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Article in Environmental Geosciences · March 2000

DOI: 10.1046/j.1526-0984.2000.71002.x

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# Avoiding Coastal Hazard Areas: Best State Mitigation Practices

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## ABSTRACT ●

Extreme weather events, such as hurricanes and severe coastal storms, occur frequently in predictable locations. These extreme events become disasters only when they intersect with concentrations of human population and development. State governments whose coastlines are vulnerable to hurricanes and coastal storms can create programs to reduce the exposure of people and property to such hazards. Such mitigation programs include mapping hazard areas, notifying the public about potential hazard locations, restricting public subsidies that encourage development in hazard areas, and acquiring property in hazard areas to prevent its development. A number of states operate such programs, including Connecticut, Florida, Maine, Maryland, Massachusetts, New Jersey, Rhode Island, South Carolina, and Texas. This article reviews current state coastal hazard mitigation programs to identify “best practices” and to recommend a comprehensive package of mitigation actions to reduce exposure to hazards.

**Key Words:** acquisition, best practices, coastal hazards, notification, state hazard mitigation, subsidy restriction.

## INTRODUCTION ●

Recent hurricane devastation has risen to catastrophic proportions. In 1992, Hurricane Andrew resulted in more than \$25 billion in damages, the highest total of any natural disaster in U.S. history. Between 1988 and 1996, 21 hurricanes were presidentially declared disasters, affecting 326 counties in 15 states. More than 36 million people now live in counties fronting the Gulf of Mexico or the Atlantic Ocean, the areas most susceptible to hurricanes and one of the most rapidly growing areas of the country (Federal Emergency Management Agency [FEMA], 1997).

Can states do anything to mitigate this rising tide of destruction? Is there any way to reform the present inadequate system of state laws, policies, and programs that deal with hazards on the assumption that such disasters are inevitable acts of God rather than preventable occurrences? Have any states assumed responsibility for avoiding coastal disasters

through advance action rather than simply providing postdisaster aid programs? The answers are found in the practice of hazard mitigation.

Hazard mitigation protects people and property from destructive impacts of coastal hazards by:

- Avoiding hazard areas—directing new development and relocating existing development to safe locations;
- Strengthening buildings and infrastructure—using building codes and engineering design to increase the resilience of structures exposed to hazards; and
- Maintaining protective environmental features—dunes, maritime forests, vegetation, and wetlands which reduce wind and wave impacts.

In this article, we review mitigation programs primarily directed at increasing avoidance of hazard areas through four means: (1) hazard area definition, (2) hazards notification, (3) restriction of public subsidies, and (4) hazard areas acquisition.<sup>1</sup> Hazard area definition provides public information about the location and intensity of potential hazards, such as flooding and storm surge. Hazards notification warns potential purchasers of property about where they can expect to encounter hazards, so that they may avoid them or take other mitigation measures, such as elevation or building strengthening. Restriction of public subsidies limits government expenditures for construction of infrastructure, such as roads and bridges, in hazard areas, reducing both exposure of such infrastructure to hazard forces and development-inducing effects of providing infrastructure in hazard areas. Hazard areas acquisition curtails new construction in hazard areas by acquiring property for public purposes, such as recreation, and allows owners of threatened or damaged property to sell and relocate to a safe area. Acquisition also may help to maintain protective natural features, such as dunes, wetlands, and maritime forests.

<sup>1</sup>The genesis of our study (Godschalk et al., 1998) was a recommendation by the 1997 North Carolina Disaster Recovery Task Force, following Hurricanes Bertha and Fran, that the state consider (1) legislation that requires full disclosure and hazard notification to persons acquiring property on barrier islands; (2) legislation restricting future state subsidies and support of development in designated high hazard areas on barrier islands, and (3) establishment of a state hazard area acquisition program. In response, we assembled information on mitigation programs in other states on how to (1) define coastal high hazard areas, (2) notify the potential purchasers of property within those areas about the hazards present, (3) limit public subsidies to development in those hazard areas, and (4) acquire threatened property in hazard areas for public purposes. For a review of other mitigation approaches, such as structural strengthening, environmental protection, and other types of programs, see Godschalk et al. (1989).

Based on the evidence of current practice, we conclude that state coastal hazard mitigation directed toward avoiding hazard areas is both possible and desirable. We review existing programs, identify the characteristics of best practice, and recommend a comprehensive package of state mitigation actions. We emphasize that to be most effective, coastal hazard mitigation programs should be integrated packages of related actions. The way that hazard areas are defined influences how disclosure and subsidy limitation are applied. Failure to notify potential buyers can increase unwise development in hazard areas. Failure to restrict subsidies can inflate property values, thereby undermining the feasibility of public acquisition of property in hazard areas. Every part of a hazard mitigation program is linked to every other part.

