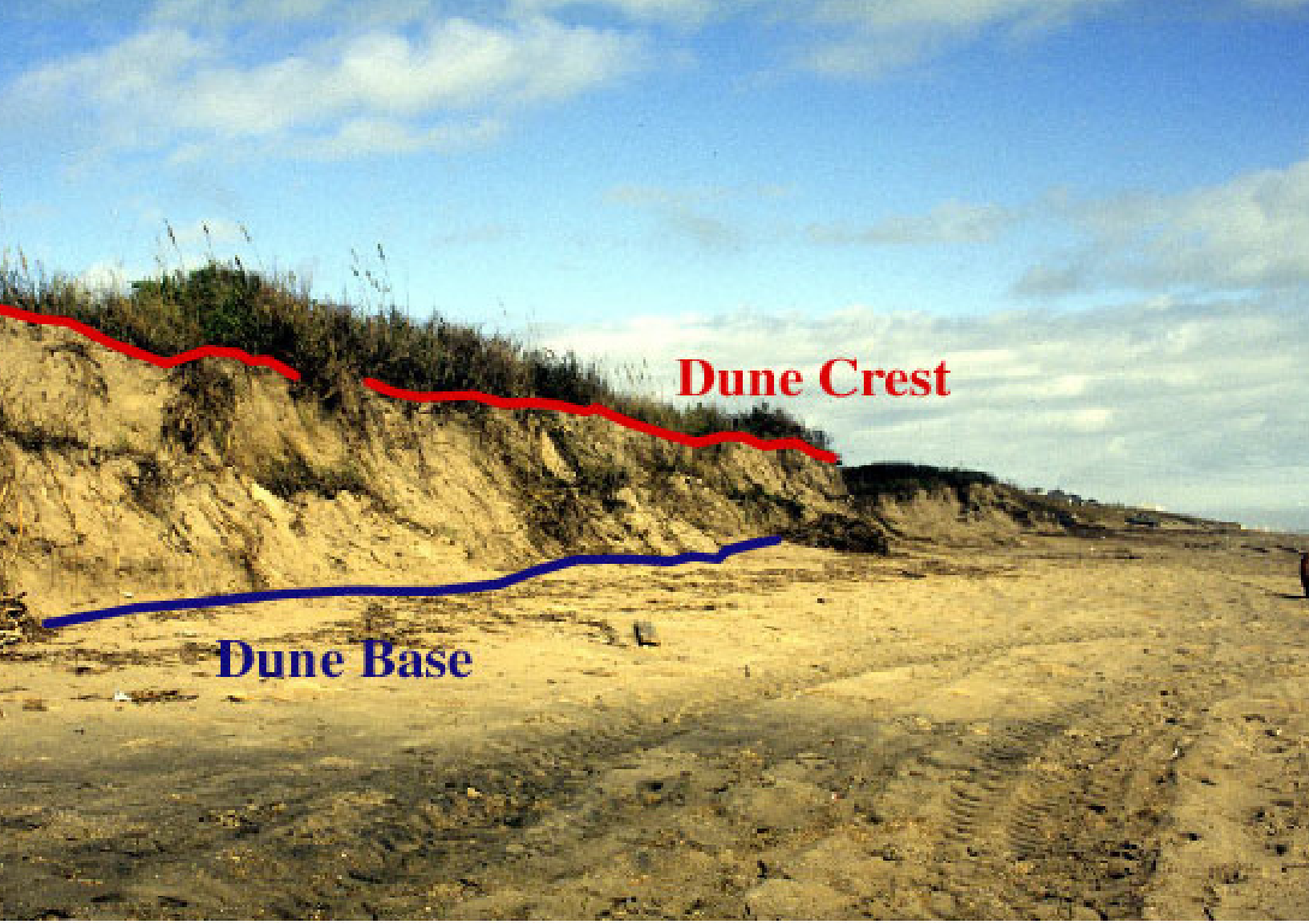

National Flood Insurance Program
Community Rating System

CRS Credit for Management of Coastal Erosion Hazards

2006

FEMA

A community interested in more information on obtaining flood insurance premium credits through the Community Rating System (CRS) should have the *CRS Application*. This and other publications on the CRS are available at no cost from

Flood Publications
NFIP/CRS
P.O. Box 501016
Indianapolis, IN 46250-1016
(317) 848-2898
Fax: (317) 848-3578
NFIPCRS@iso.com

They can also be viewed and downloaded from FEMA's CRS website,
http://training.fema.gov/emiweb/CRS/index.htm

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INTRODUCTION

The Community Rating System (CRS) rewards communities that are doing more than meeting the minimum requirements of the National Flood Insurance Program (NFIP) to help their citizens prevent or reduce flood losses. The CRS also provides an incentive for communities to initiate new flood protection activities. The goal of the CRS is to encourage, by the use of flood insurance premium adjustments, community and state activities beyond those required by the NFIP to

- Reduce flood losses, i.e.,
  - protect public health and safety,
  - reduce damage to buildings and contents,
  - prevent increases in flood damage from new construction,
  - reduce the risk of erosion damage, and
  - protect natural and beneficial floodplain functions.
- Facilitate accurate insurance rating, and
- Promote the awareness of flood insurance.

The CRS includes 18 creditable activities, organized under four categories:

300—Public Information

400—Mapping and Regulations

500—Flood Damage Reduction

600—Flood Preparedness.

Credit points are based on the extent to which an activity advances the three goals of the CRS. Communities are invited to propose alternative approaches to these activities in their applications.

The Federal Emergency Management Agency (FEMA) and many communities in the United States have long recognized that the mapping and regulatory standards of the NFIP do not adequately address all of the flood problems in the country. In particular, a number of "special" flood hazards deserve attention. They include

- Ice jam flooding,
- Flooding adjacent to closed basin lakes,
- Mudflow hazards,
- Flooding affected by land subsidence,
- Uncertain flow path flood hazards,
- Coastal erosion, and
- Tsunamis.

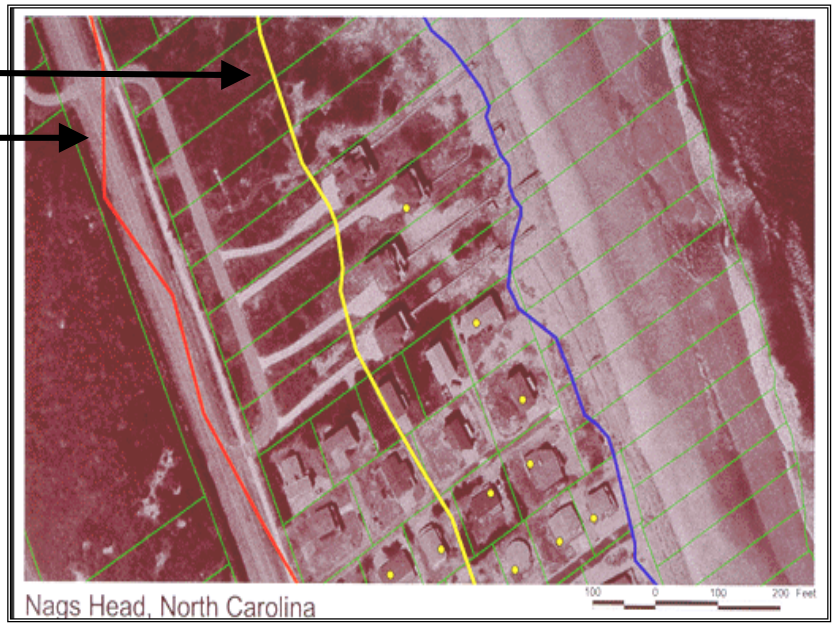
This publication discusses the credits provided by the CRS for mapping and management of coastal erosion hazards. The other hazards are addressed in the publications *Special Hazards Supplement to the CRS Coordinator's Manual* and *CRS Credit for Management of Tsunami Hazards*. Both are supplements to the *CRS Coordinator's Manual*, and include additional Schedule sections and Commentary.

