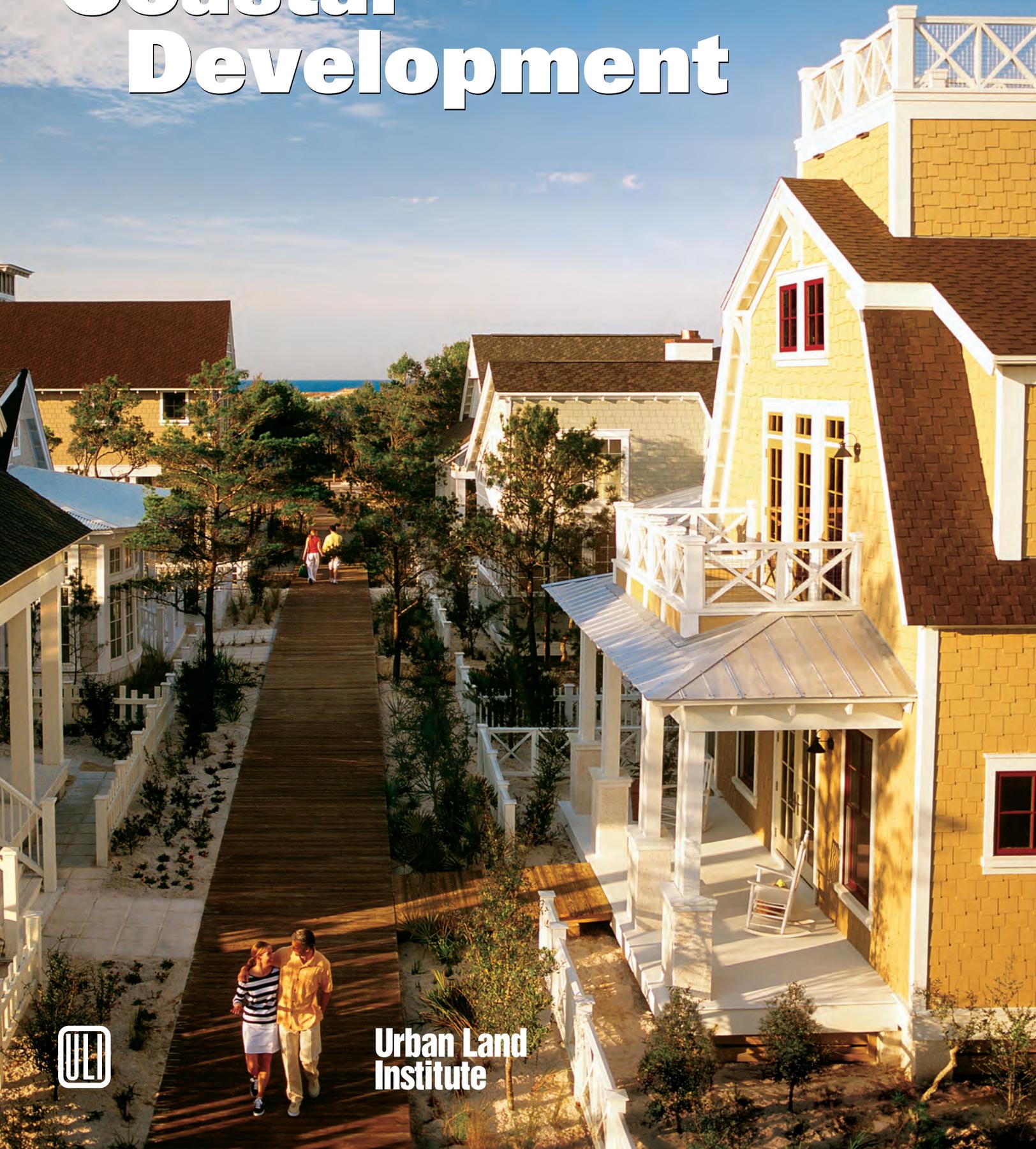


Ten Principles for Coastal Development



Urban Land
Institute

Ten Principles for Coastal Development

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About ULI—the Urban Land Institute

The mission of the Urban Land Institute is to provide leadership in the responsible use of land and in creating and sustaining thriving communities worldwide. ULI is committed to:

- Bringing together leaders from across the fields of real estate and land use policy to exchange best practices and serve community needs;
- Fostering collaboration within and beyond ULI's membership through mentoring, dialogue, and problem solving;
- Exploring issues of urbanization, conservation, regeneration, land use, capital formation, and sustainable development;
- Advancing land use policies and design practices that respect the uniqueness of both built and natural environments;
- Sharing knowledge through education, applied research, publishing, and electronic media; and
- Sustaining a diverse global network of local practice and advisory efforts that address current and future challenges.

Established in 1936, the Institute today has more than 35,000 members from 90 countries, representing the entire spectrum of the land use and development disciplines. Professionals represented include developers, builders, property owners, investors, architects, public officials, planners, real estate brokers, appraisers, attorneys, engineers, financiers, academics, students, and librarians. ULI relies heavily on the experience of its members. It is through member involvement and information resources that ULI has been able to set standards of excellence in development practice.

The Institute has long been recognized as one of the world's most respected and widely quoted sources of objective information on urban planning, growth, and development.

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Introduction

The coast is a dynamic place and its dynamism makes it susceptible to stresses and changes in a number of ways. Because the coast is where the land interacts with the sea, it is open to the action of wind, waves, tides, and currents that not only erode the shore but also can expand it with sedimentary deposits. Storm systems gather energy from the ocean and intensify natural coastal forces with wind, waves, and rain powerful enough to severely damage property and hasten erosive processes. The coast is made more vulnerable to these natural dynamic forces by rising sea level. Although sea level has been steadily rising for centuries, the process may be accelerating because of global warming. Scientists have documented the

melting of glaciers all over the world and of the Greenland and Antarctic ice caps as well. The volume of water stored in glaciers and ice caps could raise sea level significantly if it were released through melting. Just as important, however, is that the waters of the oceans will expand as they warm, pushing sea level even higher.

Social and economic forces also bring stresses to coastal areas. Population growth, land development, and resort development are all



CARRIE HALL

A pristine coastline in the Pacific Northwest.

particularly intense along the coast. Coastal areas are experiencing high growth rates, and the beach is a popular destination for vacations, second homes, and retirement. Property on or near the shore is always in high demand and as a consequence usually expensive. Because it is a valuable asset, people will go to extraordinary lengths to protect property near the shore. This behavior—the need to protect coastal property—is responsible for what is probably the greatest threat to shoreline: the practices we use trying to stabilize it. Sea walls, jetties, groins, riprap, and sandbags all disrupt the natural processes of the coast and exacerbate erosion and habitat destruction. Moreover, by increasing impervious surfaces and disturbing

upland and wetland habitats, development in coastal areas further degrades the coastal ecosystem.

Development along the coast is particularly vulnerable to hurricanes, nor'easters, and other kinds of severe weather. The 2004 and 2005 hurricane seasons hammered Alabama, Florida, Louisiana, Mississippi, Texas, and other states with tropical weather. The 2005 hurricane season alone was ruinous, recording 2,280 deaths and damage totaling over \$100 billion.

Nevertheless, trends demonstrate that coastal areas continue to draw people for the many reasons previously stated. The patterns of development along the coast must change or the degradation of these areas—the loss of property, loss of habitat, and loss of life—will continue.

ULI's *Ten Principles* publications are designed to provide readily accessible, easy-to-use information for understanding complex land use issues. The principles are intended to guide decision makers, citizens, public officials, planners, developers, and others in the creation of places that build community, enrich the economy, and protect the environment.

In creating *Ten Principles for Coastal Development*, ULI brought together a group of experts for three days to share ideas and inspirations. The purpose of this book is to provide a comprehensive overview and guidance for implementing better land use policies and practices along the coast to break the cycle of destructive trends and prevent the degradation of coastal systems as growth and development occur. It also offers opportunities to benefit environmental systems in this process.

The principles enumerated here promote the idea of shared values—protecting habitat while preserving public open space and maintaining access for everyone. The goal is to work in harmony with the environment, not to try to bend it to our will. Nature can show us where building is appropriate and where it is

What Is the Coast?