## DEFINING HAZARD AREAS

What constitutes the coastal high hazard area? This is an important question because notification, subsidy limits, and acquisition all depend on clear identification of those hazardous locations where these programs will apply. Although federal and state agencies identify various types of coastal hazard areas, such as expected flooding or erosion areas, few states currently designate or map high hazard areas—those areas where combinations of hazard forces pose extreme dangers to people and property. Thus, it is important to first define the hazards involved and the threats they pose.

Coastal hazards include periodic extreme events, such as hurricanes and severe coastal storms, as well as ongoing processes, such as regular wave, current, and wind action. Hurricanes and coastal storms generate destructively high winds, tornadoes, rainfall, flooding, waves, and storm surges that can severely damage buildings, infrastructure (e.g., roads, bridges, and sewage treatment plants), natural systems (e.g., dunes, beaches, and marshes), homes, and businesses. Ongoing coastal processes erode beaches, move inlets, damage vegetation, and reshape dunes as well as threaten buildings, infrastructure, and natural systems, although in a more gradual fashion. Together, they make up a complex hazard system.

States have several possible alternative approaches to defining coastal high hazard areas. They can:

- Use existing coastal flood hazard areas—“A Zones” (100-year floodplain) and “V Zones” (wave velocity)—specified in the National Flood Insurance Program (NFIP) and mapped on Flood Insurance Rate Maps (FIRMs) by FEMA. FIRMs define areas subject to rising water flooding, although not to hurricane storm surge or coastal erosion. In many areas, FIRMs are not up-to-date.
- Use hurricane storm surge hazard areas defined by the SLOSH (*Sea, Lake and Overland Surge from Hurricanes*) modeling program, produced by the U.S. Army Corps of Engineers to show potential surge areas for

Category 1–5 hurricanes. (Florida adopted the Category 1 hurricane evacuation area as its high hazard area following Hurricane Andrew.) SLOSH maps provide the most specific delineations of hurricane hazards but do not show coastal erosion areas and are not generally available to the public.

- Use state-defined, hazard-related *Areas of Environmental Concern (AECs)*, such as those specified under the North Carolina Coastal Area Management Act: ocean erodible areas, high hazard flood areas, inlet hazard areas, unvegetated beach areas, and estuarine shorelines (Owens, 1994). Such AEC definitions may include multiple hazard areas, including erosion, but some are not available to the public on published maps, and most do not include storm surge areas.
- Develop a more comprehensive new system of hazard area definition, such as (1) the Coastal Risk Assessment Method applied to the North Carolina coast by the Duke Center for Study of Developed Shorelines, which combines elevation (by NFIP flood zone) and presence of vegetation with various secondary factors (e.g., erosion rate, dunes, inlet movement, storm history, engineering, and finger canals); (2) the Nags Head hazards Geographic Information System database used to guide land use planning, which overlays property ownership maps with information on storm surge, incipient inlets, and an oceanfront zone; or (3) the Arbiter of Storms model, which combines wind, wave, and rainfall damage, along with coastal erosion and other factors (these three systems are described in Godschalk et al., 1998, appendix 1A).

Effective hazard area avoidance requires the designation and mapping of hazard areas so that people understand where danger exists. Accurate hazard area maps must be based upon solid coastal science and engineering data as well as careful judgement; they are not simple or inexpensive to provide. Best practice criteria for selecting appropriate hazard area definitions include (1) availability to the general public and to decision makers; (2) accuracy of hazard area boundaries; (3) inclusiveness of hazard areas; (4) feasibility of mapping hazard areas; and (5) ability to distinguish hazard intensities, such as high, medium, and low hazard areas.

Best practice recommendations for hazard area definition include the following:

- Coastal hazard areas should be identified on state-provided maps that are readily available to the general public, regularly updated, and easily understandable, similar to state highway maps.
- Hazard area boundaries should be delineated with systematic scientific studies so that the necessary data can be assembled to accurately map and regularly update the maps to enable users to have confidence in them.

- All types, intensities, and locations of potential coastal hazards should be identified on the map, both those resulting from extreme events such as hurricanes and those resulting from ongoing coastal processes such as erosion.
- States should create funding sources (e.g., from coastal management program funds or special hazard area taxes) and appropriate sufficient funds to delineate and map designated hazard areas at desired accuracy.
- Hazard maps should indicate relevant degrees of hazard intensity (such as 100-year flood or Category 3 hurricane storm surge) so that users can understand the extent of exposure at various locations.

Once hazard areas have been defined and mapped, then it is relatively simple to notify prospective purchasers of coastal property about the location, type, and intensity of hazards they are likely to encounter.

