinances that did not require a slow release minimum, allowed for the application of one-half pound of any type of nitrogen per 1,000 square feet and up to one pound if at least 50% was slow release. The City of North Port was the lone exception, stating that the application amount of fertilizer should be the "lowest rate necessary" per application.³⁴ The term "necessary" was not defined.

Six jurisdictions limited nitrogen application amounts to four pounds per year for every 1,000 square feet per year. Charlotte, Lee, and Marion County, and the City of Jacksonville specified limits based on the type of turf. The FGIM manual recommended standards based on the level of maintenance necessary to achieve the desired result. Basic, moderate, and high maintenance levels set limits of zero to two pounds, two to four pounds, and four to six pounds of nitrogen per 1,000 square feet per year, respectively. The 2003 FDEP model ordinance adopted this language by reference.

The regulation of a total amount of nitrogen content applied to turf was specifically regulated by eleven of the fifteen documents reviewed. SWRPC and Sanibel Island distinguished the total nitrogen allowed per use from the maximum annual amount. These jurisdictions limited the total amount of nitrogen to 20% of the fertilizer.

Only SWRPC and Sanibel Island regulated the total number of fertilizer applications per year, allowing no more than six applications per year. St. Johns County and the City of Jacksonville restricted fertilizer applications to no more than every twenty days, the only jurisdictions to regulate the timing of applications.

³⁴ North Port, *supra* note 23, § 8.03.

FGIM guidelines recommended applying fertilizer that contained at least 50% slow release nitrogen. However, the FGIM model ordinance recommended requiring slow release nitrogen fertilizer only in environmentally sensitive areas. Of the six other jurisdictions that required specific percentages of slow release fertilizer, five adopted the 50% rule. Only SWRPC recommended a different percentage (70%), while five of the seven signatories of that regional guideline enacted a 50% standard (Sanibel Island, Sarasota County, City of Sarasota, Charlotte County, North Port).

Both FGIM and FDEP model ordinances recommended the application of the IFAS SL-21 standards³⁵ for fertilizer containing a minimum of 50% slow release nitrogen. The FDAS model ordinance relied on FGIM's recommendations. Marion County's proposed ordinance tied the amount of slow release nitrogen to the overall amount of fertilizer allowed for every 1,000 square feet. If more than 50% of the fertilizer was slow release, then the applicator may use one pound of fertilizer per 1,000 square feet. If the amount of slow release nitrogen was less than 50%, then the applicator may spread no more than one-half pound of fertilizer per 1,000 square feet. Regulation of the amount of nitrogen per application, the maximum nitrogen applied per year, the maximum total nitrogen content allowed, and the amount of slow release nitrogen content may overlap in some cases, possibly creating confusion for commercial and private applicators.

Local governments traditionally use site planning techniques to regulate the location of structures, at-grade improvements, and plants and landscaping in relation to structures, neighboring properties, infrastructure, and natural resources.³⁶ Local land development regulations (LDR) typically contain these techniques and landscaping requirements. Site planning as a means to control nutrient runoff was virtually ignored by the FDACS model ordinance and all local ordinances. A line item in the matrix highlights whether the adopted regulations affected land development regulations. If the fertilizer regulations are not included in the local government's LDR, the regulations will probably not become part of an overall scheme to address fertilizer impacts, the method suggested by the FDEP guidelines. This omission would tend to lessen the effectiveness of adopted regulations to improve water quality. Although not part of a comprehensive site planning process, local jurisdictions did adopt a few inter-related site planning techniques, such as buffer zones, bans near impervious surfaces, and the use of deflector shields.

Buffer zones minimize runoff into bodies of water and wetlands.³⁷ Two adopted methods of buffering addressed two separate problems. The first method prohibited the application of fertilizer within a specific distance of a water body. Thirteen of the fifteen ordinance supported buffer zones. Five jurisdictions adopted and FDACS recommended a ten-foot buffer. SWRPC and Sanibel Island adopted a 25-foot buffer zone, the largest area, and Cape Coral enacted a 15-foot zone. FGIM, FDEP, St. Johns County, and Lee County proposed 10-foot no fertilizer zones if a deflector shield was not used, reduced to three feet with the use of a deflector shield. No other regulations provided for a reduction in the zone based on the use of deflector shields. The goal of avoiding direct discharges of fertilizer into a water body also pertained to the second type of buffer, no maintenance or low maintenance zones.

The purpose of a no/low maintenance zone is to trap nutrients in a vegetative buffer before discharging into a water body or drainage.³⁸ No jurisdiction mandated the establishment of these no/low maintenance zones and only Sarasota County and the Cities of Sarasota and North Port referenced this type of zone. The City of North Port recommended a distance of six feet. The FDEP model ordinance provided for 6-

³⁵ See note 33, *supra*.

³⁶ FDEP 2003, *supra* note 19.

³⁷ LEE COUNTY (FL) DIVISION OF NATURAL RESOURCES, SCIENTIFIC LITERATURE REVIEW, DISCUSSION, PUBLIC COMMENTS, AND CONSIDERATIONS FOR THE PROPOSED LEE COUNTY LANDSCAPE AND FERTILIZER BEST MANAGEMENT PRACTICES ORDINANCE (Oct. 2007).

³⁸ *Id.* at 11.

foot no-maintenance zones, except when adjacent to seawalls or bulkheads, or for erosion prevention. FDACS' model ordinance "strongly" recommended a 6-foot no/low maintenance zone. This is the one analyzed criteria where the FDACS model ordinance appeared to be more prohibitive than the majority of local jurisdictions.

The prohibition of fertilizer runoff from impervious surfaces was another method to keep nutrients out of water bodies. Eight jurisdictional ordinances and the SWRPC prohibited the intentional or unintentional release of fertilizer onto impervious surfaces. The subject was not addressed by four local ordinances (Naples, Cape Coral, Marion, and Jacksonville). All three state guidelines recommended this prohibition. As in buffer zones, deflector shields help direct fertilizer distribution away from impervious surfaces.

The FGIM manual recommended deflector shields. The FDACS model ordinance recommended their use only for rotary spreaders. Eight of the remaining fourteen ordinances required the use of deflector shields. Variations on the initial blanket requirements for the use of shields were the inclusion of types of spreaders, and required distances from water bodies and impervious surfaces.

The type of spreader regulated may confuse applicators. FGIM recommended shields without specifying a type of spreader. Charlotte County required deflector shields on "broadcast spreaders" and FDACS recommended regulation of "rotary spreaders." Whether the difference in terms proves inconsequential to applicators working in multiple jurisdictions remains to be determined.

Most ordinances and guidelines exempted certain fertilizer uses from regulation, typically for new or damaged turf and landscaping, vegetable gardens, mulch and composting, golf courses, and agricultural or ranch lands. Nine local jurisdictions allowed for the application of fertilizer to establish turf on new lawns and landscaping. FDACS uniquely recommended a booster shot, a one-time exemption for the application of one pound of fertilizer per 1,000 square feet. However, FGIM's and FDEP's statewide guidelines, and local regulations for vegetable gardens (SWRPC, City of Sanibel, and Lee County). SWRPC and Lee County exempted garden areas more than twenty-five feet from a water body. These three jurisdictions also exempted mulch and compost from regulation. The use of the term "exemption" mischaracterized the regulatory nature of fertilizer use for golf courses and agricultural lands. Although eight of the ordinances provided exemptions that incorporated their standards by reference, such as the City of Jacksonville, St. Johns County, and the Cities of Cape Coral and Naples, did not address the subject. Three ordinances granted exemptions for golf courses, these provisions deferred to statewide standards that regulated golf courses.³⁹ The same state regulation preemption policy held true for agricultural and livestock grazing exemptions.

Various factors determine the enforceability of fertilizer regulations. Adopted ordinances became codified in most jurisdictions' codes of ordinances, whether in the Land Development Code or in a separate section. In Naples, however, the guidelines passed as a resolution in support of a series of recommendations and, therefore, are not binding or enforceable. The code enforcement departments have responsibility for enforcing the local governments codes. Code enforcement provisions typically provide for fines and/or imprisonment. Code enforcement is often instigated by resident phone calls ("tips") to the departments. However, reliance on residential inquisitiveness to support enforcement of regulated amounts applied, amounts applied over extended time periods, and specific slow-release percentages, may prove difficult.

Enforcement tools for the local ordinances emanated from the ability of the local jurisdiction to license fertilizer applicators to contractually provide commercial services within the jurisdiction. Occupational licenses must be renewed annually providing a means to continually enforce the education and training

³⁹ FDEP, BMPs FOR THE ENHANCEMENT OF ENVIRONMENTAL QUALITY ON FLORIDA GOLF COURSES (Jan. 2007)

components of the code. No jurisdiction required that all applicators be trained, only that a licensed applicator be on-site to supervise other employees.

Commercial applicators working in more than one jurisdiction may encounter difficulties tracking applications and complying with different rules within different jurisdictions. For instance, seven local jurisdictions regulated the maximum nitrogen per 1,000 square feet, but only the Cities of Sanibel and Jacksonville limited the number of applications allowed per year. Tracking applications and making adjustments based on clients' individually desired level of turf "greenness" should prove challenging to commercial applicators and to government officials seeking to enforce the code. Whether the required education and training translates into proper application in the field remains to be determined.

D. Lessons Learned and Trends Discerned

The promulgation of regulations and recommendations at different levels of governance raises issues of consistency and geographical adequacy. The vertical interplay between federal, state, and local levels of government mixing with the horizontal interchange of terrestrial and marine responsibilities within these governance levels creates a complex matrix of laws and regulations of which fertilizer use is but a single component. For example, although the five state water management districts are charged with issues of water quality, FDEP retains "general supervisory authority" over the districts and, independent of the districts, over the TMDL program. FDACS also has a role in the TMDL program as the assigned developer of BMPs for agriculture and being charged with the development, administration, and enforcement of Florida's Commercial Fertilizer Law.⁴⁰

Local communities bear the brunt of HAB impacts, however, and this has led to the recent wave of fertilizer ordinances. Certain elements of these ordinances, like fertilizer composition requirements, may require harmonization with state and/or federal standards. Other elements, including BMPs, could easily vary in accordance with the needs and/or political preferences of specific municipalities. This would seem consistent with FDEP's approach to watershed management in terms of calibrating standards for individual watersheds and basins.⁴¹

As shown in the matrix above, the state and some counties and municipalities attempted to maintain current levels or decrease runoff from nutrient-laden fertilizer through the introduction of BMPs. The general process for drafting BMPs brings together a large group of stakeholders that hold public meetings to hear testimony from specialists and the public and incorporate these findings into a document on which a pre-selected majority approved. Inherent in the process is a series of compromises between different interest groups to achieve approval of the final document. Therefore, the standards agreed upon may not be based on the best science available or sufficient to accomplish desired reductions in fertilizer impacts. Most importantly, the BMPs reviewed promulgated voluntary action and avoided the task of recommending enforcement mechanisms.

The FGIM guidelines show the paradox between adopting statewide standards for local implementation and enacting local ordinances tailored to local characteristics. As a statewide guideline, recommendations address circumstances applicable to a large portion of the state. As discussed above, regulations for a geographic scope this large is probably less than optimal for local or regional situations if it does not provide for regional and local variations. Statewide regulation may forfeit the flexibility and adaptability inherent to local regulation.

⁴⁰ FRANK ALCOCK, MOTE POLICY INSTITUTE AT MOTE MARINE LABORATORY, AN ASSESSMENT OF FLORIDA RED TIDE: CAUSES, CONSEQUENCES, AND MANAGEMENT STRATEGIES (Aug. 2007).

⁴¹ *Id.* at 26.

Areas that suffer large HAB and red tide episodes may need more drastic and immediate intervention than non-impacted areas to stave off further economic losses. As the following language demonstrates, FGIM recognized the limitations of the broad application of its provisions:

This document should be used to enhance the professional knowledge and judgment of turfgrass and landscape managers, and should not be viewed as a regulatory standard to be rigidly applied in all cases. Turfgrass and landscape managers should use the information provided here as general guidance, but specific situations may require more restrictive measures to protect sites that are at particularly high risk for adverse effects on surface water and ground water.⁴²

The implementation of mandatory requirements and stronger language represents one of the most significant trends in local ordinances over the past five years. However, the benefits of local customization may be offset by local political concerns, omitting or watering down scientifically accepted standards. The path of least resistance for many local governments could be to adopt the BMPs promulgated by a state agency. In theory, local regulations reflect the best management practices for the jurisdiction while statewide BMPs encompass a statewide scope that provided generally applicable rules. Before the state moves toward mandatory standards, the question of whether state rules will preempt more stringent local regulations needs to be answered.

Another problem with enacting best local practices arose from the manner in which jurisdictions create local regulations. A benefit of not being first in time to adopt an ordinance rests in the ability of the latter jurisdiction to review the performance of other ordinances, and to add or omit attributes based on their functionality while also incorporating newer scientific findings. However, by shadowing previously adopted regulations local governments risk losing the ability to adopt more efficient techniques.

All BMPs and local regulations reviewed ignore important territorial areas affecting water quality: watersheds and water basins. Most major watersheds stretch far beyond a single county line, much less municipal limits. Florida recognized the importance of watershed management more than twenty years ago when the state legislature divided the state into five regional water management districts, under the oversight of FDEP, for the protection of the state's waters. The size of the areas managed by these districts provided the size necessary to encompass whole or large portions of watersheds. The water management districts also possess the regulatory clout to adopt and enforce rules and regulations. Although the management districts participated in the development of statewide standards and published regional guidelines, rules regulating the use of fertilizers throughout a watershed, except for the Everglades, have not been adopted. This omission must be addressed in the future to achieve desired state and local goals, an omission that the forthcoming implementation of TMDL standards may resolve. However, BMPs developed for other multi-jurisdictional circumstances, e.g. watershed and hydrological boundaries that cross local jurisdictional boundaries, may be inconsistent with local regulation. Local ordinances without the participation of all jurisdictions in a watershed might help, but the gains will be negated by the weakest ordinance in the basin.

That a major impetus for local regulation came from the SWRPC suggests that the member jurisdictions found state guidelines inadequate to meet local conditions or, at least, local public perceptions. These jurisdictions, however, recognized the importance of enacting a regulatory scheme of regional scope to protect Florida's waters. Regional Planning Commissions (RPC) typically focus on growth-related regional concerns including concurrency, traffic, housing, and the environment. However, local jurisdictions still must adopt the regulations separately as part of their codes of ordinances because an RPC does not have legislatively delegated powers like the Water Management Districts. Still, only nine of the twenty-two member governments have adopted fertilizer use ordinances.

⁴² FGIM, *supra* note 16.

The progression of the provisions enacted or proposed from 2003 to 2008 show minimal adaptations to fertilizer use regulation since 2002. The generally accepted methods then, remain the methods in 2008. Public education was a common component among all ordinances and guidelines. Local jurisdictions established education programs for the public extolling application guidelines, point-of-sale literature, and training and licensing of commercial applicator personnel, promotion of slow release fertilizer, and the adoption of statewide BMPs.

Most jurisdictions outside of the SWRPC, which enacted the most stringent regulations in the state, adopted the less-restrictive state guidelines proposed by FGIM and the FDEP 2003 model ordinance, although omitting the broad site planning approach put forth by the FEDP. Of the three SWRPC county jurisdictions considering fertilizer regulations more stringent than the State guidelines in May 2007, only Sarasota County enacted new fertilizer regulations that year. Although explicitly waiting for the publication of the FDACS model ordinance, the other two counties, Charlotte⁴³ and Lee⁴⁴, adopted fertilizer use ordinances in March and May 2008, respectively, that were similar to Sarasota County's.

The length of time from the first ordinance proposed to final adoption for Charlotte and Lee Counties coincided with a lack of a significant red tide episode in 2007 and suggested a relationship between the time removed from a significant HAB event and the level of regulation of fertilizer use. Lee County's original ordinance followed the SWRPC model, while the October 2007 draft followed the less restrictive standards of FGIM. The most recent draft offered the County Commission two options, the FDACS model or the Sarasota County model.

Charlotte County decided to postpone adopting an ordinance pending the release of FDACS report. Even though the County waited, its adopted ordinance did not follow the FDACS model. Instead the County enacted more restrictive regulations, including a tiered level of fines up to \$500 for the third offense. Considering that Lee and Charlotte Counties were signatories of the SWRPC guidelines and should have benefited from the momentum of that agreement, the lag in time from initial direction by elected officials to enactment of an ordinance suggested that the lack of an HAB event might have impacted the level of regulation. However, the ordinances that Charlotte County and Lee County adopted counter the argument that a relationship existed between the time lapsed from an HAB event and the severity of the regulation. Other jurisdictions that postponed reviewing regulations until the release of FDACS Consumer Fertilizer Task Force report should move ordinances forward in the coming months. Whether these jurisdictions will enact rules patterned on FDACS will be determined as the rules are drafted.

The future of regulating homeowners and other private self-applicators is unclear. Residential fertilizer runoff appears to be a significant contributor to nutrient loads in surface water. A 2004 study of nitrogen loading of the Wekiva Springs (a.k.a. Wekiwa Springs) watershed found that 42 percent of all nitrogen inputs into the basin waters came from residential uses.⁴⁵ The findings suggest that nutrient runoff into the state's coastal waters from residential sources would increase significantly as a result of the state's rapidly growing population over the last several years. A Lee County study supported this suggestion finding that residential fertilizer sales between 1998 and 2006 increased from 5,238 tons to 20,420 tons or 290 percent.⁴⁶ These studies highlight the importance of private homeowners in the introduction of nutrients into coastal waters.

⁴³ Charlotte County, *supra* note 23.

⁴⁴ Lee County, *supra* note 23.

⁴⁵ Lee County, *supra* note 35.

⁴⁶ *Id.*

The impact of all of the reviewed ordinances on private homeowners appeared minimal. Although twelve of the guidelines and ordinances required that private homeowners follow BMPs, at a minimum, all lacked enforcement provisions. In addition, self-applicators faced the difficulty of understanding the technical provisions of FGIM's 66-page document, also referenced by FDACS, and other BMP manuals designed for professional landscapers.

Public hearings provided valuable insight into the general public's concerns about not being able to fertilize *their* lawns and how private property rights often framed the discussion. These concerns became magnified in the context of a subdivision with a homeowners association where neighborhood aesthetics and property values clashed with private property rights. The impact of these fertilizer regulations on homeowners associations appeared minimal. Whereas multi-family developments generally employ professional landscape companies that must comply with fertilizer use regulations, homeowners often self-fertilize their lawns. Deed restrictions and homeowner association agreements sometimes require that a level of aesthetic desirability be maintained on all parcels in the subdivision. The "greenness" of the lawn may be one requirement. Therefore, homeowner associations might be at odds with sound fertilizer application practices. However, they might also play a valuable role in implementing best practices that would significantly improve the amount of nutrient runoff to the benefit of Florida's coastal waters.

III. The Role of Homeowner's Associations

At first glance it might appear that municipalities occupy the bottom rung of a hierarchy of governance levels that affect fertilizer use. Upon closer inspection, however, it becomes apparent that more localized governance institutions like homeowner associations can have a greater impact on the behavior of residential homeowners than municipalities, states and the federal government. The most salient of these institutions is the homeowner association (HOA); other relevant entities include more informal and community and neighborhood associations as well as community development districts (CDDs). It is estimated that over 2 million Florida residents live under some form of homeowner, neighborhood or community association.⁴⁷

Homeowner's associations (HOAs) are governed by Chapter 720 of the Florida Statutes. This chapter governs the ways in which HOAs can be formed and how they in turn govern their members. Questions have been raised about the ability of municipalities and counties around the state of Florida to enforce the fertilizer ordinances that they have passed. HOAs may prove instrumental in the effort to ensure that ordinances can be effective. In addition, permitting agencies can work with HOAs in ways that would facilitate the realization of the goals articulated in the ordinances.