Many definitions are used for "coast." The simplest probably is "the land adjacent to the sea." But coast can mean different things in different contexts. A political definition might be the counties adjacent to the sea or the states adjacent to the sea. An environmental definition might be land that drains to the sea or watersheds of streams that drain directly to the sea. One scientific definition of coast is "the space in which terrestrial environs interact with marine environs and vice versa." Doubtless, many others exist. For our purposes, having one definition of "coast" or "coastal" is of no benefit. From the broadest definition to the narrowest, the definition that best fits the circumstances is used.



Harbour Ridge in St. Lucie County, Florida, provides an example of the kind of practice that minimizes the shoreline effects of boat docks on the shoreline.



ST. JOE COMPANY

not. If areas that provide natural protection are compromised, communities are put at risk. We must ensure that the decisions we make today do not endanger future generations.

We also must respect the importance of the economic value a site derives from being close to the beachfront while at the same time respecting the value of waterfront as a common amenity. Given the high degree of risk associated with coastal development, why have coastal properties gained so much value in the first place? Because flood insurance and hazard insurance have mitigated the risk and thus driven up the value.

Today, a huge problem exists with obtaining private insurance in coastal areas. Private insurers are no longer willing to finance the risk when they consider the losses paid out in 2004 and 2005. The ability to obtain insurance is a key factor that will affect areas on the coast as well as other areas that are prone to harsh natural conditions.

Finally, a real commitment at the local level will facilitate the change that is needed to bring about safe and sustainable coastal communities. Local planning, building regulation, economic development, infrastructure management, and recreation facilities can provide the tools and the policies to get the job done.

Ten Principles for Coastal Development

- 1 Enhance Value by Protecting and Conserving Natural Systems**
- 2 Identify Natural Hazards and Reduce Vulnerability**
- 3 Apply Comprehensive Assessments to the Region and Site**
- 4 Lower Risk by Exceeding Standards for Siting and Construction**
- 5 Adopt Successful Practices from Dynamic Coastal Conditions**
- 6 Use Market-Based Incentives to Encourage Appropriate Development**
- 7 Address Social and Economic Equity Concerns**
- 8 Balance the Public's Right of Access and Use with Private Property Rights**
- 9 Protect Fragile Water Resources on the Coast**
- 10 Commit to Stewardship That Will Sustain Coastal Areas**

1 Enhance Value by Protecting and Conserving Natural Systems

The plan for Alys Beach in Walton County, Florida, called for the preservation of the natural vegetation along the coast; the result is a more appealing and more highly valued development.

The best way to protect and conserve natural coastal systems is to allow them full freedom to be dynamic. When the dunes, the channels, the beaches, and their interaction with the wind and the water are not disturbed, they can sustain habitats and fend off erosive forces. Conventional coastal development does not protect or conserve natural systems. In conventional practice, houses are built along the shore close to the water where the greatest likelihood exists of interference with coastal dynamics. The beachfront property owner views the beach as his or her backyard and has privacy issues about its use by others. Even when the entire beach is public, lack of public access points or parking can keep the public away and deter use. In these cases, the value of the waterfront accrues primarily to the waterfront owners.

Keeping the beach or coastal area in a natural state with open access to the public minimizes disturbance of natural processes. Thoughtful planning for protection and



ALYS BEACH



County Road 30-A

In the past 25 years, County Road 30-A in South Walton County, located on the Florida panhandle, has transformed itself from an isolated stretch of coastal land dotted with old Floridian “fish camps” to a model for balancing economic development and conservation. Endowed with North America’s only coastal dune lakes and beaches featuring fine, white quartz sand, the area is most famous for the prototypical new urbanist town Seaside.

In the 1980s and 1990s, the state of Florida bought much of the area’s land. Three large state parks were established—Deer Lake State Park, Topsail Hill, and Grayton Beach State Park—as was Point Washington State Forest. As a result, 65 percent of the region’s land is currently owned by the state and will never be developed, restricting the supply of coastal land available for development and conserving the area’s natural assets.

South Walton County simultaneously enacted tight zoning restrictions, including a maximum building height limit of 50 feet, or approximately four stories. The maximum allowable units per acre are 12, although most developments built in South Walton County during the last 20 years average five or six units per acre. These regulations have transformed County Road 30-A into a string of high-value, neotraditional resort communities, including Grayton Beach, WaterColor, WaterSound, Alys Beach, and Rosemary Beach. Today, 30-A still has only two lanes, limits speed to 35 miles per hour, and will soon be designated a Florida scenic highway.



Water Sound, a development along County Road 30-A in the panhandle of Florida, has several passages to the beach, ensuring that every resident has access to the waterfront.



GEORGE CATHCART

Attempting to stop erosion by hardening the water's edge reduces the shoreline's value to the community by disrupting ecological processes and degrading the quality of the beach experience.

access preserves the natural systems of the coast while providing a great amenity for the community. When the amenity of the waterfront is shared, the value of that waterfront is distributed in the broader community and the total value is greater. And because the natural coastal processes are minimally disturbed, the coastal area will hold its value longer.

The ultimate goal is to build in a manner that does away with the need for structural measures or beachfront replenishment; thus, developing inland from the waterfront will reduce public cost and create value. Where development is appropriate, using higher densities designed to a human scale with environmental sensitivity and applying techniques such as permeable surfaces, narrow roads, natural vegetation, recycled materials, and minimal irrigation will allow even greater protection of natural areas.

Shoreline Conservation Adds Value

Enhance overall development value by protecting the shoreline and using environmental design standards.

Protect the shoreline:

- Make the most vulnerable area of the site a common amenity.
- Reduce risk or vulnerability through open-space protection.
- Commit to habitat restoration.
- Create equity with common amenities.
- Benefit the broader community with greater public access and more access to better views.

- Increase overall development premium by driving values inland.

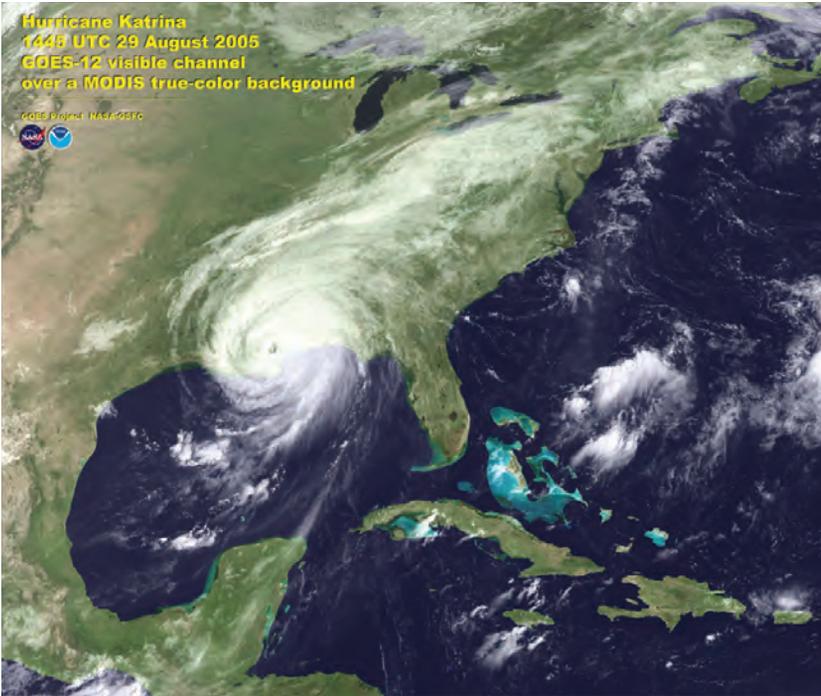
- Connect shoreline to development sites with regional park systems.

Set environmental design standards:

- Use smaller building footprints relative to the site.
- Create a connected network of open space.
- Use native plants; discourage exotic vegetation.
- Conserve water by harvesting rainwater, irrigating with graywater, and minimizing irrigation.
- Use recycled materials.

Creating a well-connected system of trails, parks, and open spaces enhances access. This access provides opportunities for the community to use the coastal amenities that improve the quality of life. Better connections will improve access to water, open space, and neighboring areas and will increase usage, visibility, and passage. Improved access will promote social equity and create further value in the community. The regulatory process should be set up to encourage good development. Well-designed development consistent with protecting natural systems should receive swift approval. Proposals using a more conventional approach should meet more barriers to approval.