## HAZARDS NOTIFICATION

Coastal hazards notification is accomplished by requiring disclosure of coastal hazard conditions to potential purchasers of property (as well as other interested parties, such as insurance companies and lending institutions) prior to purchase. Disclosure information allows purchasers to make informed decisions either to avoid the area by buying property in a different location or to purchase property in the hazard area and then pursue mitigation measures like hazard insurance or structural reinforcement (Palm, 1982).

Research indicates that the methods of notification (timing and materials) as well as the perceptions about notification created by the professionals involved in the process have the greatest influence on notification effectiveness (Palm, 1981, 1982, 1990; Palm et al., 1983; [Palm and Hodgson, 1992](#)). The potential buyer needs to learn about hazard conditions during information gathering and evaluation of properties. Ideally, notification should occur when the purchaser begins evaluation of the properties available for purchase (not during preparation of or just prior to execution of a contract to purchase, because the purchaser becomes committed to making an offer without the opportunity to fully consider hazard conditions).

The purchaser also must understand the notification message (Palm, 1982). Notification should clearly and firmly describe hazard conditions and their potential impact on property. The notification message should also be in sufficient detail so the purchaser understands its content.

Perceptions created by real estate professionals (e.g., lenders, real estate agents and brokers, and attorneys) strongly influence buyer perceptions about the seriousness of hazard conditions on property. If professionals downplay the importance of disclosure, it is given less credence by the purchaser. Prior studies show that real estate agents have not been effective in conveying the hazards message because of

their lack of understanding about hazard conditions. Studies also suggest that education of financial institution executives about hazards influences their decisions about the wisdom of lending for development in hazard areas (Palm, 1990).

## State Notification Programs

South Carolina and Texas have adopted coastal hazards notification requirements. California's earthquake fault zones hazard notification requirement is also of interest, even though not a coastal hazards program, because it is the most comprehensive and longstanding hazards notification program in the nation. Table 1 outlines the general features of each of these programs.

For the past 25 years, California's Alquist-Priolo Earthquake Fault Zoning Act has required notification to potential purchasers of property located in earthquake fault zones (properties within 0.25 mile of an earthquake fault trace) about the potential hazard conditions of the property (Section 2621.9, California Public Resources Code). The state maps the location of these zones and makes the maps available to the public. The original legislation was general about what was required to be disclosed other than that the property was located in an earthquake fault zone. During implementation, the general nature of the notification provision was identified as a problem.

In the 1980s and 1990s, the legislation was amended to address these concerns. Statutory language was added to specify how disclosure should be provided. A manual on earthquake fault zone disclosure was prepared, and a model contract addendum was designed for disclosure purposes. In 1991, the state initiated additional efforts to provide better and more detailed information about hazard conditions to purchasers both inside and outside the earthquake fault zones before they bought homes built before 1960 (California Seismic Commission, 1992) or commercial buildings constructed prior to 1975 before the state's modern building requirements were in effect (California Seismic Commission, 1993).

South Carolina's Coastal Tidelands and Wetlands chapter requires notification to potential purchasers of property affected by the state's coastal baseline and coastal setback regulations. Notification is provided through a disclosure statement that the property may be affected by the baseline or setback regulations as well as disclosure of the local erosion rate of the property. A model disclosure form has been prepared by the state and distributed to real estate professionals in the coastal area, and a set of orthophoto maps of the state's coastal baseline is available to property owners who need to determine whether these lines affect their property (B. Eisler, 1997, personal communication). However, disclosure occurs fairly late in the purchase process, because the disclosure statement is required to be part of a contract for sale or transfer of property (Section 48-39-330, South Carolina Statutes).

TABLE 1. States with notification requirements.

State Programs	Hazard/Location	Program Parameters	Results
California: Alquist-Priolo Earthquake Fault Zone Act	Earthquakes	Mandatory program Agent/seller notification Maps affected properties Residential and commercial Notification prior to signing of real estate agreement Standard form notification State and private enforcement	Notification to purchasers, but general in nature, with minimal effect on purchaser decisions
South Carolina: Coastal Tidelands and Wetlands chapter	Ocean-related hazards Flooding	Mandatory program Seller notification Uses definitions to identify affected properties; orthophoto maps provided All type of property Notification prior to signing real estate agreement Notification form provided Private enforcement	Notification provided; program appears to fulfill its purpose
Texas: Notification to buyers of property seaward of the Gulf Intracoastal Waterway (Natural Resources Code)	General beachfront and barrier island	Mandatory program Seller notification Uses definitions to identify affected properties All types of property Notification prior to signing real estate agreement No standard form State and private enforcement	Notification provided; program appears to fulfill its purpose
Massachusetts: Notification to buyers of property in the 100- year floodplain or special flood hazard area (proposed bill; not enacted)	Coastal flooding	Mandatory program Seller/agent notification Uses maps and definitions to identify affected properties All types of property Notification prior to signing of real estate agreement Standard form State and private enforcement	Not applicable; bill did not pass