BACKGROUND ON COASTAL EROSION

Coastal populations, development, and infrastructure have increased dramatically since World War II. Within the United States, coastal counties have grown at a rate equal to or greater than the national average. Since the early 1950s, rising incomes, improvements to transportation infrastructure, increased automobile ownership, and more leisure time have made coastal vacationing desirable for a growing proportion of the population. This growth brings heightened potential for a major disaster resulting from the combined effects of hurricane-force winds, coastal flooding, and the erosion of beaches. The potential for major losses exists along all of the nation's major shorelines, including the Atlantic, Pacific, Gulf, and Great Lakes.

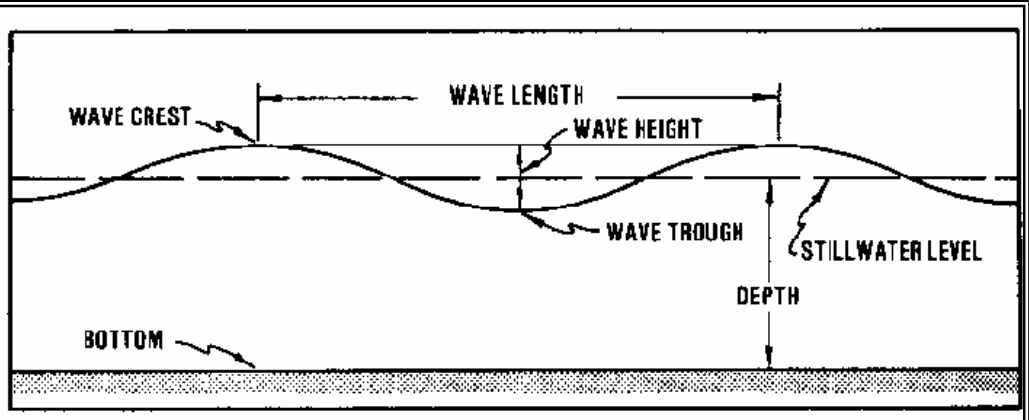
A report by the H. John Heinz III Center for Science, Economics and the Environment, *Evaluation of Erosion Hazards*, estimates that by 2060 approximately 25% of homes (87,500 of 350,000 homes) located within 500 feet of the coast (excluding those in most urban centers) will be damaged or destroyed due to the effects of erosion (H. John Heinz III Center, 2000). According to the report, erosion-induced losses to property owners during that period are expected to be half a billion dollars annually. If coastal development continues at its current rate or if sea level rise accelerates, as some scientists are predicting, the damage may be even greater.

The 30-year (yellow or center line) and 60-year (red or most landward line) areas of expected erosion are shown on the aerial photo of Nags Head, North Carolina (from the H. John Heinz III Center).



Natural Processes

Coastal erosion is a complex physical process shaped by both natural processes and human intervention. Natural factors that influence the erosion process include the sand supply; changes in sea level or the water level in the Great Lakes; geologic characteristics of the shore; the effects of waves, currents, tides, and wind; and the bathymetry of the offshore sea bottom.



Wave length, height, and period affect the direction of sediment transport (U.S. Army Corps of Engineers, 1977, p. 2-8).

Waves are one of the main forces of coastal erosion. Waves move material onto, off, and along the shore depending upon their height, length, period, and the direction at which they strike the shore. For example, when water in the nearshore zone is deep and there is a steeply sloping bottom, waves break closer to the shore and cause more erosion than if the slope of the bottom is gradual with shallow depths immediately offshore. Likewise, short, steep waves generally remove more material from the beach, while longer period waves (swells) tend to place sediment back onto the beach.

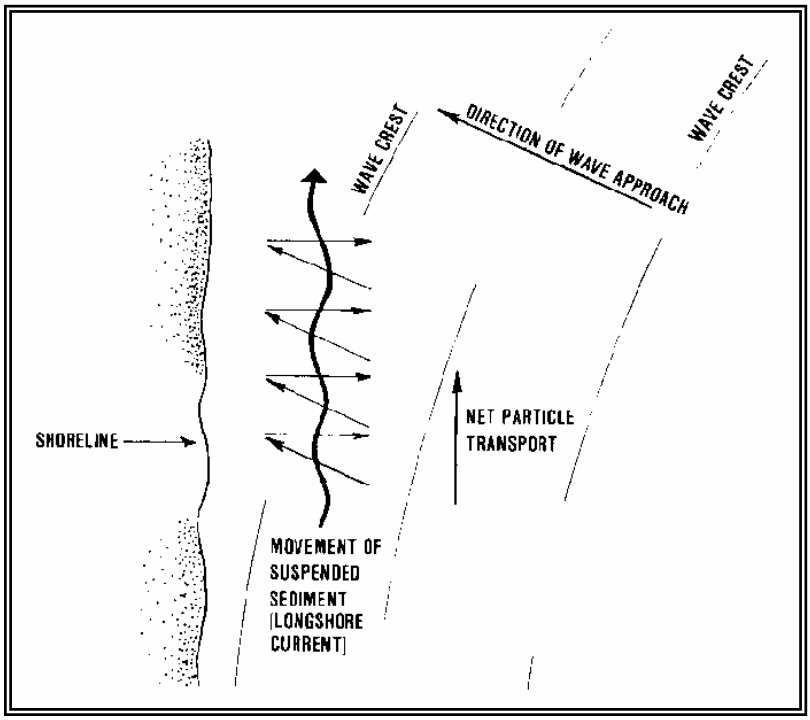
Waves that are generated by the wind are responsible for much of the shoreline erosion. The amount of energy in a wave is dependent on the speed of the wind, the wind's duration and the fetch—the unobstructed distance over the water the wind blows. The greater the speed, duration, and fetch of the wind, the larger the wave that is generated. Large waves contain more energy and thus have a greater ability to erode shoreline materials than do smaller waves. Steep nearshore bottom slopes allow large waves to break on the beach with greater force than do shallow nearshore bottom slopes.