2 Identify Natural Hazards and Reduce Vulnerability



Hurricane Katrina's sheer size ensured a wide swath of damage across the Gulf Coast.

Everyone agrees that storms are a significant hazard for coastal communities, but a number of different hazards actually come packaged with storms. Storm frequency is one. Obviously, a stretch of coast that has a high storm frequency is more hazardous than another with fewer storms. Storm intensity is another. The Saffir-Simpson Hurricane Scale is a 1 to 5 rating based on a hurricane's intensity. It is used to give an estimate of the potential property damage and flooding expected along the coast from a hurricane landfall. Wind speed is the determining factor in the scale. Storm surges that cause flooding are highly dependent on the slope of the continental shelf and the shape of the coastline in the area of the landfall (see figure on next page for more on Saffir-Simpson). Saffir-Simpson can help gauge potential danger from high winds and flooding. Another hazard is erosion

caused by the storm's waves and by the retreat of the storm surge. Erosive forces can destroy homes, businesses, roads, and other infrastructure. Wave intensity is another hazard to be considered: both the destructive force of the waves themselves and the ramrod pounding effect of debris floating in the surf.

Although severe erosion occurs during storm events, where erosion is a problem, the process can continue in the context of everyday weather and currents and with the ebb and flow of tides. Ironically, groins, bulkheads, jetties, and other structural measures meant to control erosion often exacerbate it. Erosion can be relentless and unstoppable. Nevertheless, it can be measured and understood in terms of how quickly the shoreline is retreating and what that rate of retreat means in terms of threat to coastal development.

Tsunamis are waves generated by earthquakes or landslides under the ocean. They are very large ocean waves that travel quickly over hundreds of miles. As they approach land, the shoaling water causes the tsunamis to slow down and grow in height. They reach the shore as a fast-moving wall of water 50 to 150 feet high that washes destructively across the land. Tsunamis are more frequent where seismic activity occurs. For this reason, a higher tsunami probability exists on the West Coast of the United States than on the East Coast. Hawaii, which is highly volcanic and is surrounded by areas of high seismic activity, has had several tsunamis. In May 1960, a large earthquake off the coast of Chile generated a tsunami that struck the city of Hilo, Hawaii, as a 35-foot wave, killing 61 people and causing extensive damage.

Identify Vulnerabilities

When considering developing or redeveloping coastal property, specific vulnerabilities must be identified in the initial site assessment. Vulnerabilities are identified so they can be reduced in the final design of the development.

Conservation of land and preservation of ecological systems reduce vulnerability. A strong environmental protection strategy also reduces risk to structures. Ideally, the ecological footprint should be as small as possible while still enhancing economic vitality. This strategy means not disturbing natural coastal processes, such as dune building and movement of sediments. Tread lightly; use nature's own systems for protection and advantage; avoid brute-force solutions by building with less impact.

Enhance Resilience

Understanding vulnerability to hazards and how to reduce them is very important. But we can go beyond reducing vulnerability and risk; we can build and organize in a way that makes responding to a disastrous situation easier. The capacity of a community to adapt so that it can restore and maintain an acceptable level of functioning and structure is called resilience. Resilience is determined by the degree to which the community is capable of organizing itself to increase its capacity for learning from past disasters to better implement protection from future disasters and to improve risk-reduction measures. The implementation of the measures and actions associated with resilience requires the following:

- Properly assessing the natural system in terms of sediment, biodynamics, and awareness of the inherent resilience of the coast;
- Integrating implementation from the neighborhood to the regional level;
- Appropriately evaluating and monitoring;

The Saffir-Simpson scale was developed in 1969 and predicts the storm surge and damage likely to occur based on a hurricane's wind speed.



Hazards Training: The Community Vulnerability Assessment Tool

The National Oceanic and Atmospheric Administration will offer training in the Community Vulnerability Assessment Tool (CVAT). The training is based on the CVAT methodology, which includes resilience components and a geographic information system guide for processing risk and vulnerability data.

The course will focus on helping coastal resource and emergency managers use CVAT to assess a community's risk and vulnerability to hazards and other community stressors—and also on identifying a community's strengths to determine its resilience.

For immediate information on risk and vulnerability assessments, managers can view the methodology at www.csc.noaa.gov/products/nchaz/startup.htm. On the same site, managers can also request a CD-ROM that provides the complete methodology and sample data from the pilot project area. Additional risk and vulnerability assessment tools can be viewed at www.csc.noaa.gov/rva_tools/.

The training is expected to be available in the fall of 2008. For questions about future training and the methodology, please contact Tashya Allen at (843) 740-1321 or Tashya.Allen@noaa.gov.

- Identifying opportunities for building and promoting community character and maximizing heritage and culture;
- Building relationships within the community (private, public, nonprofit);
- Reducing long-term management, maintenance, and reconstruction costs;
- Identifying constraints that can be used as amenities; and
- Linking outcomes of site analysis, vulnerability assessment, and resilience enhancement to the site-planning process.

In terms of economic resilience, a diverse coastal business mix is best, such as businesses that can easily pack up and leave, tourist-oriented businesses, and not-for-profit businesses that can provide services in the aftermath of a natural disaster. Resilience also means being able to quickly resume services, including schools and transportation, and restore electricity and water.

The retrofitting of existing structures for increased security from disasters will add to a community's resilience. Also, the retrofitted features will create value for the property owner

and change the way homes are marketed to consumers, ultimately encouraging more consumers to invest in retrofitting.

Reduce Vulnerabilities

Taken together, combining a better understanding of the nature of the coast with an assessment of hazards should lead to balanced decisions about development and use of the coastal zone. For example, recognizing and adapting to natural forces and change are important. The following elements should be factored into the land use decision-making process:

Coastal hazards:

- Extreme events;
- Storm frequency and intensity;
- Probability of tsunamis; and
- Erosion.

Long-term change:

- Shoreline fluctuation;
- Erosion;
- Climate change;
- Sea-level rise; and
- Barrier island movement.

Emergency management:

- Evacuation;
- Insurance;
- Poststorm mitigation;
- Open-space acquisition;
- Science-based decision making in which zoning is aligned with land capability; and
- Public and individual responses to change, including the need for education.

In addition, redevelopment after an event should be considered as an opportunity to reduce risk, increase livability, restore and enhance natural resources, and increase community resilience.

Establish Accountability

In the conventional policy environment on the coast, many decisions are made, approvals given, and projects implemented even as hazards are ignored, inappropriate development is allowed, or natural processes are disturbed. Yet when disaster strikes and property and lives are lost or hazards worsened, no one is held accountable. Consequently, the costs of protection of infrastructure are borne by the taxpayer rather than those directly benefiting from the development. The balance needs to be altered so that the true cost of any development is taken into account, including any long-term protection needs.

The benefits of retrofitting for disasters need to be emphasized as a marketable feature, showing how value is created by retrofitting for disasters. This effort will change the way homes are marketed to consumers, and it will ultimately encourage more consumers to invest in retrofitting.



PREMA KATARI

This beach in Mui Ne, Vietnam, was heavily eroded by the 2004 Indian Ocean tsunami. The unsightly plastic tarps are used in an attempt to restore the stability of the beach.

3 Apply Comprehensive Assessments to the Region and Site



©MARK KARRASS/CORBIS

These starfish on the Pacific coast illustrate the value of assessing and preserving unique coastal wildlife.

Each parcel of land is unique. Each landscape is the singular manifestation of the physical, biological, and cultural forces that act upon it. It is the product of a particular geologic, natural, and cultural history. The word “place” is used here to mean the uniquely personal aspect of the landscape or parcel of land. We get to know and understand a place much as we would get to know and understand a person, by becoming familiar with it and, in the case of a place, by studying it and learning about its characteristics, history, and special qualities.

Begin by identifying the natural systems functioning on the site. Taking an assessment or inventory identifies the natural systems. Because this assessment forms the database for the analysis of the place’s natural systems, using an ecological or natural resources expert to conduct the inventory is important.