Texas adopted statewide legislation requiring persons who sell property located seaward of the Gulf Intracoastal Waterway to provide specific notification to potential purchasers that the property is located in a coastal area, that it might be contiguous to the public easement that runs along the Texas coast, and that no structures can be built in the public easement (Section 61.025[a], Texas Natural Resources Code). The underlying purpose of notification is to protect the public's access to the Texas coast. As in the South Carolina law, notification required by the Texas statute occurs fairly late, in the agreement to sell. Strong enforcement provisions are included both for the state and for private parties.<sup>2</sup>

The Massachusetts legislature considered a coastal hazards notification provision during both its 1997 and 1998 legislative

sessions. The bill would have required sellers of property located in the 100-year floodplain of the Massachusetts coastal zone (or in a special flood hazard area if the 100-year floodplain map is unavailable) to notify prospective purchasers in "a reasonable time preceding execution of the purchase and sales agreement" about the location of the property in the 100-year floodplain or in the special flood hazard area (Massachusetts House Bill No. 4263). The proposed legislation also would have required that the purchaser be notified if the property is a repetitive loss structure and, where applicable, of the history of erosion and the average annual rate of erosion of the shoreline. Remedies for failure to comply with the notification provision were strong.<sup>3</sup> However, the bill did not receive sufficient support to pass (M. Malloy, 1997, personal communication).

<sup>2</sup>Failure to include the notification in the agreement to purchase provides the purchaser grounds to terminate the contract and a right to recover any earnest money (Texas Natural Resources Code, Section 61.025[b]). Failure to provide notification prior to closing is also considered a deceptive act under the state's business and commerce code, providing the purchaser and the state additional civil penalties against the seller (Texas Natural Resources Code, Section 61.025[d]).

<sup>3</sup>Failure to notify results in rescission of the sale agreement, without penalty, and receipt of any deposit paid. In addition, failure to comply with the notification requirement exposes seller or seller's agent to "damages caused by such failure." Finally, violation also subjects persons engaged in commerce or trade (the real estate agents) to the legal remedies in the state for "unfair or deceptive act[s] or practice[s]," which allows treble damage awards (Massachusetts H.B. 4263).

## Best Notification Practices

Based upon a review of state experience and literature on hazards notification, five factors appear to influence notification effectiveness: (1) timing and material of the disclosure message; (2) purchaser understanding of the notification message; (3) perceptions of the professionals involved in the purchase decision; (4) availability of adequate data to implement the program; and (5) strong enforcement provisions.

Recommended best practices in the design of a coastal hazards notification program need to be framed around these factors:

- Provide notification as early as reasonably possible, ideally when the purchaser begins to evaluate properties available for purchase.
- Notification should be clear and direct, identifying the nature of hazard conditions and their potential impact on property, and be provided in sufficient detail for the purchaser to understand its content. Model disclosure statements and manuals that explain hazards in layman's language also should be distributed to the public.
- Professionals involved in the notification process (e.g., lenders, real estate agents and brokers, and attorneys) should be educated about the meaning and importance of the notification through educational materials and seminars.
- Sufficient data should be made available to the public, including maps or other forms of information identifying lands subject to hazards, so that the program can be easily and efficiently administered.
- Enforcement provisions should be strong, clear, and easy to enforce. They should (1) allow for rescission of the agreement without penalty and return of the deposit for failure to adequately notify; (2) subject professionals involved in the process to liability for damages when they fail to notify; and (3) subject the notification requirements to the state's unfair and deceptive trade laws.

## RESTRICTING PUBLIC SUBSIDIES IN COASTAL HAZARD AVOIDING

For decades, the federal government has encouraged private development in coastal hazard areas, particularly vulnerable coastal barrier islands, through financial assistance for the construction of highways and bridges, water supply and wastewater treatment facilities, and beach stabilization projects as well as through disaster relief and flood insurance. Similarly, state and local governments have facilitated development in coastal hazard areas through cost sharing of infrastructure projects and through land use policies.

These public subsidies perpetuate an unending cycle of subsidized development, destruction, and subsidized redevelopment. After a major coastal storm or hurricane sweeps across a coastal barrier, damaging or destroying develop-

ment subsidized by government, federal disaster relief helps rebuild the damaged properties and public infrastructure. By reducing market influences on buyer behavior, public subsidies can discourage sound economic decisions by artificially lowering the cost of developing property and creating a market bias in favor of development and against preservation of property in its natural state (Kuehn, 1984).