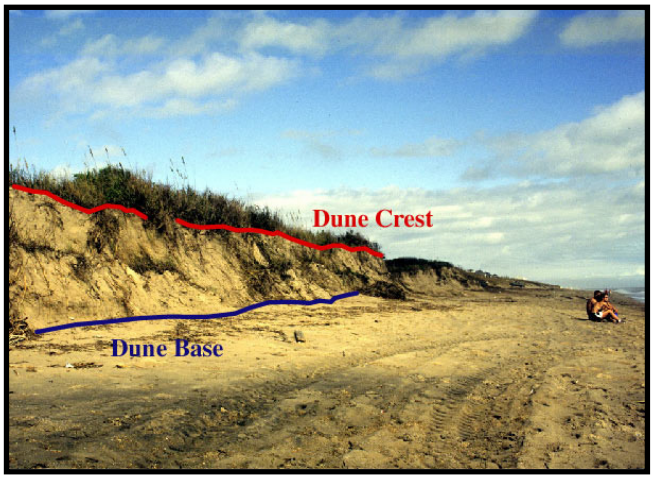
Not only do the berms, bars, and the steepness of the near shore affect the height of an incoming wave, but also their presence can affect erosion rates. Large waves will break on a nearshore bar or in shallow water and dissipate a great amount of energy. Waves that do reach the shore will break on the berm of the beach and dissipate their energy before reaching the base of the dune. But a narrow berm, a steep nearshore slope, and a lack of bars will allow large waves to break directly against the base of the dune. This will result in a greatly increased rate of dune erosion. A beach with a wide berm, a shallow nearshore slope, and nearshore bars will protect the shoreline and dunes by absorbing and dissipating wave energy.

Littoral transport is the movement of material in the nearshore zone by waves and currents—the mechanism that moves beaches. This movement may be parallel to the shore, onshore, or offshore. It is the littoral transport mechanism that causes problems by removing material from where people would like to have it—on the beach—and placing it where they do not want it—in the inlet channel.

Waves and the currents they generate are the primary agents of littoral transport. It is the energy of the waves that picks up the sand and moves it along the shoreline. Breaking waves carry sand onshore and offshore. Most waves strike the shore at an angle and thus set up a longshore current. This moves the sand along the beach in a series of zig-zag patterns as successive waves strike the shoreline. Downdrift is the term that refers to the predominant direction of the littoral transport.

When waves move sediment onto the beach at an angle, the sediment washes back off the beach in a direction parallel to the backwash of the wave (following gravity downhill). This zig-zag movement results in a net longshore current in the direction of the prevailing waves (U.S. Army Corps of Engineers, 1981, p. 7).





The volume of the frontal dune is a key to the level of protection. (Photo from USGS, 1999.)

Levels of Coastal Dune and Beach Erosion

The vulnerability of a barrier island to storm overwash and inundation is determined, in part, by the elevation of the dune crest, the elevation of the base of the dune, and the volume of the dune. When a dune is not present, the vulnerability of the barrier island to overwash is determined, in part, by the elevation and width of the beach berm. The amount of erosion and overwash is also determined by the magnitude of the storm.

Erosion Rates

Erosion rates vary significantly across regions and shoreline types; however, on average the nation's shorelines are receding at an average rate of slightly more than 1 foot per year (Leatherman, 1993). States bordering the Gulf of Mexico have the nation's highest average annual erosion rates (6 feet per year). The average annual erosion rate on the Atlantic coast is roughly 2 to 3 feet per year. But these rates vary greatly from location to location and year to year. They also can vary over short distances because of geology, inlets, and engineered structures. In addition, a major storm can erode the coastal shoreline inland 100 feet or more in a day, only to be followed by accretion over the next decade.

The Pacific coast has a variety of geomorphic characteristics that influence the erosion history of the region. The long-term average annual erosion rates are usually less than 1 foot/year, but these low averages hide the true nature of large, episodic events. Some sections of the coast are rugged mountainous regions with narrow beaches and steep cliffs that are composed of crumbly sedimentary bedrock and are therefore unstable. Where these cliffs are heavily faulted and cracked, the breaks and joints are undermined easily by wave action. In these areas cliff erosion is site-specific and episodic. In some locations, the cliffs can retreat 100 feet during one event, while only 100 feet up or down the coast no retreat occurs at all.

Other areas of the Pacific coast consist of sandy beaches, some with cobbles underneath. The major sand beaches of the Pacific coast are associated with large rivers. The construction of dams, river and stream channelization, and natural events can have a significant impact on the sand supply for these beaches.

The beaches of Southern California may be some of the most modified in the country because of the widespread use of beach nourishment projects. In these areas the long-term trend of erosion has been addressed through beach nourishment, primarily as a by-product of harbor construction and maintenance.

Shore types on Great Lakes coasts include high rock bluffs, low-lying clay and gravel bluffs, sandy bluff-backed beaches, low plains, and wetlands. The rates of bluff and dune erosion vary from near zero to tens of feet per year because of annual variability in wave conditions and lake levels.

Although sediment supply and coastal storms are important factors affecting shoreline erosion, sea level rise is perhaps the dominant process determining the rate of shoreline movement and position (Zhang et al., 1997). The global average for sea level rise has been about 1.0 to 2.5 millimeters per year during the last century (Douglas, 1995). The average rise along the Atlantic coast is approximately 1 foot per century.

Such areas as Louisiana, however, are experiencing higher than average rates of sea level rise because of subsidence caused by natural processes and human activities (e.g., pumping of oil, gas, and groundwater). Absent protective measures (e.g., beach nourishment), the combination of changes in the sediment supply, coastal storms, and sea level rise increases the rate of shoreline retreat.

Dunes and Beaches

The impact of a storm on a coastal community is dependent not only on the magnitude of the storm characteristics, such as storm surge and waves, but also on the elevation of the beach and protective dunes.

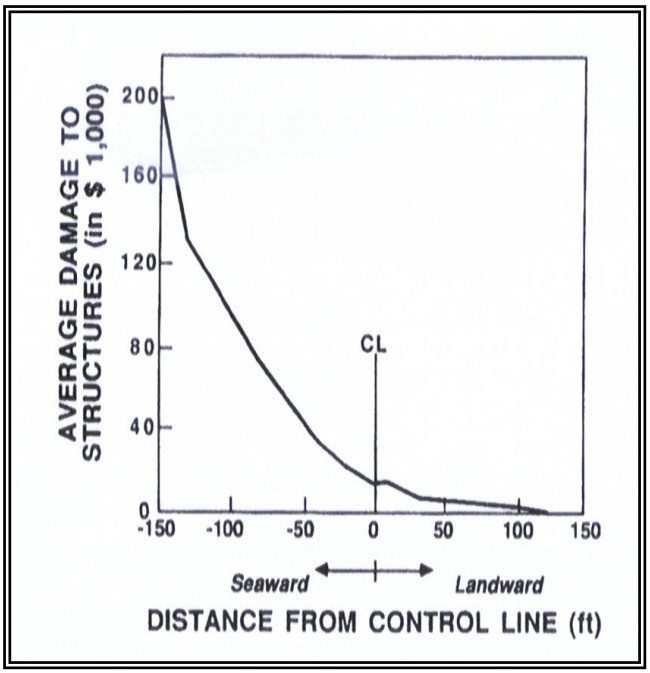
Coastal dunes and beaches provide protection to inland development. They are the barriers that break up waves and dissipate the effects of hurricanes and coastal storms. Their preservation is important to protect property from damage and destruction by coastal flooding.

