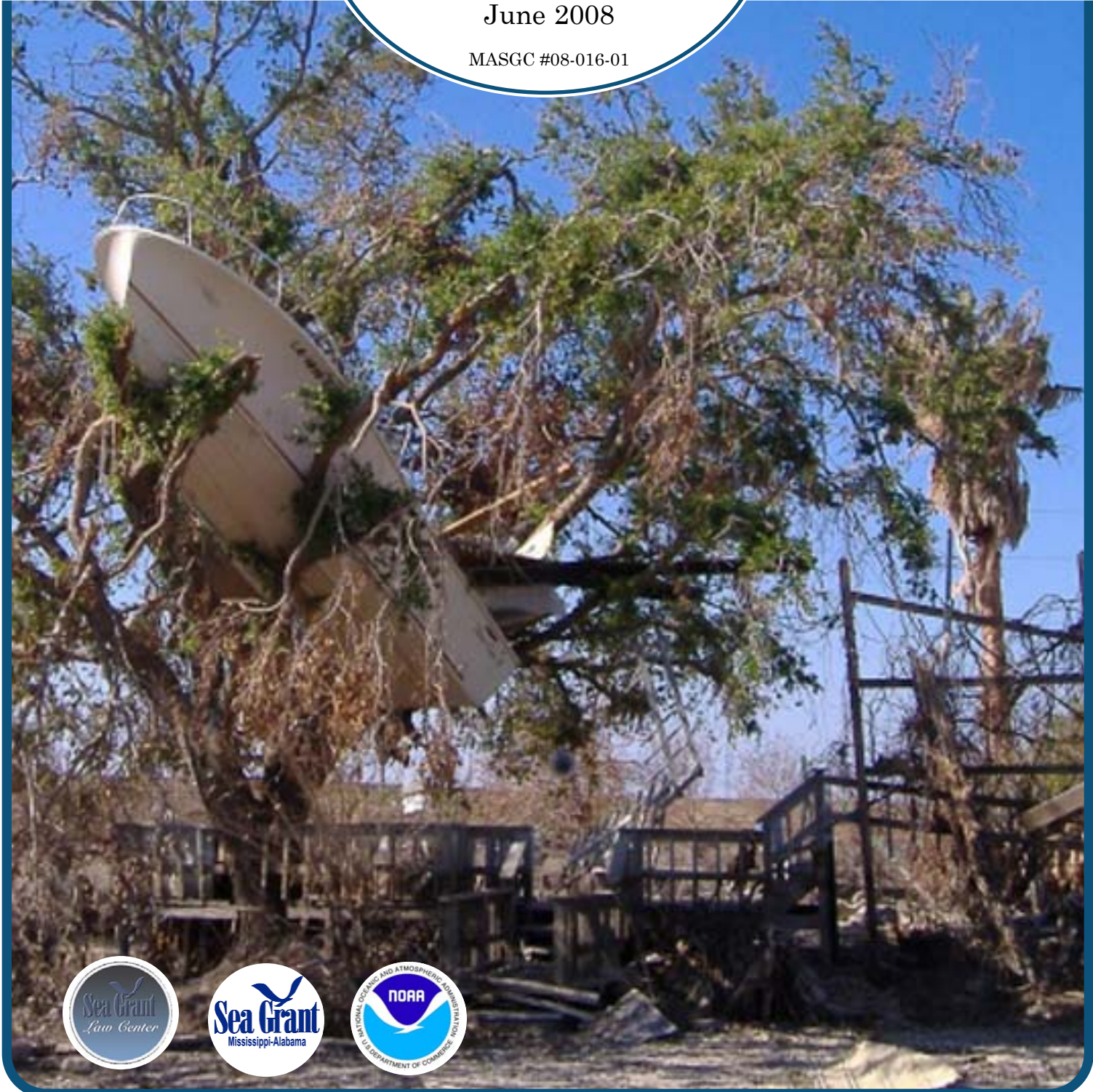


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What is Coastal Resiliency?

Introduction to Symposium Issue

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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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