In response to this vicious cycle, some states and the federal government have withdrawn subsidies that encourage private development in designated coastal hazard areas. If government subsidies are withdrawn, the costs for development will reflect the true development costs, requiring developers and buyers, rather than taxpayers, to bear the entire risk and cost of private development.

## Subsidy Restriction Programs

The most well-known example of the restriction of public subsidies, sometimes called the expenditure limitation approach, is the Coastal Barrier Resources Act (CBRA) of 1982, which prohibits federal expenditures for infrastructure, such as roads and bridges, as well as federal flood insurance in coastal barriers designated under the act. CBRA's goals are to save lives, reduce federal spending, and protect natural resources. The philosophy behind CBRA is that the risk associated with new development in areas that have been identified as high risk, damage-prone areas in which to build should not be borne by the American taxpayer. Congress initially designated 186 CBRA units, comprising ~453,000 acres along the Atlantic and Gulf coasts. The units range from small, isolated shoals of sand scarcely above sea level to chains of islands stretching hundreds of miles. These designated units comprise the Coastal Barrier Resource System (CBRS). In 1990, Congress expanded the system to 560 units.

A number of states also limit the expenditure of public funds in hazard-prone areas of the coast. Florida and Massachusetts initially developed expenditure limitation policies through executive orders and subsequently through legislation. Other states rely on their coastal zone policies to curtail public expenditures in coastal hazard areas (see Table 2).

Florida prohibits the construction of bridges to coastal barriers that are not currently accessible by bridge (originally through Executive Order 81-105 and now through Coastal Infrastructure Policy, Chapter 380.27, Florida Statutes)<sup>4</sup> and requires local governments to adopt comprehensive plans that include policies limiting public expenditures that subsidize development in coastal high-hazard areas

<sup>4</sup>Executive Order 81-105 directs state agencies to give coastal barriers high priority in land acquisition programs, to not use state funds and federal grants to subsidize growth or postdisaster redevelopment in hazardous coastal barrier areas, and to encourage growth management to ensure that population and property in coastal barrier areas are consistent with evacuation capabilities and hazard mitigation standards. Chapter 380.27, Coastal Infrastructure Policy, states that no state funds shall be used to construct bridges or causeways to coastal barriers not accessible in 1985, that no state funds will be expended for projects that increase infrastructure capacity unless consistent with the local government approved coastal management element in the comprehensive plan, and that an annual report shall assess the effectiveness of the policy on growth and development.

**TABLE 2.** Subsidy restriction programs for selected coastal states.

State Programs	Program Characteristics	Results
Connecticut: Coastal Management Act	Restricts extension of water and sewer to developed and undeveloped barrier islands.	Administered by local land use boards; policy rarely, if ever, implemented.
Florida: EO <sup>a</sup> 81-105 Coastal Infrastructure Policy Local Government Comprehensive Planning and Land Development Act	Local governments required to adopt comprehensive plans that include policies to restrict public expenditures for infrastructure in coastal high-hazard areas.	Most counties have complied with state planning requirements; local plan policies restrict public spending in high-hazard areas; local policies appear effective.
Maine: Coastal Barrier Resources System	Mimics federal CBRA; prohibits use of state or federal funds for infrastructure in designated coastal areas.	No lead agency identified; implementation appears weak or nonexistent.
Massachusetts: EO 181 and Coastal Zone Management Act	EO prohibits use of federal or state funds for projects that promote growth in hazard-prone areas of barrier beaches; coastal policy also restricts public funds for water and sewer	EO administered by state Coastal Zone Management office; the order and Coastal Zone Management policies appear effective in limiting public funds, especially for water and sewer, although administration is weak
Rhode Island: Coastal Management Program	Coastal barriers divided into three categories: undeveloped, moderately developed, and developed, with different restrictions on development for each	Policies very effective at limiting development on undeveloped and moderately developed barriers; less effective on developed barriers
Texas: Coastal Management Program	State agency to consider impacts to barriers when reviewing applications for special utility districts	Program is new and untested

<sup>a</sup>EO, Executive Order.

(Rule 9.J-5.012, Florida Administrative Code). Massachusetts uses coastal zone management policies to limit public expenditures on barrier beaches. Connecticut relies on its control over the location of water and sewer extensions to steer development away from coastal barriers and toward areas that can more readily accommodate additional development. Maine expressly prohibits the use of state funds in designated coastal areas for construction of roads, airports, boat landings, bridges, causeways, or erosion control measures (38 Maine Revised Statutes Annotated Section 1901). Rhode Island prohibits the construction or expansion of new infrastructure or utilities, including water, gas, and sewer lines, on all barriers. Adopted in 1996, the Texas coastal management zone program requires the state, when creating or approving bonds for special utility districts in CBRA areas, to consider the impacts of development in such areas.