The photographs below were taken at North Topsail Beach, North Carolina, before and after Hurricane Fran. They show an area where there was wave runup on the dune system and significant dune retreat. The volume of sand along the beach and dune system, along with the building setback, resulted in lower flood losses for these homes.

Before Hurricane Fran, July 1996 After Hurricane Fran, September 1996.
(Photos from USGS.)

Coastal erosion and flooding are related processes that can increase the risk of damage to structures. Once the coastline has shifted inland, flood elevations for the same magnitude storm will be higher farther inland and thus can cause more damage. Houses constructed in lower-risk A Zones with less stringent building codes may be subjected to waves of V-Zone intensity as the shoreline moves inland. A structure originally built in compliance with A-Zone standards at a base flood elevation of 13 feet might, after a period of erosion, be located within a V Zone with a base flood elevation of 15 feet. Now, waves and storm surge can be of sufficient magnitude to destroy a house that might otherwise have survived had it been constructed to meet the more stringent V-Zone standards.

The importance of a wide beach in reducing the damage to structures from hurricanes and tropical storms is widely recognized. After Hurricane Eloise struck Florida in 1975, a survey to quantify the benefit of beach width on storm damage reduction was undertaken in Bay County, Florida. As part of the study, 540 buildings were surveyed to determine the extent of damage and the relative position of each to a jurisdictional control line, generally parallel to the shoreline (Shows, 1978). The survey results illustrated in the graph show the structural damage caused by Eloise as a function of the proximity of structures to the jurisdictional control line.



Damage to structures is based on their relationship to the jurisdictional control line (Shows, 1978, p. 159).

This is an extreme case of localized scour that occurred during Hurricane Fran in 1996, undermining a slab-on-grade house on Topsail Island, North Carolina. The lot was several hundred feet from the shoreline and mapped as an A Zone on the Flood Insurance Rate Map before the storm. This case provides one argument for the treatment of these areas as coastal A Zones (Federal Emergency Management Agency, 2000a, p. 7-52).

Present-day beach and dune topography alone should not be used to determine whether dune retreat or dune removal would occur at a site. The most landward shoreline and beach/dune profile expected over the lifetime of a building or development should be calculated and used as the basis for decisions. The most landward shoreline should be based on long-term erosion and observed shoreline fluctuations at the site.

Siting and design should include consideration of multiple storms or hazards within a short period, whose cumulative effects can exceed those of a design-level event. (Federal Emergency Management Agency, 2000a, p. 5-17).

Finally, dune erosion calculations at a site should also take dune condition into account. A dune that is not covered by well-established vegetation (i.e., vegetation that has been in place for two or more growing seasons) will be more vulnerable to wind and flood damage than one with well-established vegetation. A dune crossed by a road or pedestrian path will offer a weak point that storm waves and flooding will exploit. Post-storm damage inspections frequently show that dunes are breached at these weak points and that the structures landward of them are more vulnerable to erosion and flood damage.

CRS CREDIT

The hazards associated with coastal erosion must be dealt with at the community level, using all of the tools used in conventional floodplain management. Under the CRS, these tools are organized under four general series of credited activities:

- Informing the public and specific populations about the hazards (300 series),
- Mapping and regulation of the hazard areas with recognition of the unique problems associated with the hazards (400 series),
- Special structural and nonstructural efforts to solve existing problems (500 series), and
- Special emergency preparedness efforts that recognize the particular problems associated with these hazards (600 series).

This section reviews the proven mitigation measures for coastal erosion hazards addressed in this publication. In some cases, CRS credit is provided for an activity in the *CRS Coordinator's Manual*. In other cases, particularly in the 400 series, special credit is provided in this publication. For those credits, this document is a supplement to the Schedule and Commentary in the *CRS Coordinator's Manual* and the same formatting is used. The special hazard credit points calculated with this publication are added to the regular credit points in the *Coordinator's Manual*.

A community's coastal erosion management program may include activities that are not eligible for CRS credit. For example, local post-disaster recovery and mitigation policies might require that damaged areas be redeveloped with new street patterns to accommodate the clustering of structures away from the high hazard area.

300 Public Information Activities

People living on the coast usually do not start worrying about erosion until their property or homes are visibly threatened. At that point, their choices are more limited than they would have been if erosion had been considered before the building was located on the site.

Because the flood hazards associated with the special hazards are different from "normal" flood hazards, there are special needs for public education. Property owners and developers must be made aware of the hazards and the methods needed to mitigate them.

A sustained public outreach program is needed to inform coastal populations about coastal preparedness and mitigation. Such a program should encourage information that is consistent between local government and the community at risk. Innovative approaches should be encouraged at many different levels.

There are several ways to provide this information, including

- Newsletter and newspaper articles,

- Signs posted in the hazardous areas,
- Brochures and booklets on the hazards and what can be done,
- Evacuation maps,
- Booths at shopping malls,
- Presentations to civic associations or neighborhood groups,
- Providing information on the location and severity of the hazard areas to inquirers,
- Putting references on the hazards and appropriate protection measures in the public library and on local websites, and
- Providing technical assistance to property owners.

Communities can use brochures, single-page instructions, periodic warning system tests, electronic and print media information, signs, and emergency response exercises to maintain awareness and instill effective response behavior. Some of this information should be directed towards special institutions, such as schools, hospitals, and convalescent-care facilities, and non-English speaking community members. Because of seasonal tourism, many coastal communities and groups provide information especially for tourists.

310 Elevation Certificates

FEMA elevation certificates, which are required for the purchase of NFIP flood insurance, and which must be maintained by CRS communities, MUST be based upon the current FIRM for the community, and they must be completed using the flood information from the FIRM and the corresponding Flood Insurance Study. There is no requirement to maintain elevation certificates outside the Special Flood Hazard Area (SFHA).

This means that if a community has mapped areas with coastal hazards, and it is regulating areas outside the SFHA and/or its regulatory flood elevation is higher than that shown on the FIRM, everyone must still use the data from the FIRM for the purpose of filling out the elevation certificate.

320 Map Information

Many communities provide inquirers with flood information from their Flood Insurance Study and FIRM. Some use this opportunity to explain local regulations, including their coastal erosion hazards and erosion management requirements. This provides the inquirers with a more complete picture of their coastal hazard and the importance of regulations as property protection measures. Notifying people that they are in flood and coastal erosion hazard areas can also motivate them to purchase flood insurance and/or undertake property protection measures.