The objective is to find an appropriate design framework for the land uses being planned. Mapping those features that have a spatial distribution may be helpful. Ideally, the data are derived from or entered into a geographic information system (GIS). Use of a GIS greatly facilitates further analysis of the information.

The goal of the inventory process is to become familiar with specific natural features of the place and to see how they interrelate, so that their continued functioning as systems can be accommodated during construction and after completion of the development. Ian McHarg laid the foundation for ecologically sensitive land use planning in the 1960s by mapping site features and resources. He used the best scientific information available. His landmark 1969 book *Design with Nature* has a chapter on coastal development in New Jersey.

After assessing the local ecosystem, the developer of Alys Beach in Walton County, Florida, decided to incorporate the natural habitat of the coast in the community design.



ALYS BEACH

Continue with the assessment by determining how the natural systems function to create a site design that protects and enhances both the natural and built environments. The movement of water; the nature of the soils; the structure of the communities of living resources; the habitats, including vegetation and wildlife; and the ecological relationship between the site and the surrounding area should be factored into the design of the project. The information from the inventory can be analyzed and interpreted to establish a design framework appropriate for the place.

The physical form of the site, the layout of the streets, the orientation of the lots and of the buildings on the lots, and the intended uses and their relation to each other should be planned to balance the natural and constructed elements of the project so that both are protected and enhanced. Here is where we apply the information about how to reduce vulnerability and enhance resilience that we have derived under Principle 2: for example, keeping structures out of high-hazard areas and preserving features like dunes that afford protection. Remember that the project will become part of the ecosystem in which it is built, and design to avoid negatively affecting the existing ecosystem.

The Nature Conservancy offers the following guidelines for integrating a development into the natural environment:

- Understand the ecosystem, its natural processes, and the stresses that adjacent development places upon it.
- Have the site assessed by a wildlife consultant to define sensitive habitats, wildlife movement corridors, and any threatened or endangered species present.



The Natural Inventory

The following are some of the natural features that should be considered in taking the inventory to better understand the “place”:

COASTAL PROCESSES

Erosion and Sedimentation

- Water induced
- Wind induced

- Sediment transport and deposition

Long Shore Drift

Tides

Currents

Sea-Level Change

Barrier Island Dynamics

Tidal Wetland Dynamics

GEOLOGY

Physiography

Surficial Geology

Geomorphology

Aquifer Recharge

SOILS

Hydrologic Soil Groups

Hydric Soils

Soil Suitability

Soil Erodibility

Suitability for Agriculture

TOPOGRAPHY

Steep Slopes

Slope Aspect

HYDROLOGY

Surface Water

Groundwater

Floodplains

Wetlands

HABITAT

Terrestrial

Aquatic

- Marine

- Freshwater

Forest Interior

Unique or Unusual Habitat

Threatened and Endangered Habitat

Threatened and Endangered Species

CLIMATE

Microclimate

Frost Pockets

Prevailing Wind

LIVING RESOURCES

Plant

- Vegetation associations

- Vegetation communities

- Forest stand delineation

Animal

- Wildlife

- Threatened and endangered species



- Preserve sensitive habitat, and refrain from breaking up or intruding into contiguous expanses of sensitive habitat.
- Consider and avoid human/wildlife conflicts.
- Leave native vegetation intact as much as possible.
- Avoid construction in drainage areas and other watercourses.

In addition, establishment of a program to fund the maintenance of designated habitat areas that, with the participation of residents, can become an educational and community-building resource is recommended.

Ascertain the regional effects of the development on natural systems and determine how regional systems affect the site. To maintain harmony with the regional ecosystem, we need to examine the place in its larger context.

- Does the site interrupt a habitat link or corridor that would diminish the larger ecosystem if it were not carefully planned? If it does, how can that link be enhanced?
- How will the runoff from the site affect communities and habitats downstream?
- What can be done to manage runoff and prevent problems?
- How can important regional systems be sustained in the design?

These questions are an integral part of the inventory and assessment learning process that must be addressed in the early stages of design.

Avoid impinging on wetlands. The aesthetics of wetlands and the wildlife they draw, particularly local and migratory birds, make them an attractive amenity for all types of development. In addition, they enhance the stewardship connection between the people and the natural systems.

Consider how people are affected by and in turn influence the development's natural and constructed elements. In designing and building a sustainable community, the people who live in the community must be part of the design if the project is to be in harmony with its environment. Residents must feel comfortable, safe, and socially and ecologically connected. They must like the place. Their behavior, decisions, and actions must support its long-term viability and not degrade it. For this reason, new residents should be given opportunities to learn about the place in which they will live.



ED/AV

One approach is to offer educational programs to explain the natural systems of the place, how they function, and how the design of the community accommodates and enhances them. The goal of the program should be to instill a sense of stewardship in the community. Residents should learn how to manage their property to reduce vulnerability, enhance resilience, protect habitat, prevent pollution, and encourage ecological efficiency. This effort could mean explaining the structure of the community ecosystem; explaining why it is important to avoid exotic, invasive plant species; and giving instruction in how to recycle yard waste and avoid use of chemicals. Ideally, these educational programs would become part of an ongoing process to keep the community aware and committed to the rewards of stewardship.

One further point to consider when planning the people side of the equation in ecological development is the function of historical, cultural, and archaeological resources. Sometimes a historical building, such as an old farmhouse or civic building from the 19th century, can provide an interesting and attractive focal point for a plan. Culture in all its manifestations can bind a community together, motivate youth, promote harmony in diversity, and provide collateral economic activity.

Developers should work to understand the extent and nature of archaeological, cultural, and historical resources by engaging qualified experts to take a common-sense and scientifically valid approach to researching the possible existence of such resources. The site plan should be designed to take advantage of resources that, through preservation, can become a point of interest and perhaps a thematic element for a development.

These salt marshes in the San Francisco Bay are fragile wildlife havens that have been restored after being disturbed by insensitive development practices.

4 Lower Risk by Exceeding Standards for Siting and Construction

From the experience of many storms along the Atlantic and Gulf coasts, storms of all types and sizes, we have gained a lot of knowledge about construction practices that provide the best protection from storm hazards. These practices can be used to build in a way that reduces risk and enhances the resiliency community. Nevertheless, risk cannot be eliminated.

The state of Florida has regularly upgraded its building code in response to new information about the effectiveness of construction practices from the experience of hurricanes. The code enacted in 2002 requires that residential commercial construction meet considerably higher standards than the code that applied before Hurricane Andrew struck south Florida in 1992. The new code toughened requirements for design, including stricter roofing measures. These more-stringent code requirements paid off when Hurricane Charley plowed across the state in 2004. Homes built to the new standards sustained considerably less damage than houses built to the code in place before Andrew. Newer commercial construction also fared better in Charley. After five storms hit Florida in 2004 and 2005, the state responded to rising insurance costs caused by storm damage by further ratcheting up code requirements.

Alys Beach

Alys Beach, developed by EBSCO Industries and master planned by Duany Plater-Zyberk, is a model for safe and durable construction. Occupying a 158-acre site on what had been the last piece of beachfront property on the Florida panhandle, Alys Beach is a neotraditional resort town. Featuring whitewashed masonry and stucco buildings, the town draws its architectural inspiration from the vernacular buildings of Bermuda and Antigua.

When built out, the town will include 900 residential units—all of which will be individually certified as “Fortified,” or disaster-resistant, by the Institute for Business and Home Safety, a non-profit, insurance industry-sponsored group. The insurance industry has long lobbied for tougher building codes, and the Fortified program has emerged as a way of recognizing projects that exceed code. Certified projects strengthen buildings well beyond local building codes for residential construction, which are often written with the bare minimum for safety in mind, and are subject to rigorous additional inspections.

Accordingly, the housing of Alys Beach is being built with disaster resistance in mind. Houses are sited to minimize window exposure to high winds, while all doors and windows are impact resistant. The buildings’ concrete masonry unit walls have steel reinforced bars every four feet rather than every



In addition to incorporating the natural habitat of the coast into the design of the community, the developer of Alys Beach in Walton County, Florida, decided to dramatically fortify the structures against hurricane damage.

eight feet, which is the Florida code requirement. Homes have concrete roof tiles covered with three coats of limestone slurry.