HOAs collect dues from the homeowners in their subdivisions and utilize that money for improvements and upkeep of the shared areas of the community. HOAs are originally formed by the developer that is constructing the subdivision, and are then turned over to the homeowners three months after the development is 90% complete or until such time as is set out in the Master Declaration and documents.⁴⁸ The developer is responsible for writing the initial Master Declaration and documents, and is also responsible for articulating the binding restrictive covenants of the community as well as obtaining permits from the Department of Environmental Protection, the regional Water Management District, and the local municipal or county government. The homeowners on the newly established board of the HOA can vote to vacate certain conditions articulated within the Master Declaration, but restrictive covenants "run with the land" and not the person, and HOAs are also required to follow permits entered into by the developer with governing agencies.

⁴⁷ Florida Coalition of Community Associations, <http://www.cocafli.org/>.

⁴⁸ See F.S.S. 720.307 (1)

Community and/or neighborhood associations are informal groups similar to HOAs but voluntary in nature. These groups identify themselves with a common area of a municipality or an unincorporated area of a county that usually does not have an HOA, although these associations can also exist alongside HOAs. Community associations have the ability to have public meetings, to lobby local governments and politicians, and to take a more informally active role in rallying their communities to embrace voluntary guidelines set out by the various state agencies. Community and neighborhood associations are weaker than HOAs in that they have no legal power to enforce agreements or restrictions on its members.

CDDs are another governance entity that is governed by Chapter 190 of the Florida Statutes. CDDs usually encompass large areas of territory that may include many different communities and HOAs. CDDs have a board of directors, and are responsible for managing all common areas held by the CDD, upkeep of all roads, wetlands, ponds, lakes, and other natural features of the CDD held area. CDDs are responsible for meeting state and federal guidelines regarding fertilizer application, wetlands and discharge permitting, and cultural resource preservation. This places the CDDs in the best position to create and enforce rules relating to discharge, runoff, and the other factors that affect fertilizer use. Homeowners pay a monthly fee to CDDs, in a manner similar to the way in which HOAs operate. The weaknesses of CDDs lie in the fact that they are narrowly construed and regulated by the provisions of Chapter 190 and have to rely on their homeowners and HOAs if there is a desire to educate the community, hold community events, or attempt to rally a community around a cause. There are ambiguous clauses within Chapter 190 that could be read to allow CDDs to hold such events as long as they were on CDD-held property, but the clauses remain subject to different interpretations.

Collectively, CDDs, HOAs and community and neighborhood associations represent a set of intervening governance institutions that mediate the impact of fertilizer ordinances on individual behavior. In some ways these institutions can blunt the impacts of ordinances passed by local municipalities but they also hold the potential for enhancing them. The only section of the Florida Statutes dealing with an area directly related to the fertilizer ordinances is § 720.3075, which forbids HOAs from prohibiting Xeriscape⁴⁹ or other Florida-friendly lawns. This provision ensures that HOAs cannot interfere with environmentally-conscious homeowners who choose to install Xeriscape.

However, there is nothing in the statute that prohibits HOAs from requiring homes that have grass to only plant certain types of grass (i.e., crabgrass or St. Augustine) or that the grass must be well-kept and free from large brown or dirt spots. Were an HOA to require these actions, as many do, it can and does lead to conflict with the goals articulated by the fertilizer ordinances, even though HOAs are required to respect the fertilizer ordinances in addition to individual homeowners. Legally, HOAs cannot prohibit homeowner compliance with municipal ordinances. They can, however, create conditions that dampen homeowner appetite for significant behavioral change. HOAs can serve as an obstacle to behavioral change by perpetuating a homeowner culture that values conformity with the ideal of a well-manicured, green lawn.

Conversely, HOAs, as well as community and neighborhood associations, hold considerable potential for facilitating change. Legally, Chapter 720 of the Florida Statutes could be amended to forbid HOAs from requiring certain types of grass, requiring the HOAs to pursue BMPs as set forth by various state agencies or to include other environmentally-friendly provisions. Enforcement of such measures could prove difficult, however, and could trigger an antagonistic backlash by property conscious HOAs. A more politically viable approach might include a combination of BMP requirements within the statute or

⁴⁹ Xeriscape is “a landscaping method developed especially for arid and semiarid climates that utilizes water-conserving techniques (as the use of drought-tolerant plants, mulch, and efficient irrigation).” Merriam-Webster Online Dictionary, <http://www.merriam-webster.com/dictionary/xeriscape> .

permitting documents and a concerted educational and political effort to enlist HOAs and their members as partners in the effort to ensure that the new ordinances are followed.

Through permitting contracts and restrictive covenants, state agencies and the HOAs themselves could play a major role in implementing the current ordinances as well as taking steps to curtail the amount of urban stormwater runoff that currently plays a major role in contributing to the overload of phosphates and nitrates in state water bodies and exacerbates the HAB problems existing in offshore waters and the Florida Everglades. Permits already require HOAs to ensure compliance with BMPs; they could also be adjusted to require compliance with different conditions laid out within model ordinances and guidelines articulated by state and federal agencies. In addition, HOA permits could hold the HOAs to the same standards of education regarding fertilizer application as the ordinances currently hold commercial applicators and landscapers.

If a concerted political effort was made to educate the associations about the need for fertilizer restrictions and the role of the community in HAB prevention, HOAs could play a major role in ensuring the viability of the fertilizer ordinances. The HOAs could incorporate the ordinance requirements into their Master Declarations and could take more restrictive steps that ordinances could not. HOAs also could play a major role in educating their homeowners about why the restrictions are so important, and why homeowners should be voluntarily restricting their fertilizer usage.

Permitting agencies such as the FDEP, the Army Corps of Engineers, and the water management districts can build provisions into their permitting schemes that will require HOAs and CDDs to live up to BMPs within their communities. All of the entities mentioned can be active in communities and attempt to achieve political awareness and change in the effort to deal with nutrient loading associated with fertilizer use and its impacts on coastal resiliency.

IV. Conclusion

During the past five years, the state of Florida witnessed a wave of fertilizer ordinances enacted by municipal governments. This article attempts to analyze some of the observable trends in the evolving wave and assess their prospects for improving coastal resiliency. We provide a matrix that illuminates a number of common elements across most if not all of the ordinances. These include an educational component, various application standards and site planning practices, exemption criteria, and enforcement mechanisms.

Between the two generally accepted approaches adopted by the municipalities, the state and SWRPC models, considerable variation exists with respect to the content of these components, especially with respect to application standards, enforcement, and site planning practices. While there is some evidence of proliferation with respect to some of the ordinance components it would appear that the substantive terms of each ordinance are tailored to accommodate both political and ecological conditions within each municipality.

There does not appear to be a clear trend towards expanding the scope or increasing the stringency of the ordinances over time. In fact, in the early stages of this article's preparation it seemed as if the Sarasota County ordinance would be the high watermark of ordinances in terms of scope and stringency. However, the most recently approved ordinances in Charlotte and Lee Counties suggest that such conclusions are premature. Considerable uncertainty remains regarding the reaction of different municipalities to the model ordinance recommended by the FDACS Consumer Fertilizer Task Force as well as that of state legislators in future sessions. Time will tell with respect to the evolution of future ordinances.

With respect to the ultimate impact of Florida's fertilizer ordinances on coastal resiliency, we argue that it will be critical to nest the ordinances within an evolving hierarchy of governance institutions that include Florida's Watershed Management Programs operating on scales that integrate multiple municipal jurisdictions as well as HOAs and CDDs that operating on much smaller scales. Creativity on the part of these private quasi-governmental entities will be essential if the ordinances are to effect lasting and worthwhile change.

**Resistance to Resilience:
Coastal Hazard Policy, Science & Planning in New Jersey¹**

John R. D'Agostino²

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I. Introduction

Although New Jersey is the fourth smallest state in the United States, its high population density and physiographic diversity make it a unique landscape through which to view coastal hazard policy. More than eight and a half million people presently reside in New Jersey's coastal counties, a 21% increase since 1980.³ Roughly bounded by New York City to the north and Delaware Bay to the south, the state's coastal area is largely comprised of low-lying barrier islands and tidal marshes, interrupted by geologic headlands in northeastern Monmouth County and southern Cape May County, totaling 1,792 linear miles altogether.⁴ In the past fifty years, New Jersey has been impacted by an array of nor'easters, tropical storms, and intense rain events that have caused extensive damage throughout the shore area, in some instances washing away sections of communities and reshaping barrier island systems within single tidal

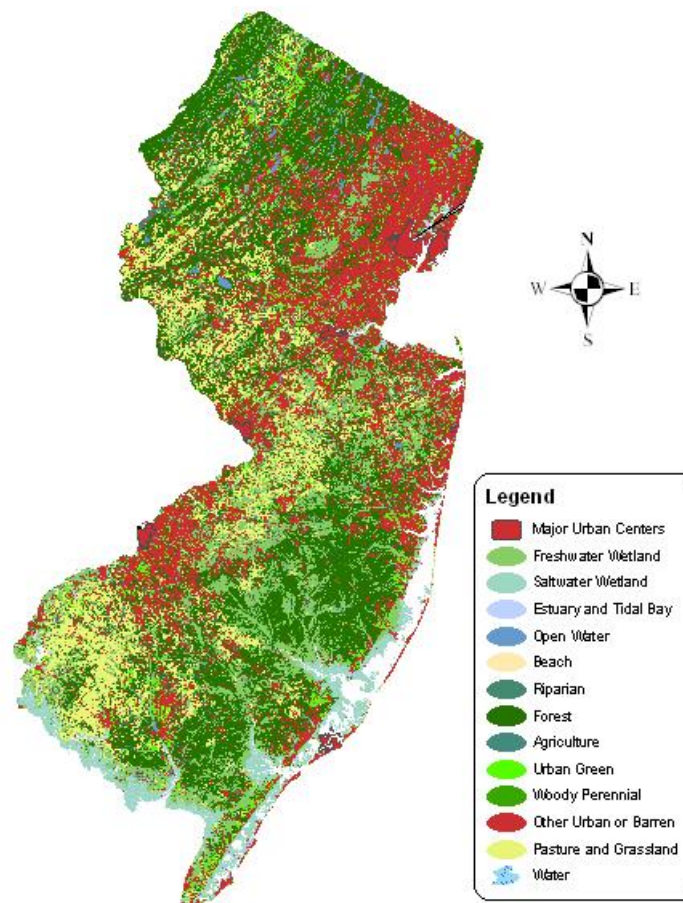
¹ This paper was presented during the Sea Grant Law and Policy Journal's inaugural symposium on Coastal Resiliency held on March 25–26, 2008 at the University of Mississippi in Oxford, Mississippi. Coastal resiliency refers to the ability of coastal cities, towns, and communities to adapt to and recover from natural hazards, including hurricanes, tsunamis, floods, and disease epidemics. Seven authors were selected to present papers on a wide range of topics related to coastal resiliency. Powerpoint presentations and additional information about the symposium are available at <http://www.olemiss.edu/orgs/SGLC/National/SGLPJ/SGLPJ.htm>.

² N.J. Coastal Planning Office.

³ NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA), POPULATION TRENDS ALONG THE COASTAL UNITED STATES: 1980-2008 (2004).

⁴ B.R. COLLINS AND K.H. ANDERSON, PLANT COMMUNITIES OF NEW JERSEY: A STUDY IN LANDSCAPE DIVERSITY (1994).

cycles.⁵ While much of New Jersey's coastal landscape remains highly susceptible to tidal flooding during strong storm events, the region's population has continued to swell, expanding the interface between natural and human systems. In many areas, where extensive natural areas once existed, residential and commercial development has taken over. More recently, large portions of the coastal landscape have been transformed from small, year-round residential neighborhoods to high-end vacation communities for second-home owners, exacerbating the exposure of people, property, and infrastructure to potential loss.



New Jersey Statewide Land Cover (1995)

New Jersey's approach to statewide resilience policy has been a multi-layered regulatory and planning effort that seeks to support a variety of hazard mitigation efforts across a diverse coastal zone. The complex interplay of New Jersey's physiographic regions and population patterns over many decades has yielded a densely populated, near-sea level metropolitan population to the north, more moderate urban and suburban development along the Atlantic barrier island and back bay central regions, and a more sparsely populated, extensive wetlands area along the state's southern Atlantic and Delaware Bay coasts. A myriad of regulatory tools and authorities have been developed to manage these diverse coastal areas, requiring extensive coordination of state mitigation efforts with respect to coastal hazards.

⁵ N.P. PSUTY AND D.D. OFIARA, COASTAL HAZARD MANAGEMENT, LESSONS AND FUTURE DIRECTIONS FROM NEW JERSEY (2002).

II. New Jersey Coastal Management

To develop an integrated framework of coastal management, New Jersey's Coastal Management Program was established as the regulatory and planning arm of the federal Coastal Zone Management Program in 1978, integrating the overarching policies of the state's Coastal Area Facilities Review Act of 1973 (CAFRA),⁶ the Waterfront Development Law,⁷ the Wetlands Act of 1970,⁸ and the Tidelands Act.⁹

The overarching goal of the Coastal Management Program is to address:

the complex coastal ecosystem as a whole, integrating goals and standards for protection/enhancement of natural resources, for appropriate land use and development and for public access to and use of coastal resources.¹⁰

Passed prior to the establishment of New Jersey's Coastal Management Program, the Wetlands Act of 1970 requires the New Jersey Department of Environmental Protection (NJDEP) to regulate all development on lands near tidal water, due to the likely presence of coastal wetlands either on-site or nearby. At present, 15% of New Jersey's landscape, approximately 700,000 acres, exists as freshwater wetlands.¹¹ Although much of the state's coastal region is characterized by tidal and freshwater ecosystems, NJDEP estimates that 39% of its original wetland area was lost from 1870 to 1970, and despite the State's targets to increase net wetland acreage in the state, estimates continue to indicate a wetland loss rate of 1020 acres per year (although this represents a 52% decrease in wetland loss from prior assessments).¹²

The coastal area in northern New Jersey, notably Hudson and Essex counties, consists largely of urbanized impervious surface and shoreline bulkheading, past zoning policies having encouraged dense settlement patterns in close proximity to the large mosaic of fluvial wetlands known as the Meadowlands. South of the Meadowlands along the Arthur Kill tidal strait separating New Jersey and Staten Island, the coastal area remains highly developed, albeit more sparsely, down to the southern edge of Staten Island where the Raritan River enters lower New York Bay, with the region dominated by the Port Elizabeth and Port Newark shipping terminals.

In the region south of the Cheesequake Creek – Raritan River confluence, coastal management jurisdiction is accomplished through the enforcement of the Wetlands Act and CAFRA. The landward distance of New Jersey's CAFRA delineation ranges throughout the southern half of the state from a few thousand feet to approximately twenty-four miles, providing jurisdiction over more than fifty communities and approximately 963 square miles of the state's Atlantic Ocean and Delaware Bay coasts. The landward extent of the CAFRA zone follows an irregular line determined by public roads, railroad tracks, and natural landscape features incorporating much of the wetlands and tidelands regions throughout the outer coastal plain. Within this area, proposed development is regulated with increasing degrees of scrutiny, contingent upon the construction's proximity to tidal water bodies. More specifically, coastal zone types classified as "high hazard," "erosion hazard," and "flood hazard" are

⁶ N.J. STAT. ANN. § 13:19-1 *et seq.*

⁷ *Id.* § 12:5-1 *et seq.*

⁸ *Id.* § 13:9A

⁹ *Id.* § 12:3-1 *et seq.*

¹⁰ N.J. ADMIN. CODE § 7:7E.

¹¹ R.G., LATHROP, MEASURING LAND USE CHANGE IN NEW JERSEY: LAND USE UPDATE TO YEAR 2000. A REPORT ON RECENT DEVELOPMENT PATTERNS 1995 TO 2000 (2004).

¹² *Id.*; NEW JERSEY SUSTAINABLE STATE INSTITUTE, LIVING WITH THE FUTURE IN MIND (3d ed. 2004).

subject to unique regulations based on an understanding of those regions' hazard vulnerability from past episodes of coastal flooding and storm surge.



New Jersey Coastal Area Facilities Review Act Region

Overall, CAFRA prohibits development in coastal high hazard areas with the exception of single family and duplex infill developments that must meet two specific standards. In the first standard, proposed developments must be sited at a distance greater than 500 feet from the mean high water mark of the affecting water body. In the second, an exception may be granted if the cross-sectional volume of the primary frontal dune between the proposed development site and affecting water body exceeds 1100 square feet, the area most recently deemed by the Federal Emergency Management Agency (FEMA) as necessary to provide an effective barrier to 100-year flood events and associated wave action.¹³

¹³ 44 C.F.R. § 65.11; N.J. ADMIN. CODE § 7:7e – 7.2 et seq.

Erosion hazard areas are defined as those regions anticipated to erode over a certain period of time based on best available erosion rates. Present Coastal Zone Management Rules proscribe time horizons of thirty years for one to four unit dwelling structures and sixty years for all other structures in both developed and undeveloped regions. The erosion hazard areas extend inland from either the most landward stabilized upland area, the crests of coastal bluffs or unvegetated dunes, or the first vegetation line from the water for vegetated dune areas. If the area in question does not have dunes, the erosion hazard areas are measured from the eight foot contour line (as defined relative to National American Datum 1983).¹⁴

While erosion hazard areas are New Jersey's version of rolling setbacks, two scale issues emerge. First, erosion rates used to estimate the extent of future erosion is based on one-mile sampling intervals, valuable for regional assessments, but often less so for municipal officials addressing localized erosion at the block group or parcel level. Secondly, the rules are based on past erosion trends that may not reflect potentially accelerated erosion rates due to sea level rise due to human climate forcing. In light of recent scientific assessments addressing the potential for such complex interactions,¹⁵ the Coastal Management Office is well served in continuing to monitor and address policy concerns regarding the impact of coastal sensitivity in erosion hazard zones.

In New Jersey, hazard mitigation efforts must be perceived through the lens of municipal "home rule" authority, which extends to municipal governments "the fullest and most complete powers possible over the internal affairs of such municipalities for local self-government."¹⁶ This authority extends such that while extensive resources have been allocated towards past hazard mitigation efforts, success in effecting consistent hazard mitigation is strongly predicated on the willingness of local governments to consider state goals in their land use considerations. Planning and regulation within different coastal zone areas is therefore reflective of both past development trends and the potential impact of anticipated future hazards.

In order to promote and support resilient coastal development, planners must have a comprehensive understanding of both current risks and anticipated future scenarios based on present biophysical and socio-economic landscape trends. As Honeycutt & Mauriello note, "sustainable, hazard-resistant coastal development (and redevelopment), must be carried out with . . . knowledge of the interrelationships and consequences of the development practices employed."¹⁷ Accordingly, resilience is a multi-faceted and constantly evolving process in coastal regions, a pursuit that demands redundancy, diversity, efficiency, autonomy, strength, interdependence, adaptability, and collaboration.¹⁸

III. New Jersey Coastal Resiliency Planning

A. State Land Acquisition

Within the framework of coastal regulation, state and local governments are charged with different responsibilities in addressing coastal resilience planning. At the state level, the State Planning Commission was established in 1985 and is charged with preparing, revising, and readopting New

¹⁴ N.J. ADMIN. CODE § 7:7e – 3.19.

¹⁵ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, FOURTH ASSESSMENT REPORT (AR4). (2007).

¹⁶ N.J. STAT. ANN. § 40:42 *et. seq.*

¹⁷ M.G. Honeycutt and M.N. Mauriello, *Multi-Hazard Mitigation in the Coastal Zone: When Meeting the Minimum Regulatory Requirements Isn't Enough*, in Conference Proceedings of Solutions to Coastal Disasters 2005 176, 71 (2005).

¹⁸ D.R. Godschalk, *Urban Hazard Mitigation: Creating Resilient Cities*. NATURAL HAZARDS REVIEW 4(3): 136–143 (2003).