Without supporting policies, however, the effectiveness of state and federal programs that restrict public subsidies in specified coastal areas is limited. In the 1980s, Florida officials denied funds to expand a bridge to Hutchinson Island after the Florida Department of Transportation determined that financial assistance would violate the intent of Executive Order 81-105, yet recent decisions by local governments have encouraged development on Hutchinson Island (Salvesen and Godschalk, 1998).

In addition, many state programs have not been tested. Rhode Island's policies restricting state spending on coastal barriers is perhaps the most strict, at least on paper. However, most of the coastal barriers that are not already developed are in public ownership. Similarly, Connecticut's program has rarely been tested, primarily because there are few undeveloped barrier beaches in Connecticut. Like Rhode Island, Maine's Coastal Barrier Resources System legislation also is strict regarding the use of public funds for roads, bridges, and airports in designated coastal areas. Yet, there seems to be little or no implementation of the law. State coastal officials contacted were unaware of the law's existence. Finally, the Texas coastal zone management program is still too new to draw lessons from.

At the federal level, the majority of CBRS units have remained largely undeveloped. However, most CBRS units are remote and relatively inaccessible by automobile, and others contain primarily wetlands and would be difficult to develop or are in public ownership and are off-limits to development. Meanwhile, a substantial amount of development has occurred on at least 12 units in the CBRS, raising questions about the effectiveness of a policy that relies on disincentives alone to control land use (Salvesen and Godschalk, 1998).

CBRA's weakness lies in its lack of a strong administrative framework plus the presence of several loopholes. Con-

gress designated the Department of Interior, U.S. Fish and Wildlife Service (USFWS), as the lead administrative agency. Yet, federal agencies only have to consult with the USFWS to determine whether a proposed project violates CBRA. Agencies can then ignore the advice of the USFWS, as happened with the Department of Transportation's reconstruction of Highway 87 in Texas after Hurricane Alicia, even though the road already had been destroyed three times by coastal storms. USFWS has no veto power over agency decisions (Jones, 1991).

### Best Subsidy Restrictions Practices

The chief attractiveness of the subsidy restriction approach is that it is a nonregulatory tool relying on market forces rather than government regulations to discourage development in high hazard areas of the coast. This is also its greatest weakness. Development can still occur in areas subject to the subsidy limitation. Thus, the technique may delay or inhibit development in designated areas but will not necessarily prevent it.

Even though an important component of hazard mitigation programs, state restrictions on public expenditures in coastal hazard areas are not likely to be effective without supporting policies. To make a difference, subsidy restrictions should be allied with coastal management programs for acquisition, notification, zoning, beach and dune setbacks, and wetlands protection.

Best subsidy restriction practices include:

- Identify coastal hazard areas that are (1) relatively undeveloped, such as coastal barrier islands with limited access, where expenditure limitations can have an effect in constraining future development; and (2) subject to repeated damage, such as repetitively damaged structures, where expenditure limitations can prevent unwise redevelopment.
- Formulate expenditure limitation policies that limit future development-inducing public subsidies for infrastructure and facilities both for relatively undeveloped areas and for postdisaster areas where redevelopment may not be the most desirable policy.
- Couple expenditure limitation policies with other hazard mitigation policies, such as acquisition of hazard areas and land use and environmental policies to strengthen the cumulative hazard mitigation effects.

## HAZARD AREAS ACQUISITION

The acquisition of hazard areas as an option for floodplain management and hazard mitigation has been discussed in the literature and in various policy guidebooks since at least the late 1970s (e.g., see Kusler, 1979; Field and Associates, Inc., 1981; Handmer, 1985; Burby and Kaiser, 1986; Association of State Floodplain Managers, 1995; FEMA,

1997; [Godschalk et al., 1999](#)). These sources point out that hazard areas acquisition has both advantages and disadvantages and that different states have tailored programs to meet their own hazard mitigation needs using similar key program components.

Researchers consistently identify two principal advantages of acquisition as compared to other hazard mitigation options such as land use regulation. First, acquisition offers a way to permanently reduce or eliminate susceptibility to flood damage in the highest risk areas at the lowest cost over the long term (Field and Associates, Inc., 1981; Association of State Floodplain Managers, 1995). Although states and localities cannot afford and do not want to acquire entire floodplains for mitigation purposes, properties subject to frequent and severe flood, wave, or wind action (e.g., coastal V zones or high erosion inlet zones) are strong candidates for acquisition because it is less expensive and less life threatening in the long run to acquire such properties and remove them from development rather than pay repeatedly for disaster relief following storm events. Second, acquisition can facilitate other important hazard mitigation goals, such as increasing floodplain storage capacity, as well as environmental protection and community goals such as the preservation of ecologically important wetlands, maritime forest, estuarine ecosystems, and beachfront areas and the provision of open space areas, parks, and public beach access (Field and Associates, Inc., 1981; Burby and Kaiser, 1986; Association of State Floodplain Managers, 1995).