Providing information from the community's Flood Insurance Rate Map (FIRM) provides many benefits to residents; businesses; real estate and insurance agents;

lenders; and those interested in purchasing, developing, or repairing property. CRS credit is provided for advertising this service and for providing information as described in the *CRS Coordinator's Manual* under Activity 320.

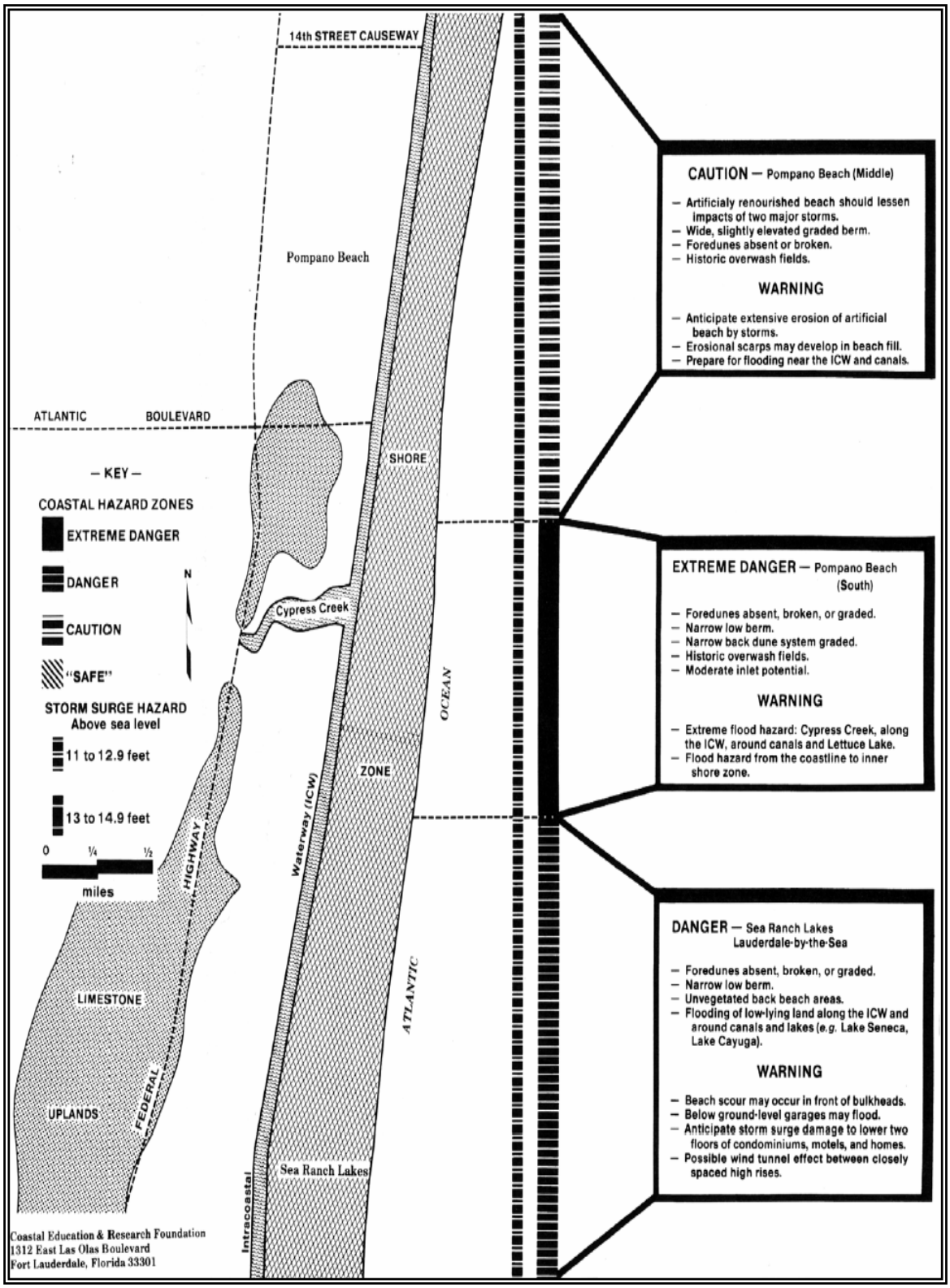
If the community is receiving CRS credit for mapping and regulating its coastal erosion hazard, the map information service must include telling inquirers if the property in question is mapped as an erosion hazard area. The community must also disclose any erosion hazard regulatory requirements for developing the property. This can help property owners and potential buyers better understand the natural hazards risks of a particular location. Understanding these risks can help property owners and builders identify and evaluate potential property protection measures.

> Broward County, Florida has compiled coastal hazard maps like the example shown on the next page that are available to the public. The maps are part of an overall coastal hazard assessment that includes information on coastal landforms, hurricane hazards, hydrologic conditions, shoreline erosion, and emergency planning. The County uses these maps to inform inquirers about coastal hazards, applicable regulations, and protection measures.

330 Outreach Projects

This activity provides credit for newsletters, mailings, presentations, booths, brochures, and a host of other means of getting the word out to the public or to target audiences, such as builders or school children. Credit for some of the elements is based on covering topics such as "flood hazard," "flood hazard map," "flood safety," and "property protection." These topics should include information on the coastal erosion hazards, in addition to the flood hazard mapped on the FIRM.

One of the elements in Activity 330 provides 100 points for developing and implementing a public information program strategy. The community identifies its most important public information needs and identifies the best way to meet those needs. The strategy could focus on coastal erosion, if the strategy team determines that that is as important as or even more important than "normal" flooding. The full credit of 100 points would still be provided.



The Broward County, Florida, Coastal Hazard Map shows storm surge and areas of erosion hazard (from Federal Emergency Management Agency, 2000a, p. G-18).

340 Flood Hazard Disclosure

The CRS provides credit when real estate agents disclose information about a property's flood hazard to prospective buyers. More credit is provided if the disclosure includes other hazards, such as coastal erosion hazards. State or local mandates that sellers, landlords, or developers disclose these hazards can receive credit. If real estate agents do not actually disclose a property's hazards, but provide a handout advising potential property buyers about what to look for and what questions to ask, additional points are provided.

When a property is subject to a hazard, some states require sellers and real estate agents to provide potential buyers with a notification of the hazard within a reasonable time before the purchase of the property. The notification may include educational materials and disclosure forms to ensure that those involved in the real estate transaction understand the issues relevant to coastal hazards.

South Carolina, Massachusetts, Florida, Texas, and Ohio are among a growing number of states that have instituted notification or disclosure laws. These provisions are based on the rationale that flood history, erosion risk, or other hazard exposure information about a particular building or property is relevant to an informed purchase or development. These states require that this information be made available to a potential buyer or developer in a timely and understandable manner.

> South Carolina's ocean-related hazard and flooding notification requirement is established in the state's Coastal Tidelands and Wetlands Act. The seller of a coastal property must notify a potential buyer of the ocean-related hazards before a real estate agreement is signed. The properties and locations affected are determined on the basis of definitions provided in the law.