Jersey's State Plan every three years utilizing "cross-acceptance" to incorporate the needs and interests of impacted, nearby communities in regional decision-making.¹⁹

The State's open space acquisition program, Green Acres, was created in 1961 to support the state goals of providing public conservation and recreation. The Program was supported from 1961 to 1995 through a series of voter-approved bond measures. In 1998, voters approved a referendum to provide stable funding, which resulted in the legislative establishment of the Garden State Preservation Trust in 1999.²⁰ For coastal areas, the State originally set aside \$15 million for the Coastal Blue Acres program established exclusively to acquire properties for improved flood mitigation.²¹ Of that \$15 million, \$6 million was dedicated to pre-storm acquisition of unimproved storm damage-prone and buffer areas and \$9 million for post-storm property acquisitions in areas suffering at least a 50% reduction in value due to storm damages. Prospective properties must be located either on coastal barrier islands, within 150 feet of mean high water of a tidal waterway, or 150 feet of the landward limit of a beach or dune. Funding for this program was extended in 2007, when Governor Jon Corzine signed the *Green Acres, Farmland, Blue Acres, and Historic Preservation Bond Act of 2007* dedicating \$12 million to acquire floodway areas of the Delaware, Passaic and Raritan Rivers, and their tributaries.²²

B. Shore Protection

While state Blue Acres funding is significant, its funds are appropriated for projects throughout the state. The funding burden for coastal hazard mitigation falls more significantly on New Jersey's Shore Protection Fund established by the Shore Protection Bond Act of 1983.²³ The Fund has had a dedicated revenue stream since 1992 when the New Jersey Legislature decided to allocate a portion of the state-dedicated realty transfer fee, capped at \$25 million per year, to the Fund.²⁴ The revenue stream supports the Bureau of Coastal Engineering by providing state-federal and state-local cost shares to fund protection projects associated with the protection, stabilization, restoration, or maintenance of the shore, including monitoring studies and land acquisition.²⁵

In the period between fiscal years 2003 and 2008, 57 coastal projects have been funded through the state's Shore Protection Program in 53 different CAFRA municipalities. 32 of these projects have been "hard" engineering constructs, consisting of installations or restorations of coastal bulkheads, revetments, groins, and sea walls in highly eroded or unstable areas. Remaining projects have been soft engineering projects, such as dune creation and maintenance in less critically vulnerable areas and geotubes and breakwaters in high-wave energy zones.

C. State Hazard Mitigation Task Force

In 1994, Governor James Florio signed Executive Order No. 115, establishing the State Hazard Mitigation Task Force to coordinate state emergency management, environmental protection, and planning agencies in overseeing statewide mitigation projects and planning.²⁶ The group was charged

¹⁹ N.J. STAT. ANN. § 52:18A-196 *et seq.*

²⁰ NEW JERSEY OFFICE OF EMERGENCY MANAGEMENT, NATURAL HAZARD MITIGATION PLAN (2008); N.J. STAT. ANN. § 13:8C-1 *et seq.*

²¹ Green Acres, Farmland, Historic Preservation and Blue Acres Bond Act of 1995, Pub. L. No. 204 (1995).

²² Green Acres, Farmland, Blue Acres, and Historic Preservation Bond Act of 2007, Pub. L. No. 119 (2007).

²³ Shore Protection Bond Act of 1983, Pub. L. No. 356 (1983).

²⁴ The fee varies from \$2.00 to \$6.05 per \$500 assessed value based on the type and total value of the property being transferred. RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY, AN ECONOMIC ANALYSIS OF NEW JERSEY'S REALTY TRANSFER FEE (Feb. 2006).

²⁵ N.J. STAT. ANN. § 13:19 – 16.

²⁶ Exec. Order No. 115, Establishment of Interagency State Mitigation Team, Governor Florio, Jan. 14, 1994.

with developing and maintaining comprehensive hazard reduction plans, increasing public awareness of hazard risks and promoting preparedness, and developing a systematic program to identify hazards, monitor changes in vulnerability and implement measures to reduce potential damage.

The Task Force, headed by the State Police Office of Emergency Management, administers and operates FEMA grant programs in the state, including the Flood Mitigation Assistance, Pre-Disaster Mitigation, Repetitive Flood Claims, Severe Repetitive Loss, and Hazard Mitigation Grant Programs. Of these, the first four are pre-disaster programs aimed at funding plans or projects that identify or mitigate developments or programs that increase community vulnerability to flooding hazards. Conversely, the Hazard Mitigation Grant Program, authorized by the 1988 Stafford Act, administers post-disaster recovery funds to communities with FEMA-approved All-Hazard Mitigation Plans to further encourage community preparedness.

In 2000, Congress passed the Disaster Mitigation Act in order “to provide an orderly and continuing means of assistance by the Federal Government to State and local governments” in mitigating hazard potential and increasing community preparedness.²⁷ The Act mandated that State and local governments wishing to remain eligible for federal emergency management relief funding and pre-disaster mitigation grants, establish FEMA-approved hazard mitigation plans. In 2005, New Jersey adopted its first official Statewide Hazard Mitigation Plan to facilitate hazard mitigation planning and projects at the county and local levels through the coordination of state resources in emergency management, environmental protection, transportation, community affairs, and banking and insurance.²⁸ Using this plan as a template, hazard planning has become increasingly integrated in New Jersey's statewide master plans, most notably in the 2001 State Planning Act, that provided both the State Planning Commission and State Hazard Mitigation Task Force the opportunity for coordinated plan review through the State's tradition of “cross-acceptance.”²⁹ Representation by the Department of Community Affairs' Office of Smart Growth on both the Task Force and State Planning Commission serves to advise both entities when proposed changes to the state's Development and Redevelopment Plan may encourage hazard-prone developments, increase hazard to adjacent areas, or detrimentally impact floodplain regions.

IV. Flood Insurance and the Coast

A. *National Flood Insurance and Community Rating*

The State Hazard Mitigation Plan's 2008 update indicates that all but twenty-two of New Jersey's 567 municipalities were participating in the National Flood Insurance Program (NFIP). Forty-four of the state's municipalities participate in the National Flood Insurance Program's Community Rating System to leverage municipal resources into community premium reductions, thirty-six of which are located in the state's CAFRA zone.³⁰ Of these, twelve municipalities have earned advanced classifications of 7 or higher (on a scale of 1-9, with 1 being the highest). Avalon, in northern Cape May County, has the highest classification with a Class 6. By fall 2007, all of the state's counties (either independently or in conjunction with one another) had received funding to commence development of all-hazard mitigation plans, if those plans had not already been earlier initiated without funding.

B. *Policies and Claims in Perspective*

²⁷ Disaster Mitigation Act of 2000, Pub. L. No. 106-390 (codified at 44 U.S.C. § 5121).

²⁸ NEW JERSEY OFFICE OF EMERGENCY MANAGEMENT, NATURAL HAZARD MITIGATION PLAN (2008).

²⁹ N.J. STAT. ANN. § 52:18A-196 *et seq.*

³⁰ Natural Hazard Mitigation Plan, *supra* note 27.

Given state and national investment in hazard mitigation, planners must consider the relative impact on flood insurance coverage and claims in New Jersey against a national backdrop. In 2007, New Jersey had 221,879 active flood insurance policies, ranking fifth nationally behind Florida, Louisiana, Texas, and California, all of which dwarf New Jersey's total land area.³¹ New Jersey far exceeded second-ranked Texas, a state thirty times its size, in total claims by more than 20%. Since 1978, New Jersey has ranked fifth nationally in policies in force and seventh in total flood claims, but first categories in terms of claims per unit area.

While the actual number and total loss value of flood claims in any given year varies with climactic trends and storm patterns, these statistics illustrate the effect of past development on the state's floodplain. Even more significant is the number of the State's coastal repetitive and severe repetitive loss properties. Along the Atlantic coast alone, more than 9800 repetitive and severe repetitive loss properties have totalled more than \$556 million dollars in losses since the program's inception.³² It is anticipated, however, that the 2004 Flood Insurance Reform Act, which instituted a pilot program to wean severe repetitive loss properties from the NFIP's rolls will, over time, address this lingering problem.³³

C. *Flood Mitigation Trends*

Although New Jersey has developed a variety of mechanisms to address coastal hazard regulation and planning in the state's coastal regions, demographic trends continue to illustrate residential migration to coastal areas throughout the Atlantic seaboard.³⁴ Due to the state's large coastal area relative to its total land area and increasing population migration, New Jersey consistently ranks among the top states in annual flood claims and total loss value.

In striving to address and mitigate the vulnerability of the state's most vulnerable areas, the State Hazard Mitigation Task Force has been active in facilitating FEMA's hazard grant funds toward specific plans and projects throughout the state. In the past three years alone, through FEMA's Pre-Disaster Mitigation, Flood Mitigation Assistance, and Hazard Mitigation Grant Program, the state has leveraged over \$5 million toward the development of mitigation plans for all of the state's counties. The Task Force has obtained an additional \$15 million in federal funds to elevate or acquire a number of the state's high-risk and repetitive loss properties. With the exception of a pumping station in Brigantine City, however, hazard mitigation funds have been overwhelmingly directed toward inland at-risk properties. Given that the extent and intensity of major flood damage has largely impacted more central and western portions of the state, or has affected coastal areas during periods of low tide, the dearth of coastal area mitigation projects is understandable. While the State Office of Emergency Management and Land Use Regulation Program at NJDEP coordinates communication and outreach with interested local officials, the absence of compulsory incentives for proactive mitigation means that engaged communities reap the benefit of federal hazard mitigation support, while others miss continued funding opportunities for proactive coastal hazard planning.

Flood mitigation projects in coastal areas, however, deal more directly with the impacts of regional shoreline erosion, garnering much of their support through Federal beach nourishment and State Shore Protection Funding. It is unknown, however, how the financial burden of beach nourishment in New Jersey will shift in coming years, given the significant amount of federal investment in past beach

³¹ National Flood Insurance Program, Policy & Claim Statistics 2007. *available at* (<http://www.fema.gov/business/nfip/statistics/pcstat.shtm>)

³² Natural Hazard Mitigation Plan, *supra* note 27.

³³ Bunning-Bereuter-Blumenauger Flood Insurance Reform Act of 2004, Pub. L. No. 108-264 (codified at 42 U.S.C. § 4001 Sec. 102).

³⁴ NOAA, *supra* note 3.

nourishment and the increasing cost of identifying and transporting potential sediment beds from New Jersey coastal waters. If national legislators and executives choose to begin divesting themselves of the federal cost-share of New Jersey's and others' beach nourishment programs, the burden of coastal hazard defense would fall more squarely on the shoulders of the state's shore protection and state hazard mitigation programs, significantly affecting the state's traditional operating framework.

Consequently, despite past efforts, coastal flooding remains of major concern for citizens and government officials. To that effect, the state's foremost challenge to integrating resilience into its policy framework is to have a broad understanding of the impacts of coastal sensitivity to sea level rise.³⁵ For if resilience is a matter of bouncing back from the damaging impacts of future, unknown, exogenous shocks, it is imperative that state and local officials have a strong scientific understanding of the state's vulnerabilities in order to institute prudent hazard policies.

V. Science and Research

As noted earlier, New Jersey supports a diversity of coastal landscape "types" and population patterns, different aspects of which are of major interest to state planners and the region's academic institutions. Throughout the state, university research centers have developed vulnerability and resilience assessments addressing complementary components of the coastal environment. Researchers from Princeton University's Woodrow Wilson School have provided a geophysical template of sea level rise on which a number of regional impact assessments have been based. The Coastal Studies Program at Rutgers University, in conjunction with the Jacques Cousteau National Estuarine Research Reserve, the American Littoral Society, and the NJDEP has produced valuable state-wide land use/land cover and coastal wetland assessments that have been valuable in monitoring annual trends and changes in the state's biophysical composition. Richard Stockton College's Coastal Research Center has worked closely with the NJDEP's Coastal Engineering bureau to assess dune vulnerability and coastal erosion rates throughout the state to prioritize Shore Protection resources and development actions. Monmouth University's Urban Coast Institute focuses on academic coordination and public policy development to promote coastal economies, ecosystem-based management, resilience outreach, and sustainable coastal communities and is invaluable in providing concurrent outreach and engagement with researchers and public officials. Additional academic research and outreach on coastal processes and ocean engineering is also provided by the Stevens Institute of Technology and in conjunction with the New Jersey Marine Science Consortium.

A. Sea Level Rise and Future Flooding

Based on New Jersey's present 3-4 mm/yr rate of sea level rise, Cooper, Beevers and Oppenheimer of Princeton University assessed the potential extent of anticipated sea level rise and flooding on the state's landscape.³⁶ Applying a generally accepted annual rate of rise of 3-4 mm/yr, the study yields a median .71 m rise in sea level by the year 2100. To assess changes in landscape inundation, the researchers employed .61 m (2 ft) and 1.22 m (4ft) contour intervals to proxy for the median and high end (1%) rates of anticipated rise. It was found that, assuming the median sea level rise scenario, 171 square miles (approximately 1% of the state's land area), concentrated in back bay wetlands regions in Middlesex, Ocean, Atlantic, Cape May, and Cumberland Counties, would be permanently inundated at the end of this century. In the 1% scenario, 442 square kilometers (3% of the state's area) is expected to be inundated. The effect of increased permanent inundation also subsequently impacts the frequency and extent of

³⁵ B.T. GUTIERREZ, S.J. WILLIAMS, AND E.R. THIELER, U.S. GEOLOGICAL SURVEY, POTENTIAL FOR SHORELINE CHANGES DUE TO SEA-LEVEL RISE ALONG THE U.S. MID-ATLANTIC REGION (2007).

³⁶ M.J.P. COOPER, M.D. BEEVERS, AND M. OPPENHEIMER, FUTURE SEA LEVEL RISE AND THE NEW JERSEY COAST: ASSESSING POTENTIAL IMPACTS AND OPPORTUNITIES (Nov. 2005).

episodic storm surge and flooding. Presently, FEMA designates the 100-year flood level in New Jersey as 2.90 meters above National Geodetic Vertical Datum. In the median sea level rise scenario, the 100-year base flood elevation will instead correspond to that of a 30-year flood. Should the high end of anticipated sea level rise occur, the study anticipates the 100-year flood level to be reached a frequency greater than once every five years.

B. Landscape Change and Wetland Migration Potential

Changes in sea level are also anticipated to have associated impacts on coastal ecosystems and the ability of saltwater wetlands to migrate inland over time. Building on previous work, the Center for Remote Sensing and Spatial Analysis at Rutgers University (funded by the American Littoral Society) produced an assessment both of the capacity for New Jersey's wetland areas to migrate apace with anticipated sea level rise, and of their horizontal proximity to infrastructure such as roads, buildings, and bulkheads that would likely impede such inland migration.³⁷ The assessment used recent satellite imagery and the Remote Sensing Center's land cover characterization typology to characterize the upland landscape within 500 meters of the state's shoreline area. Given these parameters, researchers Lathrop and Love found 42% of coastal upland buffer areas to be human-altered, comprised of residential, commercial, or industrial development or transportation infrastructure that would prevent the natural movement of saltwater wetlands. An additional 44% was classified as "natural," consisting of forests, scrub/shrub, beaches, streams and lakes, and freshwater wetlands, areas subject to composition changes due to shifts in environmental conditions. Given earlier mention of New Jersey's development patterns, much of this "natural" landscape is found in the southern portion of the state, most notably along the southern Atlantic coast and Delaware Bay.

Employing FEMA's present 100-year flood level (2.90m, in this study, rounded to 3m), the study used Cooper, Beevers and Oppenheimer's median and high-end 21st century sea level rise projections (.61 and 1.22m, respectively) to assess the 100-year flood impact on the state's coastal buffer area. The researchers determined that approximately 240 km² (16%) of the impacted area is presently developed, most notably the entirety of the New Jersey's barrier islands and significant portions of Barnegat, Delaware, and Raritan Bays. 79% (1,200 km²) of this area was classified as natural, the largest percentage (42%) of which is comprised of tidal salt marshes and freshwater wetlands. Although there is significant overlap between the extent of coastal buffer and tidal surge areas, sharper elevation gradients in the Monmouth County and Navesink River headlands regions minimize the relative area of impact in comparison with the remainder of the state.

Finally, the study examined the capacity for wetland ecosystems to horizontally migrate by a process of vertical accretion, to keep pace with expected rise. Presently, 29% of potential tidal marsh retreat zones (up to 500m) are limited by developed features and transportation corridors, with notable contrast in distribution and extent between the more upland northern coast and the wetland-dominated southern landscape. While it is noted that New Jersey's salt marshes have traditionally been able to keep pace with historic 3-4 mm/yr rates of rise, the capacity under duress of rates equaling or exceeding more recent estimates of 6 mm/yr or more are unknown.³⁸

C. Dune Vulnerability

In 2001, DEP began funding Richard Stockton College's Coastal Research Center to perform concept work on dune vulnerability to storm damage in the borough of Holgate on Long Beach Island with an

³⁷ R.G. LATHROP, JR. AND A. LOVE, VULNERABILITY OF NEW JERSEY'S COASTAL HABITATS TO SEA LEVEL RISE (Jan. 2007).

³⁸ COOPER, *supra* note 36; PSUTY, *supra* note 5.

ensuing demonstration project applied to and paid for by the Borough of Mantoloking in northern Ocean County. In the study, the linear shoreline extent of northern Ocean County was divided into 250-foot “bins” whose average volume, crest height, 2d area, etc. were determined and then relatively ranked versus the range across the entire northern Ocean County dune region.³⁹ The vertical and horizontal extent of each dune bin was then assessed relative to increasing storm surge inundation levels, and whether those dunes met FEMA’s 540 (standard at the time) and 1,100 (updated standard) square foot primary frontal dune area.⁴⁰ Although the analysis omitted bins in which no dunes were located (35 total), of those remaining bins (455), approximately 33% meet the 540-rule, with 33% of those (25) located in Island Beach State Park. Along developed shoreline reaches, approximately 8% of the surveyed bins, concentrated on the borders of Bay Head and Point Pleasant Beach, Mantoloking and Brick Township, Toms River and Lavallette Borough, central Seaside Park, and northern Berkeley Township, meet the FEMA 540 criterion.

Only 6% of the bins analyzed meet FEMA's updated primary frontal dune area 1100-rule, recently incorporated by NJDEP in its coastal engineering assessments. All but one of the areas meeting the 1100-rule are located in Island Beach State Park, the exception an extent near 8th Street in northern Berkeley Township. NJDEP funded the continuation of this work to all of Northern Ocean County using the Mantoloking work as a basis. This work was extended to Long Beach Island with anticipated completion in the fall of 2008. Subsequent work is being extended to all of the State’s ocean-facing shoreline with Congressional funding for the period from August 2006 through the end of 2013.

D. Socio-Environmental Resilience

Resilience, it must be remembered, is comprised of more than a coastal area’s physical characteristics. It must include social, economic, hazard planning and environmental frameworks that mitigate potential hazards and support a strong response network by diverse groups within and between affected communities. In a recent white paper for the Urban Coast Institute, Dr. Susan Cutter from the University of South Carolina's Hazards Research Lab has developed an initial framework to address demographic and economic contributors to resilience both within New Jersey and in comparison to other states.⁴¹ The framework is one of many attempts to capture community demographic information such as resident age average and distribution to proxy for citizens’ ability to respond in hazard circumstances, preparedness information and mock-drills to foster public awareness, and identification of landscape characteristics to identify local hazard mitigation capacity. It is anticipated that the continuation of this and similar indicator development will be valuable in providing a consistent metric of community resilience throughout the state for prioritization of future hazard planning.

E. Natural Capital

In 2004, New Jersey received a grant from the Geraldine R. Dodge Foundation to perform an economic assessment of the state's ecosystem services and natural capital. This valuation was conducted by researchers at the NJDEP and the University of Vermont using value transfer and hedonic analysis methodologies of land cover and available real estate and census data within complex economic models. In the former method, service values for various types of ecosystems, published in scientific literature, was aggregated into an Eco-Value database, from which median, mean, high, low and variance of service values were derived for each New Jersey land cover type (in this assessment, 14 categories were used),

³⁹ MIHALASKY ET AL., N.J. DEPARTMENT OF ENV. PROTECTION, BEACH-DUNE SUSCEPTIBILITY ASSESSMENT: NORTHERN OCEAN COUNTY, NJ (Ver. 1.0 May 2007).

⁴⁰ 44 C.F.R. § 65.11.