Approximately 1,500 homes in 11 states are Fortified. Alys Beach is the first community to require all of its buildings to be Fortified. Owners of Fortified homes can expect lower insurance costs.

Trying to save money by compromising building standards makes no sense. Building to code-plus is always better. Insurance companies have a much better understanding today of how high construction standards result in lower claims when a catastrophic event occurs. Thus, demanding higher standards that will provide more protection, increase the value of the structure, and further lower insurance costs makes sense. When a new community is being built, code-plus upgrades can be used as part of a marketing and sales program that can appeal to consumers.



Siting

Although superior design and construction are critically important, the proper siting of structures can significantly improve the resilience of the community and decrease its vulnerability. Proper siting, however, requires an integrated approach so vulnerability and resilience are considered at the regional, neighborhood, and site levels. Following are some of the factors to be considered:

- Location of hazard areas;
- Locations suitable for development;
- Regional open-space network, including habitat areas and sensitive environments;
- Regional transportation network, including roads and public transportation;
- Regional water and sewer system;
- Watersheds; and
- Existing land use.

Again, exceeding state and local siting requirements is a good practice.

Remember, conservation of land reduces vulnerability. Asset exposure can be reduced with a strong environmental protection policy. Leave the smallest ecological footprint while promoting economic vitality. The highest and best use may not always be in the public good. Protect the built environment that exists, but use rezoning and other public policy tools to reduce the ecological footprint and build with less impact.

To enhance structural integrity and resistance to storm damage, EBSCO Industries used double the reinforcing bars required by Florida code in the construction of homes at Alys Beach.

5 Adopt Successful Practices from Dynamic Coastal Conditions

In addition to the standard coastal hazards, such as storms and storm surges, tsunamis, erosive waves and currents, shoreline fluctuation, and barrier island movement, other forces contribute to the dynamism of the coast. Solid agreement now exists that global warming, caused by human activity, will bring changes to the coast. The acceleration of sea-level rise from the expansion of warming ocean waters and the melting of glaciers and ice sheets globally will make more-responsible and comprehensive development along the coast imperative. The global warming problem may also lead to changes in weather patterns and storm intensities that will make living along the coast more precarious. Consequently, communities on the coast must learn from each other which practices effectively increase resilience, decrease vulnerability, and reduce the potential threat of any given hazard, including accelerated sea-level rise.

Communities can look to one another for guidance concerning which policies and practices are the most effective and which are not. The Association of State Floodplain Managers has written a handbook titled *No Adverse Impact in the Coastal Zone* that describes how coastal communities can avoid or mitigate adverse impacts from dynamic coastal processes. The handbook details policies, regulations, practices, and services that can provide one of three increasingly effective levels of protection: Basic, Better, and No Adverse Impact (see accompanying sidebar).

Sharing best practices also is important at the project or site level to adopt successful design solutions from similar contexts. Learn from working examples—both good and bad. Many examples of good coastal development have begun to emerge, including the following examples of beach community best practices:

No Adverse Impact in the Coastal Zone Handbook

The Association of State Floodplain Managers (ASFPM) has prepared a handbook that describes how coastal communities can avoid or mitigate adverse effects from dynamic coastal processes. The handbook details what a community needs to do to have a “Basic” level of practices, what it must do to improve to a “Better” level of resilience, and finally what best practices it needs to put into effect to achieve “No Adverse Impact.” In the handbook, these practices are placed in the following categories:

- Hazard Identification and Mapping;
- Planning;
- Regulations and Development Standards;
- Mitigation;
- Infrastructure; and
- Emergency Services.

The appendix to the handbook provides a simple list of programs by state that are examples of these best practices. In most cases, references to Web sites will provide more detailed information.

The *No Adverse Impact in the Coastal Zone* handbook is available from ASFPM at www.floods.org.



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1



EDAW

2

- 1 Water Sound, on County Road 30-A in the panhandle of Florida, preserves the natural shoreline with protected walkways to the beach.
- 2 Public access to trails, parks, and recreational areas near the coast preserves other, more sensitive habitats from intrusion.



3



ISLAND PRESERVATION PARTNERSHIP

4

- 3 and 4 Dewees Island, South Carolina, has a nature center, a wet lab, and a resident environmental education specialist. Its island stewardship program aims at recruiting and training volunteers to help promote sustainable living on the island.



MONTAGE LAGUNA BEACH

5



MONTAGE LAGUNA BEACH

6

- Beach edge: WaterSound Beach, Florida (photo 1).
- Public access, parks, trails, walks: BeachWalk on St. Joseph Bay, Florida (photo 2).
- Interpretation: Dewees Island Nature Center, Dewees Island, South Carolina (photos 3 and 4).
- Views: Montage Resort, Laguna Beach, California (photo 5).
- Density: Montage Resort, Laguna Beach, California (photo 6).

- 5 Montage Resort in Laguna Beach, California affords every guest impressive views of the southern California coastline.
- 6 Concentrating development density in the city of Laguna Beach, California, 6,500 acres were put aside for the Laguna Beach Wilderness Park.

6 Use Market-Based Incentives to Encourage Appropriate Development

Incentives can encourage developers to locate and cluster coastal development in less vulnerable and more resilient sites. Incentives come in a number of forms: public investment, public/private partnerships for land assembly and financing, preferred treatment for timely regulatory approvals, tax incentives that add to the bottom line, and others. Market-based incentives also can help direct the development toward more environmentally compatible design, for example, with public investments in infrastructure such as water, sewer, and stormwater management. Incentives are also provided by backing off costly hard-edged engineering code requirements that serve only to exacerbate environmental disturbance. Probably the least-

expensive incentive to implement is regulatory—organize the development review process so that good design and siting, as well as good practices for environmental protection, are the path of least resistance to quick project approval. This strategy is called making the right thing easy to do.

Make the Right Thing Easy to Do

Changing the zoning code to support higher densities and compact, clustered uses is one step in the process. Subdivision regulations, engineering codes, building codes, road ordinances, and environmental rules all must be examined to

determine how they support or obstruct appropriate coastal development. Hard-edged engineering solutions for stormwater management and other infrastructure concerns should be reexamined and where appropriate made more flexible. Street designs that focus only on getting cars speedily from one place to another instead of reducing stormwater runoff or improving pedestrians' safety and comfort must be amended. Guidelines must be prepared that address the context of streets in the community and how they might contribute to enhancing environmental systems or improving the quality of life.

Create incentives for redevelopment that protects natural areas, clusters uses, and raises development standards.



Using well-designed, compact development at Water Sound made possible the preservation of abundant natural habitat.

- Conserve fragile landscapes and essential natural resources.
- Protect open natural areas with or without public acquisition through conservation easements or transfer of development rights.
- Use density bonuses to encourage affordable housing.
- Replace substandard development with hurricane- and storm-resistant development.

All these incentives require consistency and discipline in public policy. Having the patience to wait for the right projects and facilitating them through the approval process when they come will energize the proposal of similar projects. Stick to the plan, be disciplined, anticipate the need to be flexible, and then do not be afraid to bend. Finally, reward and trust those who build better.

Put Your Money Where Your Regulations Are

Integrate public facilities into the community's development strategy. Public facilities should be sited in ways that help shape the plan and vision and enhance environmental performance and synergy among private developments. The thoughtful location of public facilities will leverage private investment on surrounding sites, create a focus for the community, and help shape a more beneficial development pattern.

Build Partnerships

Maximize benefits to the community and the environment by building public/private partnerships. The public sector must be prepared through the partnership arrangement to provide capital investment, services, or both that support private sector investment and set the stage for the kind of development that will make the community less vulnerable and more resilient. Public agencies, working in partnership with the private sector, ensure that comprehensive environmental, economic, and community benefits actually happen. They provide capital investments that achieve multiple purposes; for example, improving access and parking at public beaches and enhancing coastal character and the environmental quality. Such public investment will help bring about further private investment as it is required.



Unrestrained, unregulated market forces can lead to replacing palm trees and wildlife with high rises and coffee shops. Well-crafted incentives might have brought about a better outcome.

7 Address Social and Economic Equity Concerns

In the not-so-distant past, many American communities included a variety of housing types with residents of all incomes and backgrounds. These communities were not considered “social experiments” or “mixed-income”; they were rightly thought of as simply where we live. The fact that the wealthiest residents lived within walking distance of some of the poorest was a naturally accepted part of these healthy and balanced communities.