350 Flood Protection Information

Under Activity 350, communities receive credit for putting flood protection information in their public libraries and on their websites. These materials should cover all known flood-related hazards, including coastal erosion hazards and property protection measures. Additional credit points are specifically provided if the library has references on coastal erosion hazards provided they are present in the community. This CRS supplement can be cataloged in the library to receive that credit.

The community or the librarian should also review the references at the end of this supplement to identify additional documents that would be helpful locally. Some of the websites mentioned in this supplement could also be good links for the community's website coverage of its coastal erosion hazards and ways people can protect themselves and their property.

360 Flood Protection Assistance

The other activities in this series advise people to learn more about flood insurance and flood protection. The objective of this activity is to provide interested property owners with technical information on the coastal erosion and flood hazards affecting their property, with advice on coastal erosion and flood protection measures, and information on qualified contractors.

Floodplain residents are more likely to undertake activities to reduce flood and coastal erosion hazards to their property if reliable assistance is available locally. The CRS provides credit if a local government provides technical advice to interested property owners and publicizes the availability of the service.

400 Mapping and Regulatory Activities

FEMA and many communities in the United States have long recognized that the national mapping and/or minimum regulatory standards of the NFIP do not adequately address the problems of special hazards. Since these special hazards have the potential for resulting in extraordinary flood damage, it is important that communities deal with them in ways that go beyond the minimum NFIP standards.

In order for a community to protect new development in areas subject to special hazards, they must have maps that adequately define the hazards and ordinance language that deals with the specific hazards in those areas.

Mapping Coastal Erosion Hazards

Several states and local governments have established shoreline mapping programs to provide a technical basis for permit review and to establish long-term erosion rates to use in conjunction with their building setback regulations. These shoreline monitoring programs also serve as a basis for assessing the need for beach restoration, nourishment, revegetation, and other beach erosion control projects.

To prepare beach profiles, some agencies use field surveys with the data tied to the same control points from one survey to the next. Recently, light detection and ranging (LiDAR) technology has found wider use since hydrographic and topographic surveys can be conducted over large areas more efficiently than with traditional survey methods.

The identification and mapping of those sections of a community that are most vulnerable serves as a necessary guide for managing development in a coastal community. New Jersey, Michigan, Virginia, Maryland, North Carolina, Washington, and other states have established their own shoreline mapping programs.

410CE Additional Flood Data for Coastal Erosion Areas

Credit for mapping coastal erosion hazard areas for management purposes is provided under this activity. Credit for the regulation of new development in mapped coastal erosion areas is provided in Section 430CE. Areas for which coastal erosion hazards regulation credit is requested may be within the SFHA or outside of it.

411CE Credit Points

a. Prerequisites for mapping credit:

   1. The area mapped must be subject to regulations designed to minimize future exposure to erosion damage. The community must receive at least 20 points (after the impact adjustment) for regulations that are credited under Section 431CE.

   2. The "coastal erosion-prone area" must be identified. The coastal erosion-prone area is the coastal area where waves are anticipated to cause significant erosion and shoreline retreat within the next 30–100 years. The coastal erosion-prone area must be identified based on mapping or erosion rates that meet FEMA's minimum mapping standards. In the absence of FEMA standards, the mapping must be consistent with state coastal mapping standards.

b. Mapping credit for coastal erosion hazards (MCE) (Maximum credit: 50 points)

   1. 50 points, for mapping the annual erosion rates of the community's shoreline subject to erosion.

   2. 25 points, if the community requires a site-specific erosion rate analysis to be done at the time of application for development permits within 600 feet of a shoreline that is subject to erosion.

   3. 25 points, if the community adopts a regulatory map delineating the areas expected to be affected by erosion over the next 30–100 years but without showing specific erosion rates.

As of the publication date of this supplement, there were no official FEMA mapping standards for coastal erosion. Therefore, communities may use maps or rates prepared by the state coastal management agency. If there are no state erosion maps or rates, the community may use those prepared by the U.S. Army Corps of Engineers, the U.S. Geological Survey, or other federal agency, or develop its own maps or rates. If there are no state or federal maps or rates, the community must document that the maps or rates it uses are consistent with state standards.

412CE Credit Calculation

c410CE = MCE

413CE Credit Documentation

The documentation required for coastal erosion hazards mapping credit must show how the mapping addresses the special hazard mapping criteria described in this section.

The community must provide the following for coastal erosion mapping credit:

a. A map that shows the coastal erosion hazard areas or erosion rates along the ocean or lake shoreline of the community. If only a small area of the community is mapped for coastal erosion, only those areas need be shown on the map; however, the length of the entire shoreline must be identified on the map.

b. A description of the method used for mapping coastal erosion hazards.

c. Credit for 410CE is provided only if the mapping is used for land use regulation to prevent damage from coastal erosion hazards. The documentation required for Activity 430CE will meet this requirement.

d. If credit for mapping on a case-by-case approach is requested, a description of the local government's enforcement procedures.

420CE Open Space Preservation

It is generally accepted that the best use of erosion-prone lands and coastal erosion hazard areas is to keep them open and free from development altogether. Keeping these hazard areas open has public use and recreation benefits. Preserving the area from development assures the protection of sensitive natural environments and access to natural resource areas.

There are several techniques to preserve areas as open space. Regulatory approaches, such as setbacks, can preserve areas from development; however, they do not produce the benefits that public ownership does. When the government owns full title or substantial interests in land located in hazard areas, it has full control over the use of the land.

Local governments can acquire full or partial interest in the land, commonly referred to as "fee simple" or "less-than-fee-simple" ownership. Fee simple ownership includes the full bundle of rights and is used in situations where full public use of the property is needed, such as for recreation or public buildings. When full use of the property is not

needed, such as limiting development in coastal erosion hazard areas, then local governments may opt to obtain cheaper less-than-fee simple interest.

An easement is an example of a less-than-fee simple interest in the land. An affirmative easement is a right to use land, such as when the community purchases an easement for hiking trails or beach access. A negative easement prevents the primary owner from using the land in certain ways, such as when the community purchases a scenic easement to prevent the owner from doing anything that would impair the aesthetic attractiveness of the land. Easements are particularly useful when regulations will not do the job and fee simple acquisition is not necessary, desirable, or cost-effective.

A local government may also obtain full or partial title to land by a bargain sale, dedication, or donation. A bargain sale is part sale and part donation, where the local government obtains title for less than the fair market value. This works when the property owner is willing to sell land to the local government for less than the market value, in exchange for federal and state income tax deductions equal to the difference between the market value and the sales price.

A fee simple donation may also be used to obtain property rights. Local governments usually receive donations when the property owner wants to maintain the land in a certain way or wishes to obtain tax benefits.

This CRS activity provides credit for having floodprone property within coastal dune and beach areas preserved as publicly owned or controlled open space. This credit is in addition to the credit provided for open space (OS) in Activity 420.