⁴¹ S.L. CUTTER, A FRAMEWORK FOR MEASURING COASTAL HAZARD RESILIENCE IN NEW JERSEY COMMUNITIES: WHITE PAPER FOR THE URBAN COAST INSTITUTE (2008).

based on 1995 satellite-interpreted land cover/land use data. The per-unit area value was then multiplied by each ecosystem's total land area to provide an aggregate value of the state's ecosystem services and natural capital. In the second methodology, a database of 30,000 plus real estate transactions between January 2001 and August 2004 was statistically disaggregated to interpret the marginal price effect of environmental assets on home values throughout the central portion of the state. These marginal values were then integrated based on location to determine the net value of public amenities such as beaches, forests, and wetland areas. The results of this study indicated that New Jersey's ecosystems provides an annual public benefit of between \$11.6 and \$19.4 billion per year, with a present future value ranging from \$387 to \$648 billion.⁴² By far, the largest per unit land cover contributor to these values are coastal wetlands and marine ecosystems. The largest ecosystem service value of these land covers is derived from water filtration, nutrient cycling, and, most importantly, disturbance (hazard) mitigation.

F. *Coastal Telemetry*

Considering the more short-term mechanisms of developing resilience, the New Jersey Geological Survey, in cooperation with New Jersey Department of Transportation, designed and installed the New Jersey Tide Telemetry System with assistance from the National Ocean Service.⁴³ The system provides comprehensive, real-time tide-level and meteorological data for flood-prone areas along shore and back bay areas. Information is gathered from twenty tide gauges, five tide/weather stations, and thirty-one tidal crest-stage gauges in thirteen counties, tides being measured at six-minute intervals and sent to National Weather Service, New Jersey State Police, state Department of Transportation, and county emergency management agencies. Rainfall, wind speed and direction, air and water temp, relative humidity, and barometric pressure are also gathered and transmitted by the National Oceanic and Atmospheric Administration's geostationary operational environmental satellite (GOES). At a more local scale, five additional flood warnings are presently operating throughout the state in Burlington, Passaic and Somerset Counties, and along Pascack Brook and the Rahway River. Although each system is invaluable in providing real-time tide and flood data, in many areas subject to combined fluvial and coastal flood events, benefit could be gained from incorporation of additional hydrologic information to better inform future planning and emergency management decision-making.

Automated real-time coastal hazard monitoring is also supported by the Stevens Institute of Technology through the Coastal Monitoring Network. The Institute's system is comprised of automated stations at three locations along the New Jersey oceanfront that collect and disseminate real time oceanographic and meteorological information including wave height and period, mean water level, water temperature, wind speed and direction, barometric pressure, air temperature, and digital imagery of the beach.

VI. Promoting Resilience

A. *New Flood Hazard Area Rules*

In November 2007, New Jersey adopted new Flood Hazard Area rules and associated changes to the Coastal Permit Program rules and Coastal Zone Management rules that established more stringent standards for riparian corridors.⁴⁴ The goal of the new rules was improvement of surface water quality through increased buffering capacity and increased flood mitigation potential throughout the state. The new rules expand the preservation of near-stream vegetation by implementing new riparian buffer requirements that are 50, 150, or 300 feet wide, depending on the resources being protected. The most protective riparian zone, 300-ft, is reserved for Class 1 waterways and certain upstream tributaries. Waters supporting trout, threatened or endangered species habitat, or flowing through areas containing

⁴² R. COSTANZA ET AL., THE VALUE OF NEW JERSEY'S ECOSYSTEM SERVICES AND NATURAL CAPITAL (Apr. 2007).

⁴³ H. Hoppe, U.S. Geological Survey, *New Jersey Tide Telemetry System*, Fact Sheet 2007- 3064 (Aug. 2007).

⁴⁴ NJDEP, Flood Hazard Area Program, <http://www.state.nj.us/dep/landuse/se.html> .

acidic soils require a 150-foot buffer. 50-foot buffers are required along all other watercourse. The impact of development on flooding is further addressed through the state-wide adoption of a 0% net-fill requirement for all non-tidal flood hazards, previously confined to the central Passaic Basin and Highlands Regions. The new rules also increase minimum heights for homes and roadways to one foot above FEMA-determined base flood elevation to provide vertical buffering against flooding levels.

B. No Adverse Impact

In September 2005, the New Jersey Association for Floodplain Management (NJAFM) was established as a state chapter of the Association of State Floodplain Managers (ASFPM) to encourage greater awareness and engagement in state flood issues by New Jersey's planners, engineers, regulators, and emergency management officials so as to reduce loss of life and property damage resulting from floods and promote sound floodplain management.⁴⁵ As part of its advocacy and outreach, ASFPM has developed a set of planning principles that promote such sound management under the title of No Adverse Impact (NAI). NAI seeks to encourage the application of V-zone building standards to coastal A zone buildings, limit the use of fill when elevating coastal A residences to reduce adjacent flooding and support the active maintenance and vegetation of dunes exceeding minimum hazard mitigation requirements set forth by the NFIP. As part of a coordinated effort to encourage more widespread adoption of NAI, NJAFM has promoted its use at a variety of annual conferences and symposia such as at Monmouth University's Urban Coast Institute in May 2008.

C. New Jersey Department of Environmental Protection

In December 2007, the New Jersey Coastal Planning Office contacted state, academic, and non-profit partners to examine how scientific assessments of sea level rise and associated flooding have been or are being incorporated into local hazard planning. From that outreach, it is evident that resources have been strongly leveraged toward either hazard workshops or symposiums given by academic and non-profit centers to address the science and sociology of sea level rise impacts and direct engagement by the New Jersey State Police and Division of Dam Safety and Flood Regulation with local emergency management and public officials to inform and support FEMA/NFIP and NJDEP programs and regulations. Missing from this equation has been the integration of measures that reflect an appreciation of social, economic, environmental, *and* physical factors that constitute proactive community preparedness, a paradigm that represents a shift from hazard resistance to resilience.

However, to achieve consistency throughout New Jersey's coastal zone in coming years, it is important for state planners to integrate comprehensive scientific assessments of future sea level rise to assist community planning and preparedness. As such, the Coastal Planning Office has coordinated with NJDEP's Geographic Information Systems office, the New Jersey Office of Geographic Information System, the New Jersey State Police, United States Geological Survey, the Philadelphia District of the U.S. Army Corps of Engineers, and the Natural Resource Conservation Service to procure LiDAR mapping of New Jersey's Delaware Bay-adjacent counties. From this procurement, two-foot contour intervals will be generated on which more high-resolution hydrologic models of sea level rise and increased coastal flooding will be produced. The Coastal Planning Office will then have far greater spatial precision by which to assess the current and future vulnerability of coastal areas and the landward migration of coastal wetlands, the establishment of coastal wetlands along open water areas, and transformation of freshwater wetlands to tidal wetlands.

⁴⁵ See, Constitution of the New Jersey Association for Floodplain Management (2005) available at <http://www.njafm.org/Archives/NJAFMconstitution.PDF> .

The Coastal Planning Office has begun to coordinate with the NJDEP's Division of Dam Safety and Flood Regulation to engage Delaware Bay communities about the need for comprehensive planning to anticipate sea level rise and associated impacts. Ensuing engagement will utilize the obtained LiDAR topographic data as a template to generate more precise spatial data of aforementioned sea level rise, flooding, wetland migration, and socio-economic assessments for municipal planning officials.

VII. Looking Forward

Coastal hazard policy, planning, and science have recently begun to emerge from a hierarchical regulatory structure to a more integrated management paradigm of resilience. The difference between resistance and resilience, it seems, is one between an either/or operator (i.e. resistant or not) to one that addresses the need for a complex and dynamic understanding of vulnerable coastal landscapes. While municipal planning has not moved so far as to have become mandated as part of the state planning process, it is evident that there is significant opportunity to more effectively integrate local planning and response with state and federal resources to address local hazard needs. To this effect, a more thorough understanding of local erosion and coastal sensitivity, wetland dieback and migration potential, flood hydrology, and socio-economic vulnerabilities are critical considerations for state and local planners to comprehensively and effectively manage the diversity of New Jersey's shore region in the face of anticipated coastal landscape change. It is expected that as the concept of coastal resilience continues to evolve in coming years, the experience of New Jersey's policy, planning and science communities will offer valuable perspective towards a more sustainable coastal environment.

Floods, Flood Insurance, Litigation, Politics – and Catastrophe: The National Flood Insurance Program¹

Ernest B. Abbott²

The extraordinary flooding caused by Hurricanes Katrina and Rita in 2005 damaged or destroyed hundreds of thousands of homes and businesses in Florida, Alabama, Mississippi, Louisiana, and Texas. Policy holders submitted over 165,000 flood insurance claims to the National Flood Insurance Program (NFIP) – more than the combined number of claims submitted throughout the preceding 35 years of the NFIP’s existence.³ The vast majority of these claims were settled without controversy – and the NFIP has now paid over \$16 billion in claims.⁴

But in addition, thousands of lawsuits were brought by property owners claiming they were paid less for flood losses than they should have received under their insurance policies. Indeed, Hurricanes Katrina and Rita exposed an extraordinary number of homeowners and businesses who found to their dismay (and perhaps in some cases, surprise) that not only had their homes been destroyed, but that much of the damage was not covered by insurance – either because they had never had a flood insurance policy, or because their flood insurance policy had expired, or because it did not cover much of the damage that they suffered. In their disappointment, thousands chose to litigate, hoping to obtain relief from (allegedly) negligent or miscreant insurance agents, private flood insurance companies, private ‘all risk’ insurance companies, mortgage lenders, flood zone determination companies, the Federal Emergency Management Agency (FEMA), or any other entity that might be shown to be legally responsible for their losses.

Understanding this litigation – and how it differs from “traditional” insurance litigation – requires an overview of the NFIP and its decades long efforts to generate premium income adequate to cover losses and expenses. These efforts never did allow the NFIP to achieve full solvency, and the National Flood Insurance Fund has never charged premiums high enough to build a reserve for catastrophic flooding. Indeed, Hurricane Katrina claims could be and were paid by the NFIP only with borrowed money, and in the aftermath of the flooding Congress was forced to increase the statutory cap on how much the NFIP

¹ This paper was presented during the Sea Grant Law and Policy Journal’s inaugural symposium on Coastal Resiliency held on March 25–26, 2008 at the University of Mississippi in Oxford, Mississippi. Coastal resiliency refers to the ability of coastal cities, towns, and communities to adapt and recover from natural hazards, including hurricanes, tsunamis, floods, and disease epidemics. Seven authors were selected to present papers on a wide range of topics related to coastal resiliency. Powerpoint presentations and additional information about the symposium are available at <http://www.olemiss.edu/orgs/SGLC/National/SGLPJ/SGLPJ.htm>.

² Ernest Abbott is founder and principal of FEMA Law Associates, PLLC, a firm providing legal services to the emergency management community, with particular emphasis on the laws and regulations governing preparedness, response, recovery, and mitigation programs of the Department of Homeland Security – including its National Flood Insurance Program (NFIP). Mr. Abbott served as General Counsel of the Federal Emergency Management Agency (1997-2001), and supervised (*inter alia*) all litigation and regulatory development involving the NFIP during this period. The Author wishes to acknowledge the helpful comments of JoAnn Howard, Edward Thomas, and William Cumming on this article, and the research assistance of Lara Ilao.

³ Aggregate number of claims and total dollar amount for Hurricane Katrina are published on FEMA’s website at <http://www.fema.gov/business/nfip/statistics/sign1000.shtm> (as of 5/30/2008).

⁴ *Id.*

could borrow from \$1.5 billion to \$20.775 billion.⁵ It is generally understood by Congress that the NFIP will never be able to repay this debt, which now stands at over \$17,000,000,000.⁶

This article examines the efforts of the NFIP to become financially self-sustaining and shows how these efforts may have created misunderstanding – subsequently reflected in litigation – about the need for and scope of flood insurance. This litigation is rarely successful, in large part because the NFIP can avail itself of defenses available to the federal government (e.g., sovereign immunity, federal preemption, and a requirement of strict compliance with regulatory requirements) in order to protect federal taxpayers from paying costs beyond those covered by the terms of the NFIP’s policy, and to assure that private sector contractors and agents of the federal government in the flood insurance program remain willing to serve in that capacity.

Flood insurance litigation nonetheless reveals the strains that appear when a government program with government rules and regulations steps in to offer a commercial service – flood insurance. These strains are particularly severe when the insured risk – flooding – is one that most property owners won’t buy, and property lenders won’t require, unless forced to by law. Hurricane Katrina litigation has also arisen from the frustration experienced by property owners when insurance adjusters allocate loss between that caused by wind (covered under standard private sector insurance) and by flood (insured under the strict NFIP policy if the property owner had any flood coverage at all). In these cases, courts have upheld the flood exclusion in private sector policies, but castigated any efforts by some insurers to deny responsibility for hurricane damage when damage occurred as a combined result of both wind and flood.

The NFIP is at a crossroads. It is currently set to expire on September 30, 2008. While the fiscal insolvency of the NFIP has led some to conclude it is a “colossal policy failure,”⁷ both the Senate and House have passed (differing) bills to reauthorize the Program, recognizing that it provides critical financial protection to property owners and critical incentives to reduce future flood damage. These bills would attempt to allow the NFIP to reach financial solvency by permitting increased premiums, elimination of many subsidies on existing properties, and broadening mandatory insurance purchase requirements. These bills also respond to the frustration of policyholders whose settlement checks did not pay their flood losses in full – but not by opening the door for litigation against the NFIP. Rather, they mandate more training and communication and advocacy and administrative appeal programs. As long as it is the federal taxpayer who ultimately stands behind flood losses experienced by property owners, litigation will remain an unpleasant and largely unfruitful enterprise for policyholders.

⁵ Pub. L. No. 109-65, 119 Stat. 1998 (9/20/2005, from \$1.5 to \$3.5 billion); Pub. L. No. 109-106, 119 Stat. 2288 (11/21/2005, from \$3.5 to \$18.5 billion); Pub. L. No. 109-208, 120 Stat. 317 (3/23/2006, from \$18.5 to \$20.775 billion).

⁶ As of May, 2008, the NFIP still owes more than \$17 billion. *U.S. Senate Renews Flood Insurance Program*, Reuters, May 13, 2008, available at <http://www.alertnet.org/thenews/newsdesk/N13406839.htm>.

⁷ JUSTIN R. PIDOT, GEORGETOWN ENVIRONMENTAL LAW & POLICY INSTITUTE, COASTAL DISASTER INSURANCE IN AN ERA OF GLOBAL WARMING: THE CASE FOR RELYING ON THE PRIVATE MARKET, 14 (2007) (“First, the program is a major burden on taxpayers because it has not been run in a financially responsible fashion.”)

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I. Introduction

A. *Brief History of the NFIP*

1. **Failure of Private Flood Insurance Market**

Flooding is the one of the most, if not the most, common natural hazard to damage or destroy homes and other structures.⁸ Yet flood damage historically has been (and still is) routinely excluded from private homeowners’ insurance and commercial insurance policies. One difficulty with flood risk for insurers is that the risk of flooding to structures varies enormously due to the specific geography of individual properties – and homeowners would generally know more about their properties’ geography and even its flood history than insurers.⁹

The mapping of flood prone areas was virtually non-existent prior to the creation of the NFIP. This tended to jeopardize the ability of insurers to spread risk: homeowners who were confident, based on their own geography and memories of past flooding, that they had minimal flood risk would not pay for flood

⁸ Press Release, FEMA, Flooding: America’s #1 Hazard (Aug. 16, 2004), available at <http://www.fema.gov/news/newsrelease.fema?id=13427>.

⁹ For further elaboration of history and difficulties inherent in offering private flood insurance see Adam Scales, *A Nation of Policyholders: Governmental and Market Failure in Flood Insurance*, 26 Miss. C. L. Rev. 3, 7-11 (2005).

insurance, while homeowners who were aware of significant flood risk did so. And because the flood risk of those wanting to obtain flood insurance would be very high, the premiums that would be necessary to cover flood losses on those properties would also be very high. High insurance premiums would deter property owners from obtaining coverage whenever flood risk did not appear real and imminent – and this self-selection of flood insurance applicants (known as “adverse selection”) for structures in high flood risk areas would lead to even further increases in premium as the overall experience worsened.

A corresponding and seemingly inconsistent challenge of flood risk is that many property owners are overconfident of their ability to evaluate flood risk. If the risk of flooding is not physically and historically obvious, many property owners assume that the water could not rise to levels that had not been seen over the last twenty or so years. Yet even if their reliance on only a twenty-thirty year time horizon were appropriate (and it is not),¹⁰ the construction of new subdivisions and commercial areas has accelerated runoff of heavy rains and increased flood risk in many areas – making reliance on memory of historical flooding even more inaccurate. Finally, while mortgage lenders would rarely advance funds unless a standard “all risk” (excluding flood) homeowner’s policy were in effect, lenders historically were indifferent as to whether a mortgaged structure was insured against damage caused by flood.¹¹ Finally, local governments tended not to incorporate flood risk or floodplain management into their zoning or land use planning ordinances and building codes.

The result of these forces was the withdrawal of the private insurance industry from the flood insurance market, increasing development in flood-prone areas, and rising uninsured damages from major flooding.

2. Creation of the National Flood Insurance Program

Congress enacted the National Flood Insurance Act of 1968 (“the Act”) in response to the rising cost of disaster relief and the damage to communities and individuals from floods. Congress found that:

(1) many factors have made it uneconomic for the private industry alone to make flood insurance available to those in need of such protection on reasonable terms and conditions; but (2) a program of flood insurance with large scale participation of the Federal Government and carried out to the maximum extent practicable by the private insurance industry is feasible and can be initiated.¹²

The Act created a coordinated National Flood Insurance Program, incorporating:

- **Risk identification/assessment:** mapping of flood prone areas in communities which joined the NFIP.
- **Risk mitigation:** adoption of a set of floodplain management regulations that communities must agree to adopt and enforce as a condition to their participation in the NFIP.
- **Insurance:** the federal government was authorized to arrange for the sale of federally supported flood insurance in communities which have joined the program.
- **Subsidization:** insurance premiums for properties in existence when a community joins the NFIP are subsidized (actuarial premiums for many of these older, high risk properties were

¹⁰ RICHARD TOBIN AND CORINNE CALFEE, THE NATIONAL FLOOD INSURANCE PROGRAM’S MANDATORY PURCHASE REQUIREMENT: POLICIES, PROCESSES, AND STAKEHOLDERS, 1, fn.1, and 37-38 (Mar. 2005). This report was prepared as part of the American Institutes for Research’s Evaluation of the National Flood Insurance Program, funded by the Federal Emergency Management Agency (FEMA).

¹¹ See Scales, *supra* note 9, at 18-19 for his hypothesis that lenders were willing to ignore flood risk because bank officers making the loan simply assumed that flood events would normally not lead to borrower foreclosures, and that in any event the risk of flood would be sold off to investors when the loan was sold.

¹² National Flood Insurance Act of 1968, Pub. L. No. 90-448, § 1302, 82 Stat. 572 (Aug. 1, 1968) (codified as amended at 42 U.S.C. § 4001 *et seq.*).

considered unaffordable). Insurance for properties constructed after a community joins the program (and thus have presumably been constructed in accordance with flood plain management ordinances) is intended to be set at actuarial levels.¹³

- **Attrition of high risk properties:** while existing properties were grandfathered from compliance with new floodplain ordinances and could be insured at subsidized rates, a structure damaged more than 50% by flooding must be relocated or reconstructed in compliance with current floodplain management regulations.

It was the combination of *risk identification*, *risk mitigation*, and *attrition* – along with restrictions on the scope of insured losses insured under the flood insurance program – which was supposed to give this new Government insurance program, in contrast to past private flood insurance offerings, a chance to succeed.