Over the past few decades, we have seen American communities become more economically segregated from one another as the extensive use of automobiles made possible development that sprawls across the landscape. The high cost of land on the coast only exacerbates this phenomenon. To restore balance and move toward sustainability, developers need to provide more housing choices that appeal to various market segments and demographic groups. Of critical importance is a mix of housing types, price points, and other uses that provide a more diverse and vital community. By clustering compact development, walkable mixed-use neighborhoods can be created that offer the opportunity for a variety of housing types rather than conventional homogeneous subdivisions. Different demographic groups have distinctive needs and desires for housing; furthermore, housing needs and desires change with life-cycle changes, such as when a young family evolves into an empty-nester couple or a child living at home becomes a young adult living on his or her own in the community. A mix of housing opportunities, therefore, helps create not just a one-generation subdivision but a sustainable community that accommodates life-cycle changes and allows people to stay in the community.

Social Equity Best Practices

- Offer a variety of housing types, including affordable housing, for long-term sustainability.
- Encourage resort employers to provide employee housing on site.
- Maintain local community character and authenticity.
- Take land cost out of the price equation in developing affordable housing by using surplus public land and community land trusts.
- Be innovative with mixed-use designs, such as residential on top of commercial, or several units in one large single-family type of dwelling.
- Avoid displacing people as a consequence of coastal redevelopment.
- Find ways for local communities to benefit from and contribute to the success of the development.

Different neighborhoods in the same development can have different price points, as is the case at WaterColor in Walton County, Florida.





Rental and ownership of single-family houses with yards, townhouses, and multifamily apartment buildings are needed to meet the varied lifestyles of people living on the coast. A young couple may not want a three-bedroom house with a yard but may prefer an apartment with a pool and fitness center. Families, in contrast, may want a more traditional single-family house with a yard and a neighborhood playground.

Higher-density residential areas with many amenities are most appropriate for activity and employment centers and transportation hubs. Such residential areas help generate the traffic necessary to keep retail centers vital and put the “center” in town center.

The effort to return to healthy and balanced communities begins with preservation of existing communities that are in balance. Throughout the country, much of the existing affordable housing stock is disappearing because of neighborhood changes, expiring uses, and market pressures. Much of the stock is rental housing, which is the only housing choice for many low-income families. Many communities understand the connection between balanced communities and their economic health and are working to preserve the affordable rental stock that allows working families to live near their jobs. In some communities, low-income housing tax credits are being used to update existing rental-housing stock and preserve this vital housing option.

The new affordable-housing developments being constructed today provide a variety of housing at a variety of price points. They allow people to move up without having to move out. From the developer’s perspective the mixed product creates a variety of potential customers, mitigating the development risk. If the development includes market-rate units, these units can be used to cross-subsidize the income-restricted units, making a development more financially feasible. The correct ratio of market-rate, workforce, and low-income housing units in any one community may vary based upon the situation in the surrounding community. Many developers believe that at least 50 percent of the housing in larger, mixed-income communities should be market-rate housing to ensure community stability and options for lower-income families to move up.

The Community Land Trust for Affordable Housing

A community land trust is a tool that is being used increasingly for affordable housing because it allows the value of the land to be removed from the home financing equation. A non-profit corporation established through a public/private partnership for the purpose of providing affordable housing acquires title to developable land or existing properties in a specific area through purchase, donation, or lease. Prospective purchasers of homes in the trust have to qualify only for the cost of the home itself. Sometimes public and private financing programs are available to assist low- and moderate-income buyers with their purchase.

To preserve affordability, the non-profit corporation’s stakeholders can develop a formula that may limit the amount of financial gain that can be realized when a community land trust home is resold; a portion of the profit from the sale goes to the seller, and the remainder goes to the nonprofit to assist future purchasers of properties within the trust or to develop additional affordable housing. The preservation of affordability ensures that the original public-benefit purpose remains, but the additional benefit of private wealth creation—and its multiplier effect in the community—can be realized.

Balance the Public's Right of Access and Use with Private Property Rights



Even when private homes are built along the waterfront, a public beach ensures that all can enjoy the resource.

PREMA KATARI

According to centuries of common law in the United States and Great Britain, the public has the right to enjoy the benefits of navigable waters and their shores for commerce, travel, fishing, and recreation. The right is protected under the Public Trust Doctrine (see sidebar), which the courts have used in weighing public rights of access and use against private property rights to determine the balance between public and private interests.

The best way to avoid imbalance in public and private rights is to avoid the conflict wherever possible. Where feasible, conflict is easily avoided by making the entire shoreline system a community amenity open to the public, so no private rights exist to be concerned with. This strategy not only avoids the public rights versus private rights conflict but also has the advantages of transferring the value of the waterfront property to the community at large and making preservation of coastal systems and processes easier.

To function well, a community with an open beach system must have some of the following characteristics:

- Free and uninterrupted access along the beach, ideally inland to the line of established upland vegetation;
- An access to the beach at least every half-mile in highly populated areas;
- A diverse range of access types—pedestrian, vehicular, view—with a range of amenities to meet user needs, such as parks, walkways, boardwalks, and streets, but with minimal adverse environmental effects;
- An accurate and up-to-date inventory of access sites;
- A dedicated funding source for land acquisition;
- A policy of no net loss of beach access;



- Regular collection of beach attendance records and analysis of supply and demand, including an economic evaluation of beaches;
- Public education about beach access, including customary or prescriptive right to beach access;
- Good public access to the coast and bay shores with the acquisition of land and easements and by building trails and stairways;
- Low-cost accommodations along the coast, including campgrounds and hostels;
- A policy of protecting and enhancing coastal wetlands, streams, and watersheds;
- Available urban waterfronts for public use and coastal-dependent industries, especially commercial fishing;
- Protection of agricultural lands; and
- A policy welcoming donations and dedications of land and easements for public access, agriculture, open space, and habitat protection.

Even when the entire beach is public, restricted access can be a problem. In these cases, property owners should be given incentives to provide access and truly open up the beach to the public. Property rights can be respected by using tools such as conservation easements, tax abatements, and the purchase of development rights. In some cases, just the addition of adequate parking facilities may go a long way toward enhancing public access.

Provide incentives through a better and faster approval process for good development projects that offer more open and accessible beaches. This strategy will grow support in the community and reduce opposition. Value is generated through open access and the preservation of the coastal lifestyle.



Public Trust Doctrine

The Public Trust Doctrine is a common law doctrine of property law, adapted by each state, that establishes public rights in navigable waters and on its shores. The doctrine is premised on the fact that such waters and shores have been used as common areas for food, travel, and commerce from time immemorial. The concepts presented in the Public Trust Doctrine date back at least to the Roman Empire. English common law recognized public rights in navigable waters and on their shores. American colonial courts followed English common law. Each state has since further refined the doctrine through its courts and legislatures to best fit its particular circumstances and societal needs. The Public Trust Doctrine provides 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 establishes the right of the public to fully enjoy public trust lands, waters, and living resources for a wide variety of recognized public amenities. The doctrine also sets limitations on the states, the public, and private owners and establishes the responsibilities of the states when managing these public trust assets.

Sources: National Oceanic and Atmospheric Administration; Natural Heritage Institute.

9 Protect Fragile Water Resources on the Coast



Permeable roadways prevent runoff and contribute to the recharge of groundwater.

Coastal water resources play a critical role in the ecosystem of the coast and determine how well development fits into the coastal environment. Coastal waterways are often estuaries or have important characteristics of estuaries. Technically, an estuary is a semi-enclosed body of water that has a free connection to the sea where seawater mixes with freshwater. Tidal influence maintains a dynamic relationship between freshwater and saltwater where they meet. Estuarine habitats are essential nursery grounds for many marine fish and shellfish. Estuaries often contain salt marshes, mangroves, and other wetlands, which are important habitats for many species.

Rainfall feeds freshwater into the estuarine system when it runs off as stormwater and recharges groundwater systems when it percolates into the ground. How development affects the balance between recharge and runoff is critically important to both: first, because groundwater is a major source of drinking water in coastal areas; and second, because stormwater runoff from developed areas can degrade delicate estuarine habitats.