At the same time, acquisition programs pose real disadvantages. Chief among these is that such programs can impose substantial short-term costs for acquisition itself and, to a lesser extent, long-term costs in the form of maintenance expenses, liability, and foregone local property tax revenues (Field and Associates, Inc., 1981; S. Jandoli, 1997, personal communication). In addition, successfully implementing an acquisition program requires identifying and coordinating a complex set of funding sources and mitigation incentives and, frequently, overcoming landowner objections (Field and Associates, Inc., 1981; Burby and Kaiser, 1986; Association of State Floodplain Managers, 1995).

The Association of State Floodplain Managers (1995) has identified 22 states that employ acquisition programs specifically for hazard mitigation purposes in flood prone or other high hazard locations. Thirteen of these 22 states use dedicated funds for direct state acquisition or for local acquisition. A number of these states, as well as the remaining nine states, also help local governments obtain federal postdisaster funds, including primarily FEMA Section 404 (or Stafford Act) Hazard Mitigation Grant Program (HMGP) funds.

### State Hazard Area Acquisition Programs

Table 3 summarizes the principal program components of three Atlantic coastal states that have substantial coastal

**TABLE 3.** Acquisition programs for selected Atlantic coastal states

State Program	Program Characteristics	Results
Florida: Conservation and Recreation Lands Program adopted 1974	Comprehensive program for acquisition of a variety of conservation and recreation programs Coastal hazard mitigation has been a principal emphasis of the program State funds come in part from documentary stamp and phosphate severance tax revenues	Since 1974, Florida has spent nearly \$1.2 billion to acquire nearly 630,000 acres of lands for conservation purposes, including coastal hazard mitigation
New Jersey: Coastal Blue Acres Program adopted 1995	Pre-storm acquisition of undeveloped, high-hazard coastal areas and post-storm acquisition of damaged areas State funding comes from general obligation bonds Localities purchase and manage land as open space	No poststorm acquisitions have been made New Jersey recently appropriated \$5 million for pre-storm acquisition of ~60 acres in nine different projects across seven counties
Maryland: Flood Plain Management Program adopted 1976	Pre-storm acquisition of flood hazard lands, including coastal areas, and poststorm acquisition of damaged areas State funding, provided primarily in conjunction with HMGP funds, comes from general obligation bonds and the state's open space program Localities purchase and manage land as open space	Since the early 1980s, the state has facilitated local acquisition of 400 separate properties for hazard mitigation

hazard areas acquisition programs—Florida, New Jersey, and Maryland. State acquisition efforts typically include the acquisition of property in hazardous or repetitively flooded areas, the demolition of existing structures, and the permanent dedication of the acquired land to some type of open space use, usually nature preserve or beach access. The precision with which states define and delimit areas for acquisition varies somewhat, although the focus generally is on areas that have suffered substantial damage following a major storm event, areas that have suffered cumulatively substantial damage from smaller repetitive events, or some combination of the two.

The efforts of these states also vary somewhat with regard to funding mechanisms and the disposition of acquired land. New Jersey, for example, uses state appropriations on a state–local cost-share basis for the local acquisition of properties (New Jersey Department of Environmental Protection, 1997; S. Jandoli, 1997, personal communication). Maryland primarily uses state appropriations to augment federal HMGP funding for the local acquisition of properties (Association of State Floodplain Managers 1995; W. Parrish 1997, personal communication). In both of these states, the localities own and manage the land following acquisition with the mandate that the land be maintained in a manner consistent with hazard mitigation. Florida, in contrast, uses several funding sources under its Conservation and Recreation Lands program, including documentary stamp and phosphate severance tax revenues, to acquire and manage lands itself for a variety of conservation and preservation purposes, one of which is hazard mitigation (Florida Department of Environmental Protection, 1997).

Despite these differences, the Florida, New Jersey, and Maryland programs share notable similarities. Specifically,

all three states rely primarily if not exclusively on voluntary acquisitions rather than the power of eminent domain, all three use valuation processes designed to ensure that property owners receive fair market values for acquired lands, and all three employ competitive selection processes for identifying the highest priority sites for acquisition. Under these selection processes in particular, individual landowners or localities first nominate areas for acquisition and the state then prioritizes properties to be acquired using criteria such as flood repetitiveness, shoreline erosion rates, or reductions in property values from storm damage.<sup>5</sup>

### Best Hazard Area Acquisition Practices

Four key components of successful hazard area acquisition programs can be identified, which should apply to any coastal hazards area acquisition program. First, acquisition efforts should be targeted on only the most hazardous areas, where property is repetitively damaged, lives threatened, and development at extreme risk. To that end, states like New Jersey, Maryland, and others employ a competitive process and articulated criteria to select priority sites (New Jersey Department of Environmental Protection, 1997; W. Parrish, 1997, personal communication).