Thus, flood maps would determine the flood risk in particular areas, allowing the development of actuarial premiums for flood insurance – and also providing communities and property owners the information they needed to implement the risk mitigation requirements of the flood program. Insurance was only to be made available in communities which adopted and enforced floodplain management regulations that prohibited development in floodways, and required that any new construction in floodplains be flood-proofed or elevated to above base flood elevation. These new structures would be insured under the NFIP at actuarial rates – but because of the reduction in flood risk caused by compliance with floodplain management regulations, these premium rates could be relatively low and affordable. And while structures in existence when a community joined the NFIP were “grandfathered” and eligible for subsidized¹⁴ premiums, flood damage forcing major repairs (costing over 50% of the market value of the structure before the flood)¹⁵ would trigger compliance with floodplain management regulations; the hope was that over time at least the most flood-prone of these structures would come into compliance.¹⁶

By some measures, the program has been an extraordinary success. While policy growth was slow in the early years (as discussed below), the NFIP now insures over 5.5 million properties¹⁷ with a total coverage in excess of \$1 trillion dollars.¹⁸ Over 20,000 communities in the United States have joined the program – and have therefore adopted floodplain management regulations that will – to the extent that flood maps are accurate – limit flood risk for new construction. Yet as demonstrated by the program’s vast \$17 billion debt and the anguish of residents who have experienced uncovered flood losses, characteristics of flood risk which caused the private insurance market to flee from the flood market continue to plague the NFIP.

B. *Development of the Standard Flood Insurance Policy: Balancing Cost, Coverage, and Deficit Spending*

¹³ The unsubsidized insurance rates for newer properties, constructed after promulgation of a “Flood Insurance Rate Map” showing the “Special Flood Hazard Areas” in a community, are significantly lower than the subsidized rates for older structures.

¹⁴ The “subsidy” – consisting of reduced rate premiums (i.e., lower than actuarial cost) – is available only to properties located in the 100-year floodplain, as mapped by FEMA, and built before the Flood Insurance Rate Map became effective in the community.

¹⁵ 44 C.F.R. § 59.1 defines “substantial improvement”; 44 C.F.R. § 60.3 specifies the flood plain management regulations that communities participating in the NFIP must adopt and enforce; in most cases these regulations apply to “new construction and substantial improvements.”

¹⁶ Rawle O. King, *Federal Flood Insurance: The Repetitive Loss Problem*, CRS Report to Congress RL32972, CRS-15 (June 30, 2005).

¹⁷ FEMA, Total Policies in Force by Calendar Year, <http://www.fema.gov/business/nfip/statistics/cy2006pif.shtm> .

¹⁸ FEMA, Total Coverage by Calendar Year, <http://www.fema.gov/business/nfip/statistics/cy2006cov.shtm> .

1. Balancing Coverage and Affordability

The Act required the Federal Insurance Administrator, when establishing the initial terms and conditions and the premiums to be charged for insurance, to balance the extensiveness of coverage under the policy against the affordability and marketability of flood insurance. Thus, the Administrator was required to develop the “types, classes, and locations” of properties eligible for insurance,¹⁹ the “nature and limits of loss or damage”²⁰ to be covered and the risks to be rejected by insurance,²¹ and other key policy terms. At the same time, the Administrator was to calculate and, for new construction,²² to charge actuarial premiums for this insurance. And recognizing that actuarial rates for many existing structures would be too high, the Administrator was required to determine, for existing structures, lower (and hence cross-subsidized) premiums that would “be reasonable, would encourage prospective insureds to purchase flood insurance, and would be consistent with the purposes of” the Act.²³

In order to keep flood insurance affordable, several significant restrictions on coverage were incorporated into the Standard Flood Insurance Policy:

- Statutory limits (originally \$30,000,²⁴ now \$250,000 for structure/\$100,000 for contents) on a homeowners’ policy on the amount that could be paid on any claim.²⁵
- Payments based on actual value less depreciation rather than replacement cost unless the amount of insurance is 80% of value or the NFIP statutory maximum, whichever is lower.²⁶
- No coverage for loss of access, loss of use, alternate accommodation during repairs (e.g., rental of temporary quarters), business interruption, and other economic damage caused by flood other than direct damage to property.²⁷

But just as private insurers had found flood insurance to be unprofitable, the NFIP had trouble generating premium income that would cover the program costs. In the NFIP’s early years, a relatively high proportion of policies (75% in 1978, 62% in 1982) were issued on existing structures at subsidized rates. Not surprisingly, as a result, the NFIP ran deficits in years of substantial flooding. Indeed, despite the relatively small scale of the program (with only 5,500 policies in 1970, growing to 1,897,271 policies in 1980) the NFIP had to borrow \$854 million from the U.S. Treasury by 1980.²⁸ In reaction to these deficits and the budget impact of using appropriations to bail out the NFIP, the Reagan Administration sought to make the program self-sustaining.

¹⁹ 42 U.S.C. § 4013(a)(1).

²⁰ *Id.* § 4013(a)(2).

²¹ *Id.* § 4013(a)(3): (the “classification, limitation and rejection of any risks which may be advisable”).

²² *Id.* §§ 4014(a)(1), 4015(c)(1); *see also*, Pub. L. No. 93 – 234.

²³ *Id.* § 4014(a)(2).

²⁴ Section 1306(b)(1)(c) of the National Flood Insurance Act, Pub. L. No. 90-448, 82 Stat. 572 at 575 (1968).

²⁵ In addition, provisions in other statutes had an effect on coverage of some structures. For example, the Coastal Barrier Resources Act (16 USC § 3505(d)(2)) prohibits flood insurance on structures located in the Coastal Barrier Resources Zone, and any policies mistakenly issued on such properties are void *ab initio*. 42 U.S.C. § 4028.

²⁶ The 80% coverage requirement for replacement cost coverage is relatively standard in other lines of property insurance. *See* <http://www.investopedia.com/ask/answers/06/80percentrule.asp> (Last visited May 13, 2008).

²⁷ 44 CFR § 61, App. A(1)V.A.5. While not covered by the Standard Flood Insurance Policy (SFIP), alternate accommodation – temporary housing – is one of the “losses” that is eligible for the Disaster assistance that the NFIP was in part hoping to supplant. Temporary housing can be provided under §408 of the Stafford Act. 42 U.S.C. § 5174(c)(1)(A)(i)-(ii). However, this provision will generally be available only to those with very limited financial resources; individuals are generally ineligible for grants unless they cannot qualify for a Small Business Administration disaster loan.

²⁸ U.S. GENERAL ACCOUNTING OFFICE, NATIONAL FLOOD INSURANCE PROGRAM: MAJOR CHANGES NEEDED IF IT IS TO OPERATE WITHOUT A SUBSIDY, GAO-RCED-83-53, at 40 (Jan 1, 1983).

The first approach was to increase NFIP premiums: by 45 percent in 1981, and a total of 120 percent over the next seven years.²⁹ However, these premium increases quickly attracted political attention – and Congress responded by substantially limiting the NFIP’s ability to use the technique of premium increases:

- in 1983, Congress prohibited any premium increases for a period of one year and directed that the NFIP study and then report to Congress on premium rates.³⁰
- When Congress removed this freeze on premium, it imposed a limitation – still in effect as of this writing – prohibiting increases in premium of greater than 10% per year for any risk classification.³¹

Second, with market and political forces preventing premium increases from reaching actuarial alignment and financial sustainability, the program turned to reductions in the scope of insurance coverage. In the 1980s, the NFIP added several significant exclusions to the flood coverage offered by the NFIP:

- Limited coverage for damage in basements – does not include payment to repair or replace finished walls, floors, furniture, and other personal property.
- If the homeowner chooses to cover personal property:
 - Personal property limit of \$2,500 for all jewelry, artwork, securities, and business equipment combined, and no coverage for these items if located in a basement
- A detached garage is covered by a dwelling policy only if it is used solely for vehicles and storage. If it is improved it is not covered unless separate coverage for that improved building is purchased.

The hope was that with these coverage limitations, premiums – even without the increases prohibited by Congress – could pay for a higher percentage of flood losses and reduce the program’s reliance on cash infusions from the taxpayers. These reductions were maintained despite litigation claiming that they were illegal, and despite a congressional demand that GAO investigate their propriety.³²

2. Recovery from Third Parties: Failed Subrogation Efforts

FEMA also sought to reduce the cost to the program of flood insurance claim payments by seeking recovery of the cost of paying for flood damage to new structures constructed in violation with floodplain management regulations. As noted above, a key element of the NFIP was that flood insurance would be offered only in communities that agreed to “adopt and enforce” floodplain management ordinances consistent with FEMA floodplain management regulations. These regulations required communities to allow construction of buildings in floodplains only if the lowest floor was at or above the base flood elevation. In some communities, however, new developments had somehow been granted building permits in areas that were mapped as SFHAs and – as a consequence – flooded with some frequency.

²⁹ AMERICAN INSTITUTES FOR RESEARCH, A CHRONOLOGY OF MAJOR EVENTS AFFECTING THE NATIONAL FLOOD INSURANCE PROGRAM (December 2005) available at <http://www.fema.gov/library/viewRecord.do?id=2601>.

³⁰ Pub. L. No. 98-181, 97 Stat. 1153 at 1229 (Nov. 30, 1983).

³¹ 42 U.S.C. § 4015(e), enacted in § 2302(e)(5) of Pub. L. No. 101-508. In 2004, Congress did exempt from its restriction on premium increases “any property leased from the Federal Government (including residential and nonresidential properties) that the Director determines is located on the river-facing side of any dike, levee, or other riverine flood control structure, or seaward of any seawall or other coastal flood control structure.” *Id.* § 4015(c)(2).

³² U.S. GOVERNMENT ACCOUNTING OFFICE, FEDERAL EMERGENCY MANAGEMENT AGENCY’S BASEMENT COVERAGE LIMITATIONS, GAO-RCED-86-10FS, at 25-26 (Jan. 1986); *Nelson v. Becton*, 929 F.2d 1287 (8th Cir. 1991).

In *United States v. St. Bernard Parish*,³³ the court considered an appeal of decisions in two actions brought by the United States on behalf of FEMA and the Federal Insurance Administration against the Parishes of St. Bernard and Jefferson, the State of Louisiana, and various home builders, engineers, and surveyors. Extensive litigation revealed building permits issued for and construction of entire neighborhoods built in particularly flood prone areas.³⁴ The United States claimed a right of recovery for massive flood damages incurred as a result of construction that did not comply with the NFIP's regulations; it claimed, *inter alia*, a breach of the communities' contract with the NFIP: the NFIP had made flood insurance available on condition that the community enforce floodplain ordinances and they had failed to do so. The Fifth Circuit held, however, that the Act did not authorize actions in contract for recovery of damages. The only federal enforcement option available under the Act was suspension of the community from the program.³⁵ The United States chose not to seek Supreme Court review of this decision – which had been politically charged from the outset.

Further, political reaction to premium increases not infrequently intervened to reduce the NFIP's ability to become financially self-sustaining. For example, when a portion of the Sacramento Valley was about to be placed in a SFHA due to decertification of levees, the California congressional delegation reacted to ensure that the many properties in this flood zone would not be subject to any increase in flood insurance premiums to reflect its flood risk: Congress enacted special legislation requiring that the NFIP charge premiums in that area (called the "AR Zone") as if a property were not in a flood hazard area – even though, in fact, it was.³⁶ Similarly, whenever a new Flood Insurance Rate Map (FIRM) is published revising the boundaries of the SFHA, the program bestows "grandfather" status to properties that were previously mapped as *outside* a SFHA:³⁷

To recognize policyholders **who have remained loyal customers of the NFIP** by maintaining continuous coverage and/or **who have built in compliance with the FIRM**, the Federal Insurance and Mitigation Administration has "Grandfather rules" to allow such policyholders to benefit in the rating for that building.³⁸

Essentially, the structures are treated as if they are not in the flood plain when in fact they are; this status continues (even through transfer of ownership). Private insurance companies face similar political and market reaction when they raise rates to reflect changes in their understanding of the actuarial risk of loss; their (unpopular) solution has been to raise rates and/or withdraw from that insurance market. But the NFIP has generally not had that option.³⁹ In short, the political impact of raising insurance rates to actuarial levels has meant that the premium structure of the NFIP includes not only the original subsidy for structures built before communities entered the program decades ago, but also newer subsidies for structures whose flood risk emerges as a result of development or other factors.

³³ 756 F.2d 1116 (5th Cir. 1985).

³⁴ The full saga is carefully documented by Oliver Houck in *Rising Water, the National Flood Insurance Program and Louisiana*, 60 TUL. L. REV. 61, 135-156 (1985).

³⁵ *St. Bernard Parish*, 756 F.2d at 1123 (5th Cir. 1985). The Court did conclude that the NFIP could exercise its rights of subrogation for any claims.

³⁶ 42 U.S.C. § 1307(f), enacted by § 928 of Pub. L. 102-550, 102 Stat. 3652 at 3886 (1992). The basis of this special legislation was that funds to restore the levees had been appropriated, and that the flood risk in this area was only temporary.

³⁷ FEMA guidance explaining the NFIP Map Grandfather Rule is available (as of May 29, 2008) at www.fema.gov/library/file?type=publishedFile&file=grndfthr_sht.pdf&fileid=ff525740-4449-11dc-bda9-000bdba87d5b.

³⁸ *Id.* (emphasis in original).

³⁹ The principal exceptions are for properties built in violation of applicable floodplain management regulations (if discovered) and more recently to certain repetitive loss properties affected by legislation described in Part II, D., *infra*.

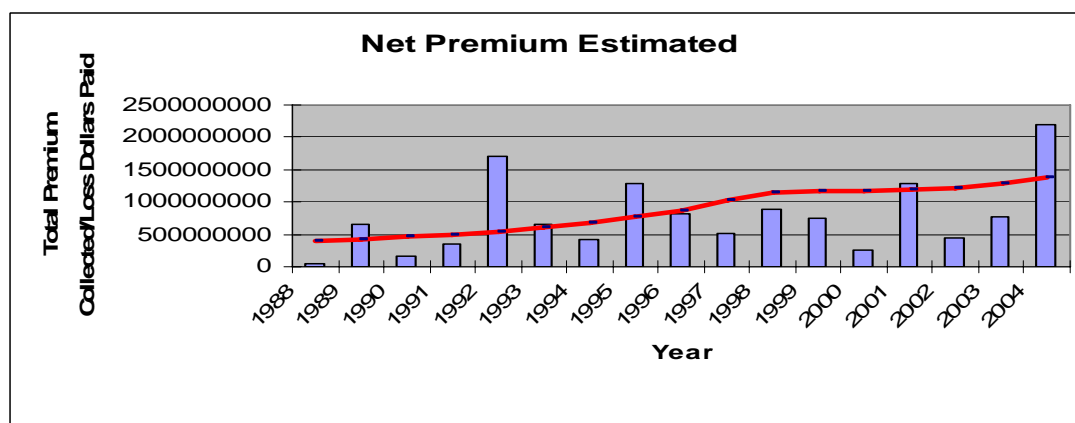
3. Result: Financially Self-Supporting But Only To Limited Extent

As a result of the increased premiums and the restrictions on coverage, and despite the political and market resistance to these measures, the NFIP achieved a measure of financial sustainability:

For the first time, the NFIP [became] financially self-supporting for the historical average loss year . . . During FY 1986, no taxpayer funds are required to meet the NFIP's flood insurance expenses. In addition, at the beginning of the fiscal year, the NFIP is required for the first time to pay all program and administrative expenses with funds derived from insurance premiums.⁴⁰

And while being “financially self-supporting for the historical average loss year” does not meet “the traditional insurance definition of solvency”⁴¹ (since the historical average did not include any catastrophic loss years), the program was funded solely by premiums from the mid-1980s until 2005. Yet despite all of the premium increases from the start of the program, and the substantial restrictions in the scope of coverage offered, the National Flood Insurance Fund was never able to generate a reserve for a catastrophic flood year.⁴²

Thus, as shown below, in a low to medium flood year (such as 1986-88, 1994, and 1997) the fund might show a surplus; in a relatively heavy flood year (such as 1993 [Missouri River], 1995 [Louisiana Flooding and Hurricane Opal], 2001 [Tropical Storm Allison], 2004 [Four Florida Hurricanes]) the Fund would run a substantial deficit and be forced to borrow from the Treasury to pay claims.⁴³



Source: FEMA, <http://www.fema.gov/business/nfip/statistics/cy2006losspd.shtm>.⁴⁴

⁴⁰ NFIP Chronology, *supra* note 29, at 40.

⁴¹ *Id.*

⁴² Recognizing that the NFIP was operating without reserves for a catastrophic event, the Federal Insurance Administrator explored establishing a special financial reinsurance vehicle in 2000 that would require an increase in premium (to cover the cost of the reinsurance) but would pay out in catastrophic loss years to reduce the need for borrowing. This proposal was not adopted in large part because of concern that any reinsurance vehicle would cost more than the cost of debt to the United States Treasury.

⁴³ Prior to Hurricane Katrina, the maximum amount borrowed was just over \$1 billion.

⁴⁴ The net premium estimated has been calculated based on an average of Total Underwriting Expenses deducted from the Total Revenue Earned (values provided by the National Flood Insurance Program *Operating Results by Fiscal Year*) per annum from 1985 through 2005, averaging approximately at a 33.37 percent increase per year.

When Katrina hit in 2005, the Fund had only just managed to pay off the debt incurred in the 2004 Hurricane Season. It had no real reserves – despite the vast increase in policies outstanding spurred in large part by the Mandatory Purchase Requirement. Yet the NFIP’s efforts to achieve financial solvency (in the historical average loss year) did have an impact: flood insurance policies became much narrower in scope that many policyholders expected. To their surprise and disappointment, many policyholders who had diligently paid premiums discovered, when they experienced a flood loss and made their claim on the policy, that many of the losses they experienced in the flood were not covered.⁴⁵ This disappointment, in turn, was one of the drivers behind the litigation discussed below.

C. *The Mandatory Insurance Requirement: Encouraging Policy Growth in Special Flood Hazard Areas and Mis-communicating Flood Risk*

1. Background of the Mandatory Purchase Requirement

After enactment of the National Flood Insurance Act in 1968, the federal government worked feverishly to implement the program. It created a new Federal Insurance Administration, drafted floodplain management rules, developed the Standard Flood Insurance Policy, and entered into agreements with private industry under which a “private industry pool” would issue flood insurance policies and adjust claims. The first insurance policies were sold in June 1969.⁴⁶ But policy growth – then wholly voluntary – was slow. After four years, less than 10 percent of eligible communities had joined the program, and only 95,000 policies across the country were in force.⁴⁷

Despite the slow growth of properties insured for flood, flood damage and federal flood disaster assistance continued to rise. In 1973, Congressional frustration with the low market penetration of flood insurance led to enactment of a flood insurance purchase requirement: federally regulated or supported mortgage lenders became *legally required* to ensure that a property in the SFHA had flood insurance, up to the amount of the loan balance, before they could advance a mortgage loan secured by a property in a defined flood hazard area.⁴⁸ Concern with lack of compliance with this requirement – which became obvious to all after widespread flooding along the Missouri River in 1993 – led Congress to clarify and strengthen the mandatory purchase requirement in the National Flood Insurance Reform Act of 1994.⁴⁹

At the same time that it was making the purchase of flood insurance mandatory in SFHAs, Congress encouraged communities to join the NFIP (so that flood insurance could be available in the community) by prohibiting federal financial assistance, including disaster assistance, “for acquisition and construction purposes” in flood prone areas unless the community had joined the NFIP.⁵⁰ The disaster assistance law already provided that insurance be obtained (if available) as a condition precedent to receipt of disaster assistance funding repair or replacement of structures. It was amended first to prohibit FEMA from waiving this requirement for the risk of flooding,⁵¹ and then to prohibit payment of flood disaster assistance if flood insurance required as a condition of assistance has not been maintained.⁵²

⁴⁵ See, e.g. William O. Jenkins, Director, Homeland Security and Justice Issues, Testimony Before the Subcommittee on Housing and Community Opportunity, Committee on Financial Services, House of Representatives, GAO-05-532T, at 5-6 (April 14, 2005).

⁴⁶ NFIP Chronology, *supra* note 29, at 13.

⁴⁷ Tobin and Calfee, *supra* note 10, at 8 fn.5.