One way to reduce the polluting effects of stormwater is to use natural drainage patterns and characteristics. A natural drainage system imitates the runoff of the site in its predevelopment state, substituting surface drainage and infiltration for conventional storm sewer drainage. One way to retain natural drainage patterns is by



Fragile coastal water systems can be preserved by incorporating existing wetlands and marshes into site development plans.



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clustering development to preserve the natural topography and, as much as possible, drainage ways. Incorporating natural drainage design can save money by reducing infrastructure costs and also reduce downstream effects and recharge local groundwater supplies.

Groundwater recharge can be enhanced by using porous paving materials. Crushed stone, gravel, stabilized decomposed granite, and open paving blocks are as durable and practical as asphalt paving, yet minimize runoff from driveways, parking areas, walks, and patios and allow rainwater to infiltrate the ground.

Water shortages and declining groundwater reserves have caused many states and counties to adopt water conservation measures. The ease and low cost of saving

Estuaries and wetlands provide recreation for residents and visitors.



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water make wasting it inexcusable. Water-saving toilets, shower heads, faucets, and irrigation systems reduce aquifer depletion and lessen the discharge of sewage treatment plants in coastal areas.

Watershed Management

A watershed is the area of land that drains to a particular body of water. The movement of water through the watershed integrates the human and natural systems functioning in it. As a form of environmentally based land use management, watershed management examines the entire watershed system, from the uplands and headwaters, to floodplains, wetlands, and receiving water. It focuses on water quantity and quality and how they are affected by the patterns of land use and land conservation.

The goal of watershed management is to retain water quality and the flow of water in a natural state and maintain, to the fullest extent possible, healthy, functioning aquatic systems and habitats. Of particular concern is how various types of land uses affect the relationship among rainfall, groundwater infiltration, evapotranspiration, overland flow, and stream flow. Watershed management is accomplished through an iterative process of integrated decision making regarding uses and modifications of land and water within a watershed. This process provides an opportunity for stakeholders to balance diverse goals and uses for environmental resources and to consider how their cumulative actions may affect long-term sustainability of both the ecological and human communities.

A variety of building practices can also help conserve water, such as using water-conserving appliances and recycling by using graywater and rooftop rainwater-harvesting systems. Harvest rainwater where practical. Rainwater can be collected from the roof for indoor or irrigation use by routing downspouts to a cistern. This practice is equivalent to using passive solar energy. It can supply nearly all water needs at little or no cost, with many environmental benefits. Rainwater harvesting is currently encouraged in Texas, Hawaii, Bermuda, and Australia, where it is sometimes the sole source of domestic water.

Use native plants and drought-tolerant landscaping with drip irrigation to conserve water resources. Landscaping with native plants that are naturally adapted to existing climate, precipitation, and ecological conditions and have minimal need for supplemental irrigation or pesticides conserves water. Plant materials can be planted using water-retaining soil amendments or mulched to retain moisture by reducing surface evaporation. Subsurface irrigation systems that supply water directly to the roots and drip emitters can supply needed irrigation with minimal waste.

What Is Graywater?

Graywater systems use drainage water from sinks and showers (not toilets or dishwashers) for irrigation; the additional nutrients in graywater are beneficial for plant life. In addition, local groundwater is recharged as the graywater filters through the ground. Graywater systems require separated household drainage systems and properly designed collection tanks, filters, and pumps, which can be supplied by local and national firms. Local codes vary, but many jurisdictions are beginning to see the benefits and allow the use of graywater systems. Graywater irrigation is also being used for turf areas.

Although installing a sophisticated graywater system to serve a small turf area may not be cost-effective, the technology is appropriate for areas with greater irrigation needs, such as golf courses that would otherwise deplete scarce groundwater reserves.

10

Commit to Stewardship That Will Sustain Coastal Areas

Stewardship means the responsible management of our environment, economy, and society for the benefit of present and future generations of people, plants, and animals. The complexity of environmental, economic, and social interactions requires that a good steward enhance and balance all three. For example, from an environmental perspective, stewardship obliges us to plan development in a way that enhances environmental and social systems. This process contrasts with the conventional practice of building wherever we please and attempting to use engineering brute force to bend natural systems to our will. Adopting a philosophy of stewardship of the complex systems that we depend upon is an important step toward sustainable development.

Sustainable development respects complexity by taking into account the fact that ecological, economic, and social systems are interconnected. Sustainable develop-

ment holds that economic necessity and ecological responsibility are not mutually exclusive—that development and environment are not necessarily in conflict. By requiring us to see and think in new ways, sustainable development can help us understand how the built and natural environments can be closely integrated.

Committing to stewardship means planning to sustain and enhance the natural assets of a site while understanding its context in the broader regional system by adopting environmental design strategies that enhance sustainability, such as the following:

- Design a land plan that preserves the character of the landscape.
- Use a whole-system design approach to site resources, materials, energy use, function, and aesthetics.
- Optimize the use of natural features and resources of the site by orienting buildings for passive solar heating and natural cooling.



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- Reduce building size and footprint to minimize site disruption and destruction of habitat; use less land and expend less energy and water.
- Combine vernacular designs with local materials and modern, high-efficiency technologies.
- Design in flexibility to accommodate future needs.
- When tradeoffs are necessary, choose solutions that favor energy efficiency and durability.
- Imitate natural drainage and other features.
- Save existing vegetation and trees where possible.
- Use locally adapted native plants to minimize irrigation; discourage the use of exotic invasive species.
- Commit to habitat restoration and protecting sustainable habitat areas—plan to sustain natural site assets and their broader regional system. Develop plans to recover disturbed, deteriorated areas.
- Cluster development to increase density and preserve open space.
- Keep open spaces connected and unite fragmented systems.



MONTAGE LAGUNA BEACH

To effectively implement a program of sustainable development, the community must share a vision of its future. This vision involves a strategy for implementation, which includes funding mechanisms (public and private), potential partners (and their responsibilities), and an agenda or time frame for achieving the vision. One way to implement the strategy to achieve the vision is to build partnerships that maximize benefits for the community and the environment. A partnership is a process, not a product. Successful navigation through the process results in benefits for all parties. Public sector entities can leverage and maximize public assets, increase their control over the development process, and create a vibrant built environment. Private sector entities are given greater access to land and receive more support throughout the development process. Many developers earn a market niche as a reliable partner with the public sector and are presented with opportunities to continue to participate in implementing the vision. A partnership should be inclusive so that stakeholders



know they have a significant role to play in building a consensus. For this reason, a process of identifying stakeholders and bringing them into the partnership is important. Stakeholders will probably include the following groups:

- Residents;
- Neighborhood and homeowner associations;
- Government officials;
- Seasonal residents and visitors;
- Community organizations—service groups, faith-based groups, nongovernmental organizations, chambers of commerce, and the like; and
- Recreational users.

The partnership process must be transparent and open. By casting a wide net and giving all the stakeholders—including potential partners—an opportunity to help craft the vision, less possibility exists for opposition. Public hearings, charrettes, visioning exercises, and other tools for involving stakeholders in the visioning process should be used to ensure the broadest outreach.

Coastal development planning and resource protection must consider long-term horizons to meet the needs of future generations. Change is certain, so a need for flexibility exists—plan for anticipated unknowns. The community will want to maintain and enhance the livable and desirable characteristics that it has.

Appendix: Case Studies

This appendix is a simple list of programs by state that are examples of best practices in six categories: Hazard Identification and Mapping; Education and Outreach; Planning; Regulations and Development Standards; Mitigation; and Infrastructure. These programs were collected by National Oceanic and Atmospheric Administration to supplement the *No Adverse Impact in the Coastal Zone* handbook (see Principle 5). In most cases, references are given to websites that will provide much more detailed information. Each description suggests what the state program is.