421CE Credit Points

Preserved coastal erosion open space (CEOS) (Maximum credit: 35 points)

Credit of 35 points is provided for preserving dune and beach areas seaward of the frontal dune as open space. There is no 420CE credit for preserving open space landward of the frontal dune.

Dune and beach areas preserved in their natural undeveloped state may also qualify for natural and beneficial functions (NB) credit under Activity 420 (see Section 420.c. in the *Coordinator's Manual*). Sand dunes are home to many plants and animals. These plants and animals live in a harsh environment of salt spray, shifting and infertile sand, bright sunlight, and storms. Some of the animals that depend on sand dunes include burrow-dwelling beach mice, coach-whip snakes, ghost crabs, nesting sea turtles, least terns, piping and snowy plovers, ground doves, and migrating monarch butterflies.

CEOS = 35 points if at least 5 acres of the regulatory floodplain meet the following prerequisites:

a. The area must meet the credit criteria for open space preservation in Activity 420.

b. The community must receive at least 20 points for its regulations under Section 431CE.

The open space requirement may be met in one of three ways:

1. Public land, such as state and local parks and easements: However, as noted in Section 403 of the *CRS Coordinator's Manual*, there is no open space credit for federal lands. All portions of city and county parks, forest preserves, state parks and state forests, publicly owned beaches, or natural areas that are within the regulatory floodplain may be counted for open space credit, EXCEPT PAVED AREAS. See Activity 420 of the *Coordinator's Manual*]. Separate parcels owned by a school district or other public agency can be counted, provided there are no buildings on them within the regulatory floodplain.

2. Preserve land: private wildlife or nature preserves that are maintained for open space purposes. Examples would be church retreats, hunting club lands, Audubon Society preserves, and similar privately owned areas that are set aside and not intended to be developed. A parcel set aside by a developer as a temporary "preserve" until the area develops is not considered permanent open space.

3. Restrictive development regulations: privately owned lands subject to state or local regulations that prevent construction of buildings or the placement of fill or other obstructions. Credit is only given for such regulated lands that are vacant at the time of application for CRS credit. Some examples are setback regulations, natural areas regulations, or any state or local law that prohibits new buildings in a defined area.

423 Credit Calculation

Maximum credit for coastal erosion open space credit is 35 points.

cCEOS = 35

424 Credit Documentation

a. To receive CEOS credit, the area receiving credit must be identified on a map as dune and beach area preserved as open space.

b. Documentation must be provided that shows that the area meets the preservation requirements for Activity 420 (Open Space Preservation) in the *Coordinator's Manual*.

c. Documentation showing the community received at least 20 points under 430CE must be provided.

430CE Higher Regulatory Standards

Local governments have used a variety of ordinances to reduce the risk of damage from hurricanes, coastal erosion, tsunamis and other hazards. Such ordinances include shoreline setbacks; zoning to regulate the use of land and density of development; subdivision regulations to guide the placement of buildings and facilities within a development; and environmental protection ordinances to preserve frontal dunes, wetlands, and other landforms that provide the community with a degree of natural protection. Credit is provided for regulating coastal erosion hazard areas in a manner that recognizes those elements of the hazard not addressed by the NFIP minimum standards for floodplain management.

In this activity, credit is provided for regulatory standards that mitigate the effects of erosion within those coastal erosion hazard areas. This is in addition to credit provided for other regulatory standards under Activity 430 in the *Coordinator's Manual*.

Setback Regulations

Coastal construction standards of the NFIP have emphasized the elevation of structures rather than horizontal displacement of them. The NFIP only requires horizontal displacement in V Zones to the extent that buildings must be "located landward of the reach of mean high tide" and must not alter frontal dunes or mangrove stands (44 *CFR* Section 60.3 (e)). These requirements do not apply in coastal A Zones, despite the possibility that such areas may be experiencing erosion.

Setbacks based on maximizing the distance between the shoreline and the oceanfront side of a structure can be effective in delaying damage from erosion. To minimize damage, the safest approach available to individuals in eroding areas is to site the structures in a way that will avoid long-term erosion risks over the anticipated life of the structure.

Seventeen states have some form of shoreline setback policy in place. The stringency of these policies and degree of enforcement vary both within and across states. Six states