⁴⁸ Section 102 of the Flood Disaster Prevention Act of 1973, Pub. L. No. 93-284, 87 Stat. 975 at 978.

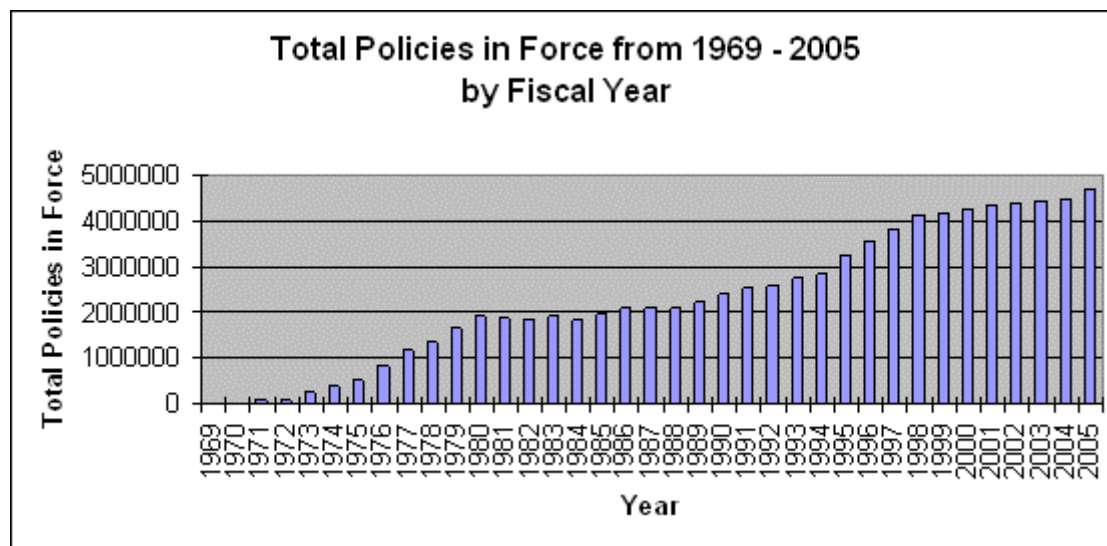
⁴⁹ The National Flood Insurance Reform Act of 1994 (“1994 Act”), Title V of the Riegle Community Development and Regulatory Reform Act of 1994, Pub. L. No. 103-325, 108 Stat. 2160, at 2255-2287.

⁵⁰ Section 202 of the Flood Disaster Prevention Act of 1973; 42 U.S.C. § 4106.

⁵¹ Section 521 of the 1994 Act, 42 U.S.C. § 4012a.

⁵² Section 582 of the 1994 Act, 42 U.S.C. § 5154a.

Spurred on by the growing strength of the mandatory purchase requirement, policies outstanding grew substantially – reaching over 5 million policies in force at the end of 2006:



Source: NFIP Operating Results (FEMA)

Clearly the mandatory purchase requirement stimulated a significant expansion of coverage over a “voluntary” system; significant growth occurred in the period following adoption and strengthening of the requirement in 1973 and 1994, respectively. The significance of the “mandatory” requirement is also shown by the following statistics: In 2006, about 75% of the homes in SFHAs were covered by the mandatory purchase requirement – and compliance with this requirement was about 75%. By comparison, of the 25% of homes in SFHAs that were not subject to the mandatory purchase requirement,⁵³ only 20% had insurance. Yet concerns about lender compliance and market penetration remain. In SFHAs, the NFIP Evaluation Final Report Working Group concluded in 2006 that only about 50% of homes in SFHAs had flood insurance⁵⁴

2. Misunderstanding Generated by Requirement

While it was (somewhat) effective, litigated cases show that the mandatory insurance purchase requirement nonetheless seems to have generated confusion about flood risk both among those who were and were not subject to its requirements – and this uncertainty has also led to some of the current litigation.

3. “Should Purchase” vs. “Required to Purchase”

Note first that the NFIP’s mandatory insurance requirements only apply to structures located in an area shown, on the Flood Insurance Rate Map (FIRM) promulgated by FEMA after technical studies and consultation with a community, as having at least a 1% chance per year of flooding in any given year. A property which is not located in an SFHA is not subject to the mandatory purchase requirement. Reflecting the perceived absence of flood risk in areas not mapped in SFHAs, only 1% of insurable homes in non-SFHAs have flood insurance.⁵⁵

⁵³ There is no requirement, for example, for homes whose mortgages have been paid off.

⁵⁴ AMERICAN INSTITUTES OF RESEARCH, THE EVALUATION OF THE NATIONAL FLOOD INSURANCE PROGRAM FINAL REPORT, at 26 (October 2006).

⁵⁵ L. DIXON, ET AL., RAND CORPORATION, THE NATIONAL FLOOD INSURANCE PROGRAM’S MARKET PENETRATION RATE: ESTIMATES AND POLICY IMPLICATIONS, at 29 (Feb. 2006). This Report is part of the Evaluation of the Flood

While the majority of properties outside of SFHAs may well have no real risk of flooding, experience has shown that many properties do. The maps may have been wrong, technically, from the outset. Areas that had a 1% chance per year of flooding may now have a 1 in 30 year chance of flooding after development has replaced land that absorbs rainfall with impervious roads and rooftops. Levees may have been improperly built or maintained. Areas that have only a 1 in 100 chance in any year of flooding may well flood during a storm with a 1 in every 200 year severity. In fact, in the history of the NFIP, over one third of all flood claims have been paid on properties located outside the SFHA – and in one state (Idaho) 82% of flood claims were incurred in areas mapped as having a less than 1% per year chance of flooding.⁵⁶

The problem – at least as it is disclosed in the complaints filed by uninsured plaintiffs⁵⁷ – is that some property owners seem to believe that if they are not in a Special Flood Hazard Area, they do not have a flood risk and so should not purchase flood insurance. In many cases they may ask their agent, before buying a home, whether they “*have to have*” flood insurance on their new home. Many agents construed these request as asking whether the property owner was legally required (by the mandatory purchase requirement) to have flood insurance – and said “no.”⁵⁸ Indeed the documentation of flood risk required by statute, with a lender obtaining and keeping in its files a “Standard Hazard Determination Form”⁵⁹ showing whether a property is in a SFHA and thus required to have flood insurance, may have led both insurance agents and property owners to think that if the Form said the property was not a flood area, flooding and flood insurance need not be of concern.

But almost inevitably, some of these uninsured properties then flood, and property owners have then brought suit alleging that the insurance agent had negligently failed to advise them, when asked, that they “*needed*” flood insurance. Thus, the mandatory purchase requirement, in addition to communicating flood risk to property owners in a SFHA and stimulating the purchase of flood insurance, appears also to have *incorrectly* communicated an *absence* of flood risk for those not in mapped SFHAs.

4. Minimum Required Coverage and Replacement Cost

A second effect of the mandatory purchase requirement has been to create the impression that, if the property owner purchases the *required amount* of flood insurance, the property owner is protected from losses due to flood. But the purchase requirement does not do so and was not even designed to provide full protection. The NFIP’s flood insurance requirement only requires that flood insurance be obtained in an amount covering the outstanding loan balance. When homeowners purchase only the amount of flood insurance “required,” they not only purchase no coverage whatsoever for any equity they may have had in their home – the amounts in excess of the mortgage loan – but they also automatically – and perhaps unwittingly – do not even purchase coverage that would pay for repair of flood damage within the policy limits.

Insurance Program funded by FEMA and is available (as of May 21, 2008) at <http://www.fema.gov/library/viewRecord.do?id=2599>.

⁵⁶ Tobin and Calfee, *supra* note 10, at 1 fn.1 and 37.

⁵⁷ *Nast v. State Farm Fire and Cas. Co.*, 82 S.W.3d 114 (Tex. App. 2002); *Jones v. State Farm General Ins. Co.*, 2007 WL 1428705 (E.D.La. May 11, 2007).

⁵⁸ Demonstrating significant lack of understanding of the flood insurance program, some insurance agents have even advised property owners, incorrectly, that flood insurance is not available in areas that are not mapped as SFHAs. *See, e.g., Jones*, 2007 WL 1428705. Plaintiffs asked insurance agent 90 days prior to Katrina if she could procure flood insurance. Agent’s representative told her that because her property was in a no flood zone, flood insurance was not necessary. Plaintiffs’ house was destroyed by water that flowed through levee breaches. Agent later admitted that his office was incorrect, and that insurance can be purchased in a no flood zone. (Case decided on jurisdictional grounds). Flood insurance in these areas is not only available, but relatively cheap; homeowners can qualify for a “preferred risk” policy.

⁵⁹ 42 U.S.C. §1365.

How can this be? The deficiency in coverage occurs because a flood policy will only provide “replacement cost coverage” if the policy limit is 80% of the replacement cost of the insured structure (or the maximum amount available under the NFIP).⁶⁰ If a property owner has paid for only \$100,000 in coverage, and the replacement cost of the structure is \$150,000, then in the event of flood damage the policy will pay only the Actual Cash Value (ACV) of the damaged property at the time of loss *less its accumulated depreciation*.⁶¹ For older buildings, where there is substantial depreciation, the actual cash value of damaged property is considerably less than the cost of repairing or replacing the damaged property.

The significant difference between ACV and Replacement Cost Coverage interacted with the flood insurance purchase requirement in a way that may have surprised many policyholders. The NFIP mandatory insurance requirement directed mortgage holders to assure that mortgaged property located in a special flood hazard area had flood insurance “in an amount at least equal to the outstanding principal balance of the loan or the maximum limit of coverage made available under the Act . . . , whichever is less.”⁶² This protected lenders but is incomplete protection for the property owner for medium to large flood losses.

Faced with a number of recalcitrant buyers and some litigation,⁶³ many lenders were reluctant to require flood insurance greater than the amount they were under an obligation to require. And whenever only “the required amount” of insurance was purchased, replacement coverage of structure and contents was in effect only for those loans with less than 20% equity. For older homes – the ones with the greatest adjustments for depreciation – this meant no replacement cost coverage. So if the amount of a mortgage loan were less than 80% of the replacement cost of a structure, and a homeowner only insured (as required) to the amount of the mortgage loan, the homeowner *by definition* would receive less in a claim settlement than the amount required to repair or replace the damaged property.⁶⁴

The significant restrictions and exclusions in the Standard Flood Insurance Policy – crafted in an effort to stem the hemorrhage of red ink in the program – meant that many insured policyholders would experience substantial uncovered losses after significant flood events. We have also seen that the mandatory flood insurance requirement – while encouraging many policy holders to have coverage – may have caused misunderstanding of the actual flood risk on properties not within SFHAs. The mandatory purchase requirement may also have caused property owners to think that they were appropriately insured in purchasing only the amount of insurance required – and led them to be underinsured.⁶⁵

Thus, after Hurricanes Katrina and Rita devastated the Gulf Coast, many thousands of property owners found that their homes had been destroyed by flooding, and all too many of them had no flood policies at all, or wholly inadequate flood coverage given the scale of the damage. Many of these property owners

⁶⁰ Standard Flood Insurance Policy (44 CFR Part 61, App. A(1), Article V, ¶ 1a.

⁶¹ *Id.*, Article V, ¶ 2.

⁶² Section 102(b)(1) of the Flood Disaster Protection Act of 1973, as amended, 42 U.S.C. § 4012a(b)(1).

⁶³ *Norris v. Union Planter's Bank*, 98-1581 (La.App. 1 Cir. 6/25/99); 739 So.2d. 869 (holding bank purchased more insurance than permitted by National Flood Insurance Act); but see *Hayes v. Wells Fargo Home Mortg.*, 2006 WL 3193743 (E.D.La. Oct. 31, 2006) (Holding bank was clearly within its rights under the federal flood program to require Hayes to obtain flood insurance beyond the outstanding value of the mortgage).

⁶⁴ U.S. GOVERNMENT ACCOUNTING OFFICE, IMPROVEMENTS NEEDED TO ENHANCE OVERSIGHT AND MANAGEMENT OF THE NATIONAL FLOOD INSURANCE PROGRAM, GAO-06-119, at 20-21 (Oct. 2005).

⁶⁵ It is also plausible that these underinsured property owners would have refused all coverage in the absence of the mandatory purchase requirement – so that they would have uninsured rather than underinsured in a flood. Whatever their motivation, these policy holders – after their property was flooded – discovered that their policy left them with substantial uncovered losses.

then sued insurance carriers and insurance agents under a wide variety of theories that are now being evaluated by the courts. In the vast majority of the cases involving the NFIP, the federal government is not even a party to the litigation. The federal government may have created the insurance policy, promulgated rules governing its interpretation and applicability, accepted all insurance risk, and agreed to pay most of the costs of litigating cases – but is not in the courtroom when its liability is at stake. To understand flood insurance litigation, it is necessary first to describe the relationship between the federal government and the private insurance industry.

II. Flood Insurance Litigation

A. *The Role of the Private Insurance Industry in the NFIP*

From the outset of the NFIP, Congress anticipated and encouraged a very active role for the private insurance industry. The purpose of the Act was to “authorize a flood insurance program by means of which flood insurance, over a period of time, can be made available on a nationwide basis through the cooperative efforts of the Federal Government and the private insurance industry. . . .”⁶⁶ The insurance program could commence only after consultation with representatives of the insurance industry.⁶⁷ The Congress expressed a clear preference that the new program provide flood insurance through an industry flood insurance pool supported by the federal government.⁶⁸ Indeed, the federal government could assume operational responsibility of the program only after consultation with the insurance industry and a report to Congress and to the industry.⁶⁹ And the Secretary of Housing and Urban Development (HUD) had to include in this report a determination either that the industry pool arrangement “cannot be carried out,” or that the NFIP “would be assisted materially by the federal government’s assumption of operational responsibility for the program.”⁷⁰ But even if the federal government assumed operational control, Congress gave the Secretary wide latitude to utilize “insurance companies and other insurers, insurance agents and brokers, and insurance adjustment organizations, as fiscal agents of the United States.”⁷¹

The NFIP commenced operations in 1969 under Part A of the Act through the National Flood Insurers’ Association (NFIA), a private industry pool created for this purpose. NFIA issued these policies with federal government subsidies of the pool’s losses under a financial assistance agreement.

The private industry pool program of NFIA operated for less than ten years. Tensions between the HUD and the NFIA on cost and performance issues grew throughout the Nixon and Ford Administrations and in 1977, the Carter Administration’s new Secretary of HUD determined that operation of the program “would be assisted materially by the Federal Government’s assumption . . . of the operational responsibility for flood insurance.”⁷² Despite a flurry of legal maneuvering by the NFIA,⁷³ HUD commenced direct Federal operation of the flood program, utilizing a servicing contract with EDS Federal Corporation, on January 1, 1978. Virtually simultaneously, the Secretary of HUD’s responsibilities over the flood insurance program, and the entire Federal Insurance Administration, transferred to the newly created Federal Emergency Management Agency (FEMA).⁷⁴

⁶⁶ 42 U.S.C. § 4001(d)(1).

⁶⁷ *Id.* § 4041.

⁶⁸ *Id.* §§ 4051-4056.

⁶⁹ *Id.* § 4071.

⁷⁰ *Id.* § 4071(a).

⁷¹ *Id.* § 4071(a)(1).

⁷² Secretary’s Report to Congress Upon Making Determination to Operate Under Part B Framework, 42 Fed. Reg. 58569 (Nov. 10, 1977).

⁷³ See *National Flood Insurer’s Association v. Harris*, 444 F. Supp. 969 (D.D.C. 1977).

⁷⁴ Reorganization Plan No. 3., 43 Fed. Reg. 41943, Exec. Order No. 12,127 (1978).

The assumption of operational responsibility under Part B of the Act meant, as a legal matter, that all policies were issued directly by the federal government. The name of the Insurer on every flood insurance policy – printed by the U.S. Government Printing Office – was the Federal Insurance Administration. Indeed, all policies issued by the NFIA became direct obligations of the United States. The insured's premium checks were deposited in the Flood Insurance Fund in the U.S. Treasury. Claims made were made against the United States. The servicing contractor acted as agent of the United States in selling policies, training insurance agents, and servicing claims. The Department of Justice defended litigation arising from disputes over flood insurance policies. A policyholder could have no doubt that he or she was dealing with the federal government.

Shortly after the start of the Reagan Administration, the new Federal Insurance Administrator began formulating a new arrangement to bring the private insurance industry back into the flood insurance arena. FIA promulgated the resulting Write-Your-Own ("WYO") Arrangement (so named because participating insurance companies could write flood insurance policies on their own "paper" or policy forms) in 1983.⁷⁵ While this new arrangement did not eliminate the agency's "direct" insurance program, within a very few years, more than 90% of all flood insurance policies were issued under the WYO Arrangement. This Arrangement created a unique public-private partnership with a fascinating and still unfolding mixture of public and private responsibilities.

The statutory foundation of the WYO Arrangement is the same as that of the direct program: it is a "Government Program with Industry Assistance" under Part B of the Act.⁷⁶ The WYO Arrangement not only remains a federal program, it looks like a federal program as it relates to the relationship between FEMA and the participating insurance companies. The "Arrangement," or contract,⁷⁷ between FEMA and the insurance company participants (WYO carriers) is itself promulgated by rule in the Code of Federal Regulations. FEMA also continues to specify in the Code of Federal Regulations every provision of the Standard Flood Insurance Policy. This policy cannot be altered by anyone – not even the private insurance company "writing" or issuing the policy – without the express written consent of the Federal Insurance Administrator.⁷⁸ FEMA continues to set the premium applicable for each type of policy in each of the risk zones specified on the Flood Insurance Rate Map (FIRM) issued by FEMA for participating communities. In the absence of underwriting mistakes – that is, assuming all companies properly determine a property's flood zone on a FIRM and correctly enter elevation, age, and other relevant data for the property – every insurance company must charge the same premium for the same coverage on a property as FEMA would if selling the policy directly. FEMA continues to be financially responsible for every loss incurred on any policy sold under the WYO arrangement to the same extent as if it had sold the policy itself. From a legal standpoint, WYO companies are acting as "fiscal agents" of the United States,⁷⁹ not as general agents.⁸⁰

⁷⁵ 48 Fed. Reg. 46789-01 (Oct. 14, 1983)

⁷⁶ 42 U.S.C. § 4071-4072. Specifically, under Part B the Director shall "undertake any necessary arrangements to carry out the program of flood insurance . . . through the facilities of the federal government, utilizing, for purposes of providing flood insurance coverage, either (1) insurance companies and other insurers, insurance agents and brokers, and insurance adjustment organizations, as fiscal agents of the United States, (2) such other officers and employees of any executive agency . . . as the Director and the head of any such agency may from time to time, agree upon, on a reimbursement or other basis, or (3) both the alternatives specified in paragraphs (1) and (2)." *Id.* § 4071(a).

⁷⁷ The arrangement is treated as a "subsidy agreement" and not as a federal contract by FEMA. As a result, government procurement regulations are not applicable to it and participating insurance companies are not considered to be federal contractors.

⁷⁸ 42 C.F.R. Part 61, App. A(1)VII(D); App. A(2)VII(D); App. (A)(3)VII(D); *Gowland v. Aetna*, 143 F.3d 951 (5th Cir. 1998).

⁷⁹ 42 U.S.C. § 4071(a)(1); *Van Holt v. Liberty Mut. Fire Ins. Co.*, 162 F.3d 161, 166 (3rd Cir. 1998).

⁸⁰ *See Parsons Footwear, Inc. v. Omaha Property & Casualty Co.* 19 F. Supp 2d 588 (N.D.W.V. 1998).

Nonetheless, the WYO Arrangement has given flood insurance the appearance of a private sector program to its policyholders. Participating insurance companies sell flood insurance to the general public in their own name: it is the Company's name, and not FEMA's, that appears at the top of the policy declaration page. While there are ample hints in the policy that the federal government has something to do with the policy, these hints will likely appear to most policyholders in a mass of boilerplate.⁸¹ Policies are sold by and through the same agents who handle homeowners' other lines of insurance, such as automobile and homeowners' insurance.