Hazard Identification and Mapping

MAINE

Volunteer Monitoring Study: <http://www.geology.um.maine.edu/beach/>

Beach Scoring System for the Management of Maine's Sandy Shoreline: <http://www.seagrant.umaine.edu/extension/cc.htm>

MARYLAND AND VIRGINIA

Comprehensive Coastal Inventory Reports: <http://ccrm.vims.edu/ci.html>;
<http://ccrm.vims.edu/gisdatabases.html>

MASSACHUSETTS

Office of Coastal Zone Management delineate velocity zone floodplain boundaries in four Massachusetts coastal communities: <http://www.mass.gov/czm/>

OREGON

Oregon's Coastal Atlas and Oregon littoral cell mapping: <http://www.coastalatlantlas.net/index.asp>

WASHINGTON

Washington Coastal Atlas: http://www.ecy.wa.gov/programs/sea/SMA/atlas_home.html

Education and Outreach

MARYLAND

Shore Erosion Control Technical Assistance Program: <http://www.dnr.state.md.us/forests/programapps/sec.html>; Shore Erosion Control, the Natural Approach: ftp://ftp-fc.sc.egov.usda.gov/MD/web_documents/programs/rcd/shore_esrcd.pdf

OREGON

Educational DVD: "Living on the Edge, Building Property on the Oregon Coast,"
http://seagrant.oregonstate.edu/video/flash/Living_On_the_Edge.html

WASHINGTON

Padilla Bay National Estuarine Research Reserve Coastal Training Program: <http://www.padillabay.gov/>

Shorelands and environmental assistance program: <http://www.ecy.wa.gov/programs/sea/shorelan.html>

WISCONSIN

Educational DVD: "Wisconsin Shores: Coastal Erosion in the Great Lakes,"
http://coastalmanagement.noaa.gov/issues/hazards_casestudies.html

Planning

CALIFORNIA

San Diego Regional Beach Sand Project: San Diego Association of Governments. 2003. "San Diego Regional Beach Sand Project Fact Sheet."

<http://www.sandag.org/index.asp?projectid=101&fuseaction=projects.detail>

Monterey Bay Shoreline Management

The Monterey Bay National Marine Sanctuary

http://coastalmanagement.noaa.gov/initiatives/shoreline_ppr_planning.html

Southern Monterey Bay Pilot Project

Southern Monterey Bay Coastal Erosion and Armoring Workgroup: Members include California Coastal Commission, Monterey Bay National Marine Sanctuary, U.S. Geologic Survey, Association of Monterey Bay Area Governments, Monterey County, California state parks, City of Monterey, City of Seaside, California State University-Monterey Bay, University of California Santa Cruz, and the Naval Postgraduate School. <http://www.coastal.ca.gov/recap/chap2.html>

FLORIDA

The Waterfronts Florida Partnership: <http://www.dca.state.fl.us/fdcp/dcp/waterfronts>

MASSACHUSETTS

Cape Cod Commission model floodplain bylaw: <http://www.capecodcommission.org/bylaws/floodplain.html>

NORTH CAROLINA

Conservation tax program: <http://www.enr.state.nc.us/conservationtaxcredit/>

Regulations and Development Standards

CALIFORNIA

California Coastal Commission: irrigation restrictions placed on California bluff property, <http://www.coastal.ca.gov/ccatc.html>

FLORIDA

State of Florida Coastal Construction Control Line:

<http://www.dep.state.fl.us/beaches/programs/ccclprog.htm>

Collier County TDR Program: www.beyondtakingsandgivings.com/collier.htm

HAWAII

Maui County Planning Commission: Maui County Shoreline Setback Areas, <http://www.co.maui.hi.us/departments/Planning/czmp/ssa.htm>

Maui Shoreline Atlas: <http://www.co.maui.hi.us/departments/Planning/czmp/method.htm>

MAINE

Restrictions on building size: Coastal Sand Dune Rules, <http://www.maine.gov/dep/blwq/topic/dunes/index.htm>

MASSACHUSETTS

Town of Scituate: Land Subject to Coastal Storm Flowage means “land subject to inundation caused by coastal storms up to and including that caused by the 100-year storm, surge of record or storm of record, whichever is greater”; http://www.town.scituate.ma.us/documents/wetlands_rules_regs111603.pdf

MICHIGAN

Michigan Department of Environmental Quality Shorelands Protection and Management: http://www.michigan.gov/deq/0,1607,7-135-3313_3677_3696-11188—,00.html

NEW JERSEY

Borough of Mantoloking: Setback Ordinance, <http://www.mantoloking.org/>

NEW YORK

The New York Division of Coastal Resources is taking actions that will correct past human mistakes and improve decision making: <http://www.nyswaterfronts.com/>

NORTH CAROLINA

Setback requirements: North Carolina Administrative Code for Ocean Hazard Areas (15A NCAC 7H .0306), http://coastalmanagement.noaa.gov/initiatives/shoreline_ppr_setbacks.html

OREGON

The state of Oregon requires local governments to adopt a 75-foot setback. Marion County requires all septic tanks and drain fields to be set back 100 feet from the high-water line: http://www.oregon.gov/LCD/OCMP/ShorHaz_Intro.shtml

PENNSYLVANIA

Pennsylvania Bluff Recession and Setback Act: http://coastalmanagement.noaa.gov/initiatives/shoreline_ppr_overlay.html

RHODE ISLAND

Rhode Island Coastal Resources Management Program: <http://www.crmc.ri.gov/>

SOUTH CAROLINA

Rolling Easement: 2005 Surfrider Foundation State of the Beach Report, <http://www.surfrider.org/>

TEXAS

Rolling easements in Texas Open Beaches Act: 2005 Surfrider Foundation State of the Beach Report, <http://www.surfrider.org/>

Mitigation

CALIFORNIA

City of Pacifica, San Mateo County, coastal flooding and beach erosion program: http://coastalmanagement.noaa.gov/initiatives/shoreline_ppr_retreat.html

City of Ventura Surfer’s Point Planned Retreat Policy: http://coastalmanagement.noaa.gov/initiatives/shoreline_ppr_retreat.html#2

Matilija Dam Ecosystem Restoration Project Case Study: <http://www.matilijadam.org/>

Mitigation Approach to Shoreline Armoring, California Coastal Commission:
http://coastalmanagement.noaa.gov/initiatives/shoreline_ppr_mitigation.html

MARYLAND

Worcester County Conservation Easement Strategy to Protect Coastal Property:
<http://www.co.worcester.md.us/RLpage.htm>.

MICHIGAN

Emergency Home Moving Program

NEW JERSEY

Blue Acres Program Coastal Blue Acres Program: <http://www.state.nj.us/dep/greenacres/blue.htm>

NORTH CAROLINA

North Carolina's Public Beach and Coastal Waterfront Access Program: <http://dcm2.enr.state.nc.us/Access/grants.htm>

Infrastructure

MARYLAND

Hazard Web Portal and Shoreline Change Internet mapping tool: <http://shorelines.dnr.state.md.us/>

Shoreline Changes Online: http://shorelines.dnr.state.md.us/sc_online.asp;
<http://shorelines.dnr.state.md.us/>

Development and Implementation of a Sea Level Rise Response Strategy using LIDAR imagery:
http://dnrweb.dnr.state.md.us/download/bays/sea_level_strategy.pdf

Assess vulnerability to flood damage using HAZUS-MH FLOOD: <http://www.esrgc.org/hazus.htm>

Mapping repetitive flood losses to assist in prioritizing flood mitigation funding:
http://www.mde.state.md.us/Programs/WaterPrograms/Flood_Hazard_Mitigation/floodMgmtGis/index.asp

Calvert County land management practices to address bluff failures: <http://www.co.cal.md.us/>

Kent County a regulatory hierarchy to promote nonstructural and hybrid approaches to address erosion: DNR Shore Erosion Control Program; Eastern Shore Resource Conservation and Development Council; <http://kentcounty.com/gov/planzone/>

Assessing the effectiveness of nonstructural and hybrid erosion control measures: DNR Shore Erosion Control program (SEC)

Coastal Community Initiative: <http://www.dnr.state.md.us/bay/czm/ccrfp.pdf>

NORTH CAROLINA

Relocation of Cape Hatteras Lighthouse: <http://www.nps.gov/archive/caha/lrp.htm>

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Michael Pawlukiewicz, Prema Katari Gupta, and Carl Koelbel

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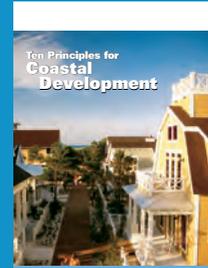


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