Second, because most state programs lead to the acquisition and long-term maintenance of the hazards areas by localities, most programs provide for substantial financial

<sup>5</sup>A number of noncoastal states and localities have established similar programs designed expressly for the acquisition of lands in high hazard areas and specifically in high flood hazard areas. Like Maryland, these states and localities have relied primarily on federal HMGP funds to purchase high hazard areas, clear those areas, and dedicate them for floodplain management and public recreation purposes. Prominent examples include Missouri's extensive buy out program created in the wake of the 1993, 1994, and 1995 Midwestern floods (Missouri State Emergency Management Agency, 1995; FEMA, 1997) and efforts undertaken by historically flood-ravaged Tulsa, Oklahoma following the 1984 Memorial Day flood (Patton, 1993; Meshk and Associates, 1994). Other states that have established programs for the acquisition of land in floodplain or other high-hazard areas include, for example, Connecticut, Illinois, Kentucky, Massachusetts, Minnesota, Mississippi, Virginia, and Wisconsin (Association of State Floodplain Managers 1995).

assistance to localities using primarily direct state appropriations. Perhaps more importantly, states also provide assistance to help localities through the complex maze of funding applications (D. W. Owens, 1997, personal communication; T. Murphy, 1997, personal communication) in order to tap into the substantial and largely untapped federal HMGP funds (see Godschalk et al., 1999, chapter 10).

Third, because most state programs rely primarily on voluntary acquisitions rather than eminent domain, state programs undertake multiple land assessments in conducting their negotiations and strive to offer pre-storm fair market values for high priority properties to provide an adequate incentive to sell. Equally important, state officials managing acquisition programs stress that acquisition efforts need to be integrated into a comprehensive mitigation program so that other state policies do not undercut incentives to sell (S. Jandoli, 1997, personal communication; W. Parrish, 1997, personal communication). Such counterproductive policies include, for example, the provision of disaster relief despite a pre-storm failure to participate in the NFIP or the state subsidization of infrastructure repairs that maintain artificially high private property values.

Finally, whether an acquisition program is administered primarily by a state agency or by local governments, it is vital that the state support local acquisition efforts. Necessary support includes technical assistance, public outreach and education, and public participation opportunities generally, all of which provide local governments with the information they need to provide strong local leadership, ensure effective and equitable acquisition efforts, and enhance the political acceptability of the program generally (Field and Associates, Inc., 1981; Handmer, 1985; Burby and Kaiser 1986; Patton, 1993; Missouri State Emergency Management Agency 1995; Florida Department of Environmental Protection 1997; S. Jandoli, 1997, personal communication; D. W. Owens 1997, personal communication).

Based upon this summary of the literature and state experience, best practice recommendations for hazard area acquisition programs include:

- Target acquisition programs on repetitively damaged or extreme-risk developed areas and vulnerable environmental areas (e.g., dunes and wetlands) that offer protection from hazards, particularly those that also can serve as future beach access areas, public recreation areas, or wildlife habitat areas.
- Provide both state financial assistance and state technical assistance to localities to acquire and maintain hazard areas.
- Build adequate incentives into voluntary acquisition programs and coordinate them with related state policies, such as infrastructure expenditure limitations.
- Develop strong ties with local leaders and stakeholders through technical assistance, public education, and pub-

lic participation to build consensus for the need for and desirability of hazard area acquisition programs.

## CONCLUSION ●

Our review of state coastal hazard mitigation programs discovered a number of effective state initiatives. At the same time, it revealed several less effective programs. It is clear that to be very successful in mitigating coastal hazards, states need comprehensive programs that bring together hazard definition, notification, subsidy restriction, and acquisition in an integrated fashion.

There is also a clear need to bring together state and federal programs so that they reinforce each other rather than work at cross purposes. The federal CBRA program has been undercut by state and local government zoning and development subsidies in a number of instances, such as on Hutchinson Island, Florida and Topsail Island, North Carolina (Salvesen and Godschalk, 1998). Yet there are opportunities to coordinate CBRA and the Coastal Zone Management Act, along with the Stafford Disaster Relief and Emergency Assistance Act and the National Environmental Policy Act, with state and local hazard mitigation plans and programs. Together, their accomplishments could be far reaching; separately, they leave much to be desired.

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