An insured's premium check is made out to the WYO carrier. All contacts in connection with the policy are made through the agent or directly to the WYO carrier. The WYO carrier determines and collects the appropriate premium, processes renewals and coverage changes, receives notice of claims, hires adjusters for those claims, and settles the claims, providing a company check written on the company's bank.⁸² In short, customers interact with their agent and WYO carrier in the same manner that they interact with their agent and insurance carrier for homeowners insurance – in many cases with the same agent and carrier (or family of carriers) used for homeowners and automobile insurance. Indeed, a principal justification for the WYO program was to give the flood program access to the private insurance industry's vast network of agents and adjusters rather than rely on a single purpose network comprised of federal contractors that perhaps would not even be adequate to respond to catastrophic flooding.⁸³

B. Impact of the NFIP Public-Private Partnership on Flood Insurance Litigation

We have now seen that the WYO program of the NFIP, under which well over 90% of policies are sold, was designed to “look like” a standard private insurance policy sold and serviced by private insurers. The “real” insurer (the entity holding all risk of loss) is the federal government – but the federal government designed the WYO program to virtually eliminate any interaction of the federal government with policyholders. However, there is a big difference between the law applicable to private insurers and the law applicable to the federal government.⁸⁴

As a result, NFIP litigation over the last several decades has been characterized by a largely unsuccessful struggle by policyholders to have their “sold by the private sector” flood insurance policies treated by standard principles of insurance law in state courts rather than treated as a federal government program defended in federal court.

1. Federal Versus State Court Jurisdiction

The Act provides for “original exclusive jurisdiction” in federal district court of challenges brought by policy holders from a total or partial disallowance by “the (FEMA) Director”⁸⁵ of a claim on a flood

⁸¹ These are (1) Policy subject to NFIA and Regulations, (2) No alteration of policy without consent of FIA, (3) Definition of NFIP, (4) Reference to FEMA building standards, (5) What Law Governs etc.

⁸² Indeed, FEMA is not a proper party to the action. *Tollini v. State Farm Fire and Cas. Co.*, No. C99-3383 MJJ (D. N.J. Feb. 9, 2000).

⁸³ 48 Fed. Reg. 46789-01 (Oct. 14, 1983).

⁸⁴ Under the McCarran-Ferguson Act, 15 U.S.C. §§ 1011-1015, Congress made “the business of insurance, and every person engaged therein, . . . subject to the laws of the several States which relate to the regulation or taxation of such business.” Further, “[n]o Act of Congress shall be construed to invalidate, impair, or supersede any law enacted by any State for the purpose of regulating the business of insurance, or which imposes a fee or tax upon such business, unless such Act specifically relates to the business of insurance.” Since the National Flood Insurance Act indeed relates to the business of insurance, it does preempt state law.

⁸⁵ The head of FEMA is now the Administrator.

insurance policy, and further specifies a one-year statute of limitations for these actions.⁸⁶ Relatively early in the history of the WYO Program, the Courts concluded that this jurisdiction and limitation provision applied not just to suits directly against FEMA, but also to suits filed against a WYO carrier.⁸⁷ Later cases have made it clear that when a WYO Company denies a claim, it does so as “fiscal agent of the United States,” and therefore that any suit brought against the WYO Company challenging its total or partial disallowance of a claim on a flood insurance policy may be brought only in federal court.⁸⁸

Policy holders sought to evade this provision by claiming they brought suit not under their Standard Flood Insurance Policy (SFIP), but for extra-contractual damages under state laws requiring prompt handling of insurance claims, or for fraud in the manner of handling claims, and the like. These efforts generally proved unsuccessful, particularly after FEMA amended the language of the SFIP (in 2000) to state that

If you do sue, you must start the suit within one year after the date of the written denial of all or part of the claim, and you must file the suit in the United States District Court of the district in which the covered property was located at the time of loss. *This requirement applies to any claim that you may have under this policy and to any dispute that you may have arising out of the handling of any claim under the policy.* [2000 Amendment italicized.]⁸⁹

Further, in what was a clear effort by FEMA to preempt state remedies arising from the handling of flood insurance claims, the policy provides that:

This policy and all disputes arising from the handling of any claim under this policy are governed exclusively by the flood insurance regulations issued by FEMA, the National Flood Insurance Act of 1968, as amended, and Federal common law.⁹⁰

On the other hand, courts found that exclusive jurisdiction in federal courts did not apply to disputes arising from failures of an insurance agent or WYO Company to obtain an SFIP in the amount and with the coverage requested by a property owner.⁹¹ Thus in most cases, if fault of the agent prevented a policy from coming into existence, then no dispute can arise “under the policy” and the matter may remain one properly handled in state courts.

⁸⁶ “The Director shall be authorized to adjust and make payment on any claims for proved and approved losses covered by flood insurance, and upon the disallowance by the Director of any such claim, or upon the refusal of the claimant to accept the amount allowed upon any such claim, the claimant, within one year after the date of mailing of notice of disallowance or partial disallowance by the Director, may institute an action against the Director on such claim in the United States District Court for the district in which the insured property or the major part thereof shall have been situated, and *original exclusive jurisdiction* is hereby conferred upon such court to hear and determine such action without regard to the amount in controversy.” 42 U.S.C. § 4072 (emphasis added).

⁸⁷ *Spence v. Omaha Indemnity Casualty Co.*, 996 F.2d 793 (5th Cir. 1993); *Van Holt v. Liberty Mut. Fire Ins. Co.*, 163 F.3d 161 (3rd Cir. 1998).

⁸⁸ *Newton v. Capital Assur. Co., Inc.*, 245 F.3d 1306 (11th Cir. 2001); *Van Holt* 163 F.3d 161.

⁸⁹ 44 C.F.R. App. A(1) at ¶ VII R, promulgated at 65 Fed. Reg. 60758, 60776 (October 12, 2000).

⁹⁰ *Id.* at ¶ IX.

⁹¹ *Moore v. Allstate Ins. Co.*, 995 P.2d 231 (Alaska 2000); *Houck v. State Farm Fire & Cas. Co.*, 194 F.Supp.2d 452 (D.S.C. 2002); *Landry v. State Farm Fire & Cas. Co.*, 428 F.Supp.2d 531, 532-36 (E.D.La. 2006); *See, Houck v. State Farm Fire and Cas. Co.*, 620 S.E.2d 326 (S.C. 2005) (No duty under South Carolina law owed by agent and WYO Company to advise insured of availability of cheaper Preferred Risk Policy).

2. Construction of the Insurance Policy

State laws generally characterize insurance policies as contracts of adhesion drafted by the insurance company, and construe any ambiguity against the insurance carrier.⁹² By contrast, the SFIP is developed by FEMA as a regulation, after opportunity for public notice and comment, and is codified in the Code of Federal Regulations. Its provisions have the force and effect of law. Ambiguity in a federal flood insurance policy is not construed in favor of the insured and against the drafter – the Flood Insurance Administrator (FIA). Rather, the FIA is granted deference as the Agency responsible for promulgating and interpreting the SFIP. Indeed, the federal law generally operates with a presumption that residents are bound by technical programmatic regulations whether or not the customer is aware of them.

3. Technical Defenses: the Proof of Loss Requirement

The SFIP includes a strict requirement that a claimant file and notarize a Proof of Loss within 60 days of the loss, and also a strict requirement that “you may not sue us to recover money unless you have complied with all the requirements of the policy.”⁹³ The SFIP also provides that it cannot be

changed, nor can any of its provisions be waived without the express written consent of the Federal Insurance Administrator. No action we may take under the terms of this policy constitutes a waiver of any of our rights.⁹⁴

This Proof of Loss requirement has tripped up an astonishing number of claimants, given the clear language in the policy. A WYO Company’s adjuster may provide a proposed settlement of a claim with which a policy holder disagrees. The policy holder refuses to sign the proposed Proof of Loss – and does not submit an alternative one, perhaps because the policy holder is not confident that he or she has adequate information to certify formally a specific dollar amount as the quantum of loss from the flood. The policy holder may even be advised (clearly by a lawyer with no flood insurance experience) not to sign a formal proof of loss because in most states the formal proof of loss is not required in insurance cases.

However, if negotiations between the WYO Carrier and the claimant break down and this claimant files suit, the claimant will be met by a motion for summary judgment for failure to comply with the policy’s Proof of Loss requirement. This filing is almost always successful.⁹⁵

4. Punitive and Extra-Contractual Damages

For private insurance companies, punitive damage exposure is the key consideration in evaluation of an insurance company’s litigation position. Even in states where punitive damages are not available for contract actions, many states have established, either by statute or common law, an affirmative duty sounding in tort of good faith and fair dealing, and a breach of that duty gives rise to a tort action of bad faith.⁹⁶ In order to protect policy holders from delayed and “low ball” settlements on insurance claims, some state laws specifically allow the award of punitive damages for failure to pay claims in the amount ultimately approved by a jury, or within a specific period of time after the event triggering an insurance

⁹² Scales, *supra* note 9, at 24-25.

⁹³ 44 C.F.R. Part 61, App. A(1) at ¶¶ VII J and VII R.

⁹⁴ *Id.* at ¶ VII D.

⁹⁵ *Shuford v. Fidelity Nat’l Prop. & Cas. Ins. Co.*, 508 F.3d 1337 (11th Cir. 2007); *Richardson v. American Bankers Ins. Co.*, slip copy, 2008 WL 510518 (5th Cir. 2008); *Neuser v. Hocker*, 246 F.3d 508, 510 (6th Cir. 2001) (“Our sister circuits have consistently held that FEMA’s proof of loss requirement is to be strictly enforced.”); *Gowland v. Aetna*, 143 F.3d 951 (5th Cir. 1998).

⁹⁶ *Pickett v. Lloyd’s*, 621 A.2d 445 (N.J. 1993).

claim.⁹⁷ A key rationale for awarding punitive damages is to eliminate any incentive insurance companies might have to fail to pay claims in full promptly.

WYO Companies do not have a profit incentive to fail to pay claims in full. All flood claim payments come not from the company's capital and surplus, but from the federal treasury. Indeed, because the WYO is paid, for claims handling expenses, a percentage (3.3%) of every claim dollar paid out on a flood policy, plus certain "allocated loss expenses,"⁹⁸ a WYO Company has a financial incentive to pay every proper claim presented to it. For a WYO Company, the principal cost of improperly over or underpaying claims is that improper claims handling could violate its contractual undertakings as "fiscal agent" of the United States. This could cause FEMA to suspend the WYO from the program.⁹⁹

In any event, state extra-contractual and punitive damage claims do not apply in suits against the federal government. Indeed, suits against the federal government are allowed only to the extent that the government consents to be sued. While the federal government has generally authorized actions in tort, no tort action can be filed against the FIA in connection with errors or abuses arising out of issuance or servicing of a flood insurance policy because the Congress has not waived immunity for such suits. Similarly, the federal government has not authorized suits for punitive damages, although Plaintiffs have recently been having some success in obtaining costs and attorneys fees under the Equal Access to Justice Act when successful in flood insurance litigation.¹⁰⁰

C. Courts and Congress: Litigation and Major Flood Events

1. Hurricane Isabel Litigation

The result of all of these provisions is that policyholders dissatisfied with their claim settlement under a flood insurance policy will generally not be successful in obtaining a higher settlement in the courts. An interesting example is *Moffett v. Computer Sciences Corp.*¹⁰¹ In this case, 182 different SFIP policy holders received settlements on flood losses, incurred after Hurricane Isabel passed through Maryland in 2003, that were far lower than the cost to repair the damage. They sued FEMA and a number of FEMA's employees, as well as FEMA's flood insurance contractor, the Computer Sciences Corp. (CSC), several WYO Companies, and insurance adjusters working for the WYO companies. The principal objective of the lawsuit was to find some way of recovering damages in excess of those covered by their SFIP.

Count I sought damages from FEMA's employees under *Bivens v. Six Unknown Named Agents*.¹⁰² "A *Bivens* action is a judicially created damages remedy designed to vindicate violations of constitutional rights."¹⁰³ The Court found that a *Bivens* action was unavailable because Congress had expressly provided for exclusive jurisdiction in federal district court for review of flood insurance claim determinations; this Count was dismissed.

Count II claimed fraud in selling the SFIP to plaintiffs; the fraud was that defendants falsely represented the "nature and extent of benefits that would be paid . . . in the event of a flood loss."¹⁰⁴ This Count was

⁹⁷ See, FLORIDA STAT. ANN. § 624.155(1)(b).

⁹⁸ 44 C.F.R. Part 62 App. A, Article III, C.

⁹⁹ *Id.* at Article V, D. A WYO's pattern of overpaying claimants, and receiving reimbursement from federal funds, can be prosecuted under the False Claims Act. See, *U.S. v. Bankers Ins. Co.*, 245 F.3d 315 (4th Cir. 2001).

¹⁰⁰ See, *Berger v. USAA General Indem. Co.*, slip copy, 2008 WL 1730533, (E.D.La., 2008); *Qader v. FEMA*, 2008 WL 576223 (E.D. LA. Feb. 29, 2008); *Grisaffi v. Audobon Ins. Co.*, 2008 WL 695375 (E.D. La. Mar. 13, 2008).

¹⁰¹ 457 F.Supp.2d 571 (D.Md. 2006).

¹⁰² 403 U.S. 388 (1971).

¹⁰³ *Moffett*, 457 F.Supp.2d. at 578.

¹⁰⁴ *Id.* at 586.

held preempted by federal law because it would in all likelihood be the federal treasury which would pay for any judgments.

Count III claimed fraud in the adjustment of the claim - by “misrepresenting the nature and extent of Plaintiffs’ SFIP coverage in order to induce them to accept ‘low ball’ offers.” Count IV claimed tortious interference with contract, based in some fashion on the handling of the claim. These counts were dismissed because a federal regulation – the language described earlier in the SFIP itself – expressly preempted state law, and also because even prior to the promulgation of this provision in the policy, three federal circuits had concluded that federal law preempted state remedies for disputes involving handling of claims under the SFIP.¹⁰⁵

Finally, Count V sought damages for breach of the SFIP itself – but it claimed not just damages for “direct physical loss due to flood” as covered by the policy, but also “delay damages, prejudgment interest, disgorgement of profits, and a refund of premiums.” The Court dismissed the portion of the Count seeking these *additional* damages – because they were not called for by the SFIP. In short – plaintiffs were left with no claim for any damages other than direct physical loss due to flood – after application of all of the exclusions set forth in the SFIP, and after computing the “actual cash value,” less than replacement cost, for all properties that did not have replacement cost coverage.¹⁰⁶

Meanwhile, plaintiffs had sought relief in the Congress, expressing outrage at congressional hearings over the minimal settlements offered under the NFIP. At first blush Congress appeared sympathetic, and in late 2004, Congress enacted the “Flood Insurance Reform Act of 2004.”¹⁰⁷ The Committee’s Report on the bill expressed sympathy for the difficulties experienced by policyholders after Hurricane Isabel and directed FEMA to respond:

The Committee is aware of many problems in the flood insurance program as a result of recent flooding from Hurricane Isabel, which took place in September, 2003. As a result of this flood, 24,000 claims were made to NFIP. Unfortunately, many flood victims did not receive adequate settlements under NFIP to allow them to repair their homes. While the changes contained in this bill will ensure that future flood victims do not face these same problems, we expect FEMA to conduct a thorough review of all claims resulting from Hurricane Isabel, and to re-adjust those claims where flood victims did not receive fair and adequate payments. The Committee expects the review of claims to be an independent process, where adjusters are not reviewing claims for which they were initially responsible after Hurricane Isabel. FEMA must make all efforts to ensure that the claims in question are settled fairly.¹⁰⁸

In response to Congressional concern, FEMA did establish a process to review Hurricane Isabel claims, with the following result: almost half of the 2,294 policyholders (of the 24,000 Hurricane Isabel claimants) who sought a review received additional payments averaging \$3,300 more than the original settlement.¹⁰⁹

Further, in the wake of Hurricane Isabel Congress imposed on FEMA a number of new requirements in the claims-handling process – all to be implemented in six months:

¹⁰⁵ *Id.* at 581-83.

¹⁰⁶ See also, *Howell v. State Farm Ins. Companies*, 540 F.Supp.2d 621 (D.Md. 2008) (Proposed class action against WYO Companies; all extra-contractual claims dismissed).

¹⁰⁷ Pub. L. No. 108-264, 118 Stat. 712 (June 30, 2004).

¹⁰⁸ S. Rep. No. 108-262 (May 13, 2004) at 5.

¹⁰⁹ GAO, *supra* note 64, at 5-6.

- §202: FEMA must prepare supplemental forms explaining “in simple terms” the coverages of the SFIP, including exclusions, with “an explanation, including illustrations, of how lost items and damages will be valued under the policy in time of loss.”
- §203: FEMA must prepare an “acknowledgement form” that SFIP purchasers must sign indicating the purchaser of the policy has received the policy and explanation of coverage “in simple terms” developed under §202.
- §205: FEMA must develop a new “appeals process” allowing any policyholder to file an administrative appeal *with FEMA* of any denial of coverage by a WYO company;
- §204: FEMA must develop a “claims handbook” describing how to file a claim under the NFIP and how to use the new appeals process.
- §207: FEMA must establish and publish minimum training and education requirements for all insurance agents.¹¹⁰

In addition, the Comptroller General was directed to conduct a study (within one year) on the adequacy of flood coverage, the adequacy of payments to flood victims under flood policies, and the practices of FEMA and insurance adjusters in estimating losses during a flood.

In short, despite very substantial concern about the flood victims who “did not receive adequate settlements” after Hurricane Isabel, and enactment of legislation specifically in response to this concern, about 5% of the Hurricane Isabel claimants received an average of \$3,300 – largely due to price inflation between the time the initial settlement offer was made and the date of the review. *But the most significant political impact of this experience was creation of a number of mandates requiring FEMA, WYO Companies, and insurance agents to provide a better explanation of the substantial limitations on flood insurance coverage.*

2. Hurricane Katrina Litigation

Hurricane Katrina was a truly catastrophic flooding disaster; flood losses from this one event exceeded the losses experienced in the 35 years since the first flood insurance policy was sold.¹¹¹ It also generated more flood insurance litigation than any previous flood event. While relatively few cases have been decided on the merits,¹¹² the progress of litigation has been strikingly similar to the course of cases litigated after previous floods. Of roughly 1100 cases that remain pending, 740 allege inadequate claim settlements or improper claims handling, 60 challenged the administration of the policy by the WYO Company, and 100 were brought due to (alleged) failure of an agent/WYO Company to procure a flood policy as requested by the homeowner. And of these 1100 cases, all but 100 are being litigated in federal court.¹¹³ In other words, in Hurricane Katrina cases just as in all other NFIP cases, the federal court has exclusive jurisdiction of any cases that involve claims handling and policy administration – because the statute itself provides for “original exclusive jurisdiction in federal district court” and because they involve the interpretation of a federal regulation (the Standard Flood Insurance Policy), and the implementation of federal policy and guidance on how WYO Companies must write policies and adjust claims that are effectively paid from federal funds.¹¹⁴

¹¹⁰ Pub. L. No. 108-264, 118 Stat. 712 (June 30, 2004).

¹¹¹ FEMA, Loss Dollars Paid by Calendar Year, <http://www.fema.gov/business/nfip/statistics/cy2007lsdoll.shtm> .

¹¹² At the 2008 National Flood Insurance Conference, Jordan Fried, Associate Chief Counsel for Litigation for FEMA, and Gerald Neilson, an attorney representing a number of WYO companies in NFIP litigation, reported on the status of Hurricane Katrina related flood litigation. Mr. Neilson noted that only five cases had gone to trial – although approximately 1000 cases had been settled.

¹¹³ *Id.*

¹¹⁴ 42 U.S.C. § 4072; e.g., *Cantelli v. Farmers Insurance Group*, 2008 WL 251803 (E.D.La. Jan. 28, 2008); *Catchot v. Felsher*, 2006 WL 3313779 (S.D. Miss Nov. 14, 2006).

Just as in prior flood cases, where policy holders bring suit challenging the claim settlements offered by FEMA or its WYO Companies, the federal courts deciding Katrina cases have upheld the technical requirements of the SFIP and protected the National Flood Insurance Fund against claims for extra-contractual damages. Many Katrina related flood cases were summarily dismissed due to the failure of the plaintiff to comply with the proof of loss requirement.¹¹⁵ In order to expedite processing of claims after Hurricane Katrina, the Federal Insurance Administrator waived the Proof of Loss requirement for a twelve-month period – but policyholders challenging the proffered settlement were still obligated to provide a Proof of Loss within the twelve-month period or lose their right to litigate.¹¹⁶

Similarly, federal courts have protected the NFIP and WYO Companies from extra-contractual or punitive damages; extra-contractual claims based on state law are preempted by federal law,¹¹⁷ and the National Flood Insurance Act does not authorize recovery of extra-contractual or punitive damages under federal law¹¹⁸ – although, as noted earlier, it appears that attorney fees can be awarded under the Equal Access to Justice Act.¹¹⁹

As in prior flood litigation – but with far more cases – much of the continuing litigation has dealt not with adjustment of actual claims on policies, but claims that a policy that was not in place would have been in place absent negligent (or worse) conduct, advice or communications by agents and WYO companies.¹²⁰ Actions for extra-contractual damages of this type have had some (but not uniform) success – at least in surviving a motion to dismiss.

Some plaintiffs were incorrectly advised that their property was not located in a flood zone when it was, and brought suit against their mortgage lender,¹²¹ or against the flood zone determination company retained by their lender to advise whether the lender was required to obtain flood insurance.¹²² And even these efforts have generally not fared well despite a few notable exceptions.¹²³

Perhaps the most controversial flood insurance litigation arising from Hurricane Katrina arose from the adjustment of claims where damage to a structure was caused concurrently by wind and flood. Many

¹¹⁵ *Shuford v. Fidelity Nat. Property & Cas. Ins. Co.* 508 F.3d 1337 (11th Cir. 2007); *Richardson v. American Bankers Ins. Co. of Florida*, 2008 WL 510518 (5th Cir. Feb. 27, 2008).

¹¹⁶ Under this waiver, no proof of loss was required for a WYO Company to settle a claim within one year of the date of loss. However, if no proof of loss was filed within that year, then failure to file a proof of loss became fatal to the claim. *Shuford v. Fidelity Nat. Property & Cas. Ins. Co.*, 508 F.3d 1337 (11th Cir. 2007). The text of the waiver is found at 1340.

¹¹⁷ *Gallup v. Omaha Property and Cas. Ins. Co.*, 434 F.3d 341 (5th Cir. 2005).

¹¹⁸ *Wright v. Allstate Ins. Co.*, 500 F.3d 390 (5th Cir. 2007).

¹¹⁹ See, *supra* note 100.

¹²⁰ See, *New Inv. Properties, LLC v. ABC Ins. Co.*, 2007-0943 (La. App. 4 Cir. 11/21/07); 972 So.2d 392; *Robichaux v. Nationwide Mutual Ins. Co.*, 2007 WL 1536703 (S.D. Miss. May 24, 2007); *Landry v. State Farm Fire & Cas Co.*, 428 F.Supp.2d 531 (E.D.La. 2006).

¹²¹ *Ellis v. Countrywide Home Loans*, 541 F.Supp.2d 833 (S.D. Miss. 2008); *Whitfield v. Countrywide Home Loans, Inc.*, 252 Fed. Appx. 654 (5th Cir. 2007); *Duong v. Allstate Ins. Co.*, 499 F.Supp. 2d 700 (E.D.La. 2007); see *Mid-America Nat. Bank of Chicago v. First Savings & Loan Ass'n of South Holland*, 737 F.2d 638 (7th Cir. 1984).

¹²² *Lusins v. First American Real Estate Solutions*, 2007 WL 1745625 (S.D. Miss. June 14, 2007); *Ford v. Fisrt American Flood Data Services, Inc.*, 2006 WL 2921432 (M.D.N.C. Oct. 11, 2006); *Metoyer v. Auto Club Family Ins. Co.*, 536 F. Supp. 2d 664 (E.D.La. 2008); *Audler v. CBC Innovis Inc.* 519 F3d. 239 (5th Cir. 2008).

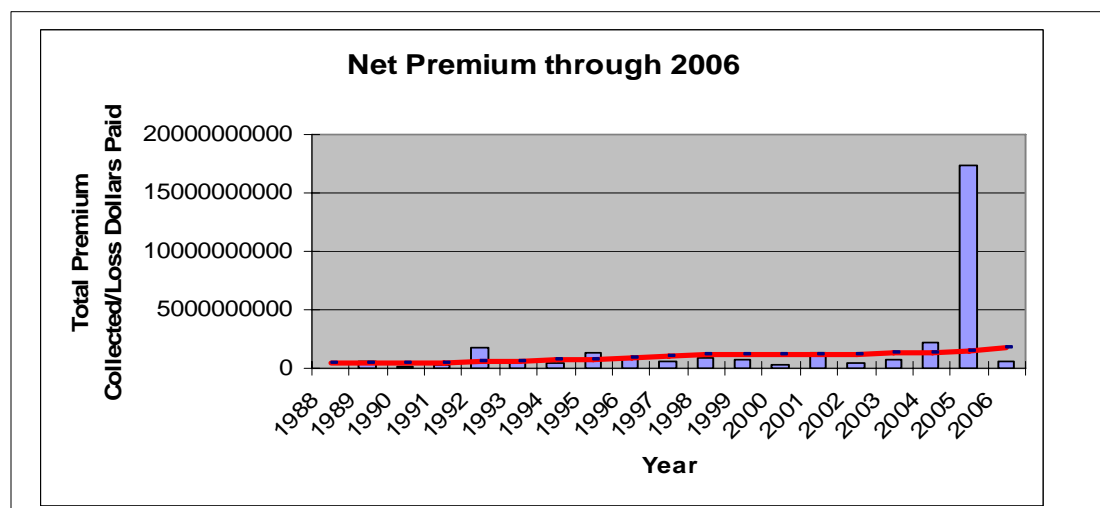
¹²³ See *Saadat v. Landsafe Flood Determination, Inc.*, 253 Fed. Appx. 343 (2007) (Directing district court to remand property owner's fraud and negligence action against determination company to state court); *Duhon v. Trustmark Bank*, 2007 WL 627889 (S.D. Feb. 25, Miss 2007).

property owners had only homeowners' insurance with its flood exclusion.¹²⁴ Others had both homeowners' and flood insurance – but had damage far exceeding either the limits on their flood policy or the amount that was offered by FEMA and WYO Companies for flood damage. The inadequate insurance proceeds available to these property owners generated considerable suspicion that insurance adjusters had been instructed by companies (where possible) to attribute losses to flood (covered, if at all, by flood insurance funded by the National Flood Insurance Fund) rather than to wind.¹²⁵ While GAO investigations did not uncover any such conspiracy to defraud the flood program, it did find that FEMA did not have access to company information about wind settlements to assure that there was no bias in apportionment of damage to wind, flood, or both.¹²⁶

The lesson from flood insurance litigation – both before and after Hurricane Katrina – is that, despite the restrictions on coverage provided by the SFIP, and the uncovered losses sustained by many insured flood victims as a result, the courts have generally protected this federal program from expansion of coverage or from payment of extra-contractual damages.

3. Financial Insolvency Exposed by Katrina

This judicial protection has not been enough, however, to prevent the current financial crisis facing the NFIP. Even with all of the premium increases and reductions in coverage over the program's four decades of existence, the program has not been able to generate premium sufficient to cover the actual cost of the insurance provided including catastrophic loss years. As noted previously, while the "fixes" over the last thirty years did bring the program to sustainability on an "average year" basis, absent Congressional action, the program could never generate any significant reserves for a catastrophic year. And the impact of that one catastrophic year – 2005 – has effectively made the program insolvent.



Source: FEMA <http://www.fema.gov/business/nfip/statistics/cy2006losspd.shtm>.¹²⁷

¹²⁴ The interpretation of the flood exclusion in *homeowners'* policies is beyond the scope of this paper for further information on this issue see Virginia Trainer, *Hurricane Insurance Litigation: More Than Wind Versus Water*, 68 LA. L. REV. 389 (2008)

¹²⁵ U.S. GOVERNMENT ACCOUNTING OFFICE, NATIONAL FLOOD INSURANCE PROGRAM: GREATER TRANSPARENCY AND OVERSIGHT OF WIND AND FLOOD DAMAGE DETERMINATIONS ARE NEEDED, GAO Report 08-28 (Jan. 30, 2008).

¹²⁶ *Id.* at 22, 26-27.

¹²⁷ The net premium estimated has been calculated based on an average of Total Underwriting Expenses deducted from the Total Revenue Earned (values provided by the National Flood Insurance Program Operating Results by Fiscal Year) per annum from 1985 through 2005, averaging approximately at a 33.37 percent increase per year.

The principal hope to rescue the program must come from reducing the number of “high risk” properties that are insured under the program and by moving toward more actuarially based premiums which brings political issues to the surface.

D. Eliminating Repetitive Loss Properties (at Last?)

As noted at the outset of this article, encouraging the attrition of high risk properties was always one of the key objectives of the NFIP. Communities joining the NFIP were required to “adopt and enforce” floodplain management regulations that would substantially restrict new construction or substantial improvement of properties in floodplains. Over time, properties at severe risk of flooding were to disappear. But compliance with the restriction on rebuilding in floodplains was spotty,¹²⁸ and the financial cost of multiple flood insurance payouts to the same properties continues to drain the financial strength of the program.¹²⁹

The problem is not new. In 1994, Congress found that there were “a number of properties in the program that do not comply with current flood protection standards.”¹³⁰ To address the financial cost of these properties to the program, the National Flood Insurance Reform Act of 1994 sought to encourage compliance

1. by adding a new “cost of compliance” coverage to the SFIP, so that policyholders rebuilding after a flood would have the financial resources to elevate their property after it was severely damaged by flooding;¹³¹
2. by codifying the “Community Rating System” under which the NFIP encouraged community compliance by providing premium reductions in communities that had developed stronger systems to mitigate flood risk;¹³² and
3. by creating the National Flood Mitigation Fund (generally funded at \$30 million per year) to fund mitigation of existing properties that did not comply with current floodplain management requirements.¹³³

Ten years later, in the National Flood Insurance Reform Act of 2004 (2004 Act), Congress again addressed the problem of repetitive loss properties that were receiving subsidized premiums. Political will was summoned to remove subsidies immediately on one small class of structures – those “leased from the Federal Government (including residential and nonresidential properties) . . . located on the river facing side of any dike, levee, or other riverine flood control structure or seaward of any seawall or other coastal flood control structure.”¹³⁴ In addition, actuarial rates were to be gradually phased in (at the

¹²⁸ AMERICAN INSTITUTES OF RESEARCH, AN EVALUATION OF COMPLIANCE WITH THE NATIONAL FLOOD INSURANCE PROGRAM PART A: ACHIEVING COMMUNITY COMPLIANCE, at 32. (Oct. 2006) (Concluding that 20-25% of participating communities are not in compliance).

¹²⁹ King, *supra* note 16, at 19-20 and Appendices A and B.

¹³⁰ H.R. Conf. Rep. 103-652, 1994 U.S.C.C.A.N. 1977, discussing Title V, Flood Insurance.

¹³¹ National Flood Insurance Act of 1994, Pub. L. No. 103-325, § 555, 108 Stat. 2160 at 2274.

¹³² *Id.* at § 541, 108 Stat. 2160 at 2268, codified at 42 USC 4022(b).

¹³³ *Id.* at § 553, 108 Stat. 2160 at 2270, codified at 42 USC 4104(d). Much greater resources – in the hundreds of millions of dollars – for mitigating flood risk on properties were made available under § 404 of the Stafford Act and by special legislation enacted after specific flood events such as Hurricane Floyd. *See*, Pub.L. 106-113 (HR 3194) Consolidated Appropriations Act 2000, 113 Stat 1501, 1501A-292 (1999) (appropriating \$215,000,000 for the buyout of principal residences rendered uninhabitable by flooding caused by Hurricane Floyd, with land to be restricted for open space uses)

¹³⁴ Pub. L. No. 108-264, § 106, 118 Stat.712 (2004), codified at 42 U.S.C. § 4015(c)(2).

Congressionally limited 10% per year maximum rate of increase per year) for properties that had been constructed when floodplain management ordinances were in effect but had not been followed.¹³⁵

Finally, the 2004 Act adopted a “pilot program” for addressing the repetitive loss problem. Because the program now could identify the specific properties that had received multiple large settlements on flood insurance claims, the 2004 Act specifically directed the NFIP to target mitigation efforts on “severe repetitive loss properties” – offering to buy these properties from the owner or to elevate them. But should an owner refuse this voluntary offer of mitigation assistance, the NFIP was directed to charge the actual actuarial cost of insuring the property. The actuarial cost of flood insurance for a severe repetitive loss property would range in the thousands of dollars per year: it would take net premium of \$10,000 per year to pay flood claims on a property that incurs \$50,000 in flood damage every 5 years.

Hurricane Katrina arrived before the “pilot program” created by the 2004 Act could make any impact on the repetitive loss problem. And many of the losses caused by Hurricane Katrina were not caused by repetitive loss properties. Rather, Hurricane Katrina exposed the significant residual risk for properties (primarily in Louisiana) protected by levees, and the further risk of coastal properties (primarily in Mississippi) affected by a storm far more severe than the 1 in 100 year events on which flood risk mapping had been based. The result was a \$17 billion programmatic debt.

III. The Future Direction of the NFIP

The NFIP is at a crossroads. The overall authorization for the NFIP expires on September 30, 2008. At this writing, both the U.S. House of Representatives¹³⁶ and the U.S. Senate¹³⁷ have passed separate bills that would reauthorize and reform the NFIP; the differences between these bills must be reconciled in Conference before any change is enacted. While it is virtually certain that the program will be reauthorized even if reform cannot be enacted this year, the common characteristics of these bills demonstrate Congressional awareness that the program cannot achieve financial solvency without major reforms in virtually all aspects of the NFIP discussed in this paper: premium levels, coverage, market penetration/mandatory purchase, and repetitive loss.

Thus, both the House and the Senate bills would allow the NFIP to increase premiums by 15% per year (up from the current 10%), and the Senate bill would require minimum deductibles on policies. And while subsidized rates would continue to be available under both bills for homeowners’ principal residences, the bills would withdraw the subsidy over time (the schedules vary) for different classes of non-residential properties, second homes, and severe repetitive loss properties.

The bills seek to increase market penetration (in slightly different ways) by expanding the properties subject to the mandatory flood insurance purchase requirements,¹³⁸ by increasing penalties for non-compliance, and by enhancing communications to homeowners and training for insurance agents about flood risk.

¹³⁵ *Id.*, codified at 42 U.S.C. § 4015(c)(1).

¹³⁶ H.R. 3121, as passed by the U.S. House of Representatives on September 27, 2007, available as of May 28, 2008 at http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_bills&docid=f:h3121eh.txt.pdf.

¹³⁷ H.R. 3121, as passed by the U.S. Senate on May 13, 2008, available as of May 28, 2008 at http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_bills&docid=f:h3121eas.txt.pdf.

¹³⁸ The Senate Bill would extend the mandatory purchase requirement to include “residual risk areas” protected from flooding by man-made structures such as levees or dams; the House Bill calls only for enhanced disclosure of residual risk areas in flood maps.

The “pilot program” adopted in 2004 to eliminate repetitive loss properties would be expanded and accelerated. Both bills require recognition in flood maps of areas in the 500-year flood plain, as well as the areas that would be in the 100-year flood plain *but for* protection provided by levees and seawalls.

Both Bills respond to the frustration of homeowners that is reflected in the litigation arising under the program – but by increasing government requirements for customer service and not by opening the door to the courtroom. Under this proposed legislation, FEMA would be required – once more – to improve communications to the public about the risk of flooding and the limitations in the SFIP. Appeals from denials of coverage are to be handled more quickly, and better training required. A National Flood Insurance Advocate would be appointed with no connection to FEMA and with a background in customer service and in insurance.

No change is proposed in the legal doctrines that prove decisive in flood insurance litigation – federal jurisdiction, proof of loss requirement, and the status of the standard flood insurance policy as a federal regulation whose provisions have the force of law and cannot be waived except by the Federal Insurance Administrator. Indeed, the increase in the number of specific statutory customer service requirements that are proposed in both bills may have the effect of *reducing* the ability of policy holders to challenge WYO Company and insurance agent actions in state court. (The more federal statutory and regulatory requirements and federal dispute resolution procedures there are governing agent and WYO Company responsibilities in the marketing and sale of flood insurance, the more federal regulation “occupies the field” of marketing of flood insurance – and pre-empts state laws and remedies.¹³⁹)

Passage of NFIP reauthorization in 2008 remains uncertain – both because of the foreshortened legislative calendar in an election year and because of two major differences between the House and Senate bills. The first is somewhat technical: the Senate Bill would forgive the full debt owed by the program to the Treasury, while the House Bill would allow the debt to increase some more pending a study on whether and how the debt would ever be repaid. The Senate position reflects the reality that this debt will never be repaid; the House position arises from its own rule that no increase in spending (and debt forgiveness is treated as spending) can be enacted without identifying corresponding reductions of spending that will offset the impact on the national deficit.

Perhaps the most intriguing difference in the Senate and House Bills is the provision in the House Bill that would give purchasers of flood insurance the option to obtain wind coverage from the federal government at actuarial rates. Proponents of adding wind coverage to the NFIP argue that combined wind/water coverage is necessary to eliminate coverage disputes when wind and water both contribute to a loss; these coverage disputes at a minimum slowed claim settlements and generated acrimony with policy holders as well as substantial litigation. Proponents of adding wind coverage also point to the increasing difficulty property owners experience in obtaining wind coverage in coastal areas as private insurance carriers, saddled with losses from Katrina and other recent storms, seek to reduce exposure to losses due to hurricane force winds. They do so by increasing premiums, reducing coverage, increasing deductibles or withdrawing from the market altogether. The Senate bill did not add wind coverage to the program, but responds to the concerns of the House in two principal ways: (1) by appointing a “Commission on National Catastrophe Risk Management and Insurance” to study the issue; and (2) more substantively, by increasing the ability of FEMA to obtain information from WYO Companies about the settlements the Companies and their affiliates made for wind damage.¹⁴⁰

¹³⁹ C. Antieu and W. Rich, *Modern Constitutional Law* § 43.19-43.20.

¹⁴⁰ H.R. 3121, as passed by Senate, Title II (§§ 201-208). The provision allowing FEMA to obtain data about wind settlements from WYO Company affiliates was a recommendation of the U.S. Government Accountability Office’s report on the Hurricane Katrina wind-water damage controversy. *See*, GAO Report 08-38, *supra* note 124.

The House proposal to add a new federal wind damage program due to the increasing cost and reduced availability of private wind insurance in high risk areas calls to mind the findings made by Congress almost exactly forty years ago in the National Flood Insurance Act:

(1) many factors have made it uneconomic for the private industry alone to make flood insurance available to those in need of such protection on reasonable terms and conditions; but (2) a program of flood insurance with large scale participation of the Federal Government and carried out to the maximum extent practicable by the private insurance industry is feasible and can be initiated.

After forty years, the jury is still out on whether the program of flood insurance created in 1968 is financially feasible – although it certainly has accomplished a great deal in identifying and mitigating flood risk, and in providing insurance benefits to those who purchase policies. Have “many factors” also made it uneconomic for the private industry alone to insure for wind damage? And if so, would it take forty years to determine if a federal program of wind insurance at actuarial rates was good public policy?

The challenge is that more and more development is taking place in flood prone and hurricane prone areas. People like to live near the seashore. But unless the actual cost of living by the water is reflected in the cost of ownership – including the cost of building properly to resist wind damage, elevating out of floodplains, and insuring at actuarial rates for the cost of rebuilding after inevitable floods and hurricanes – then the result will only be more development in more risk prone areas and the potential for another \$17,000,000,000 insurance debt that cannot be repaid.