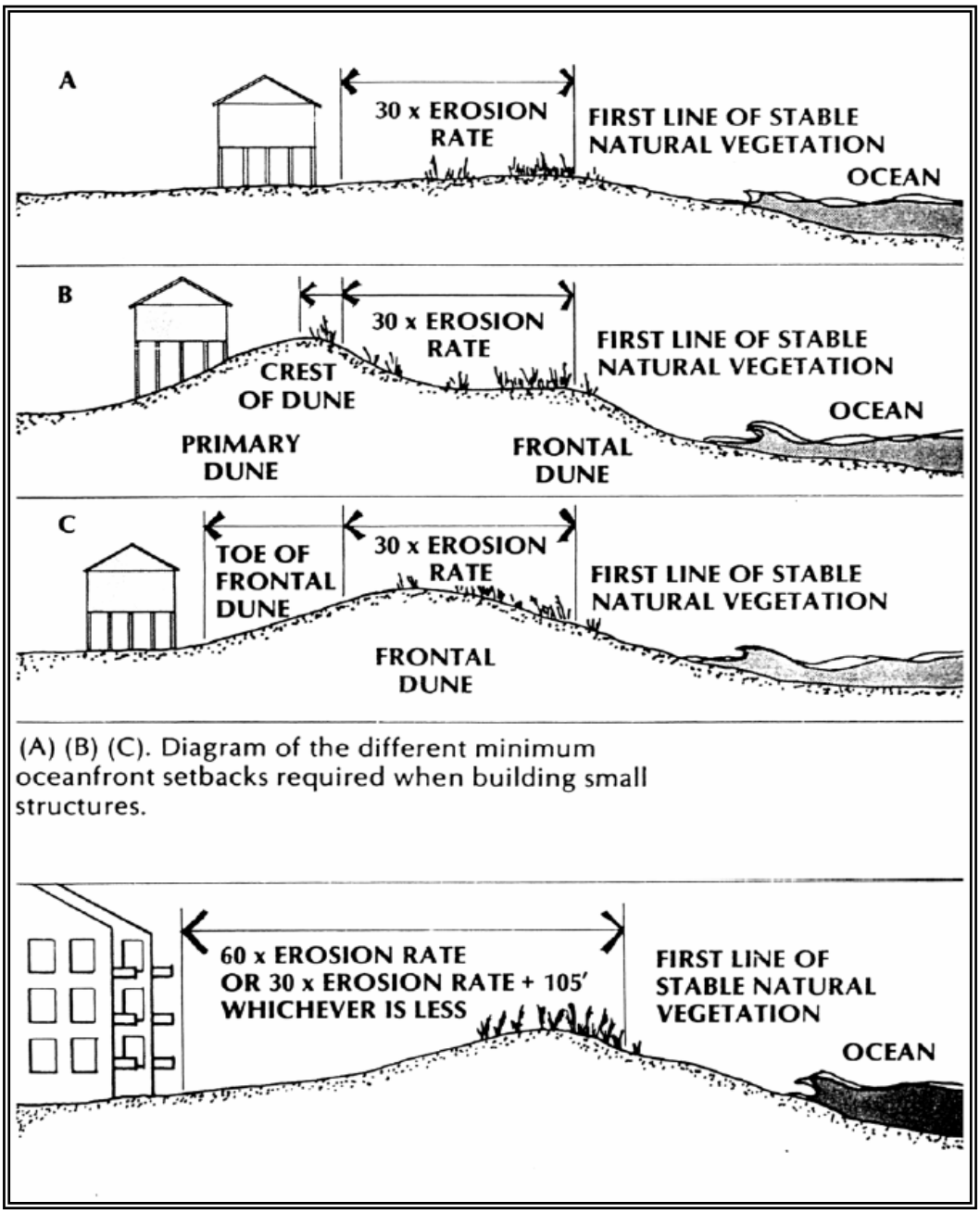
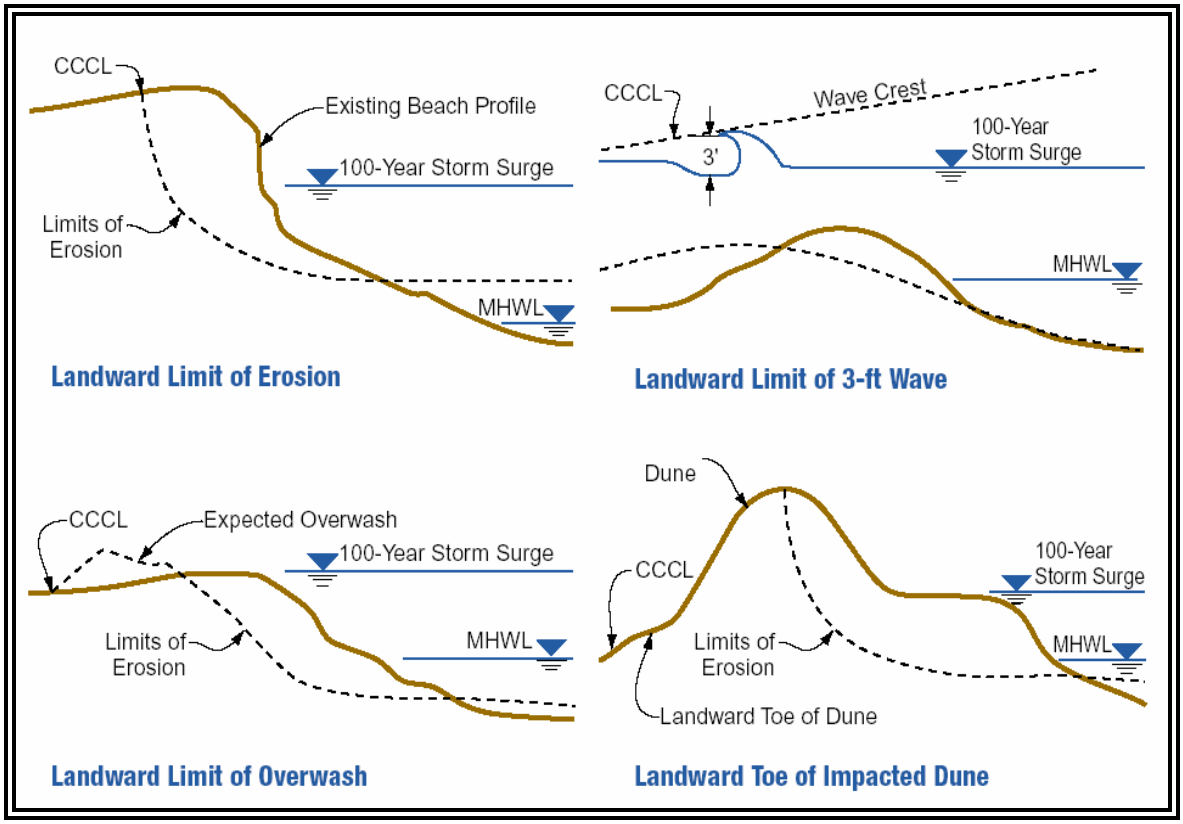


Illustration of North Carolina's setback regulations
(from Federal Emergency Management Agency, 2000a, p. G-14).

(Michigan, North Carolina, New Jersey, New York, Rhode Island, and Virginia) use "average annual erosion rates" to establish the minimum setback for new construction.

Michigan and North Carolina require a 30-year setback on smaller structures. For example, if a structure is to be located in an area with an average annual erosion rate of 2 feet per year, the building would need to be located at least 60 feet (2 feet x 30 years = 60 feet) behind the regulatory reference feature, usually the first line of natural vegetation. North Carolina also imposes a 60-year setback on larger buildings.

Florida's Coastal Construction Control Line (CCCL) defines that portion of the beach-dune system that is subject to severe fluctuations based on a 100-year storm (see Chapter 161, *Florida Statutes*, and Chapter 62B, *Florida Administrative Code*). The control line is based on the estimated inland reach of a 100-year storm. When an application is received for construction seaward of the Coastal Construction Control Line the State of Florida establishes a 30-year erosion projection for the parcel. The projection is based on long-term erosion rates. No multi-family structures are permitted by the state seaward of the 30-year erosion projection, but a single-family structure may extend seaward of the 30-year erosion projection in certain instances.



Criteria for locating the Coastal Construction Control Line
(from Federal Emergency Management Agency, 2000a, p. G-12).

Florida has also established a Coastal Building Zone, within which new construction must meet certain requirements. In areas where a Coastal Construction Control Line has been established, the Coastal Building Zone extends landward from the Coastal Construction Control Line a distance of 1,500 feet (or 5,000 feet on coastal barrier islands). In areas where a Coastal Construction Control Line has not been established, the Coastal Building Zone extends from the seasonal high water line to the most-landward V Zone established by FEMA. Construction seaward of the Florida Coastal Construction Control Line must satisfy whichever requirements are more restrictive—Florida's or FEMA's. (Note that state law prevents the 30-year projection from being established farther landward than the Coastal Construction Control Line.)

431CE Credit Points

Coastal erosion regulations (CER) and dune and beach regulations (DBR) (Maximum credit 370 points)

a. Prerequisites for CER credit under this element:

   1. The regulations must be based on coastal erosion mapping developed in accordance with the criteria of Section 411CE, and

   2. In the 30-year erosion-prone area the regulations must prohibit all new buildings and substantial improvement of existing buildings.

b. CER = the total of the following points:

   1. The erosion protection level, in years, where new buildings are prohibited. CER has a range of from 30 to 100. The minimum value for CER is 30, i.e., the regulations meet the prerequisites listed above. The maximum value for CER is 100, i.e., the regulations prohibit all new buildings in at least the 100-year erosion-prone area.

   2. 0.5 x the number of years of erosion protection required by the setback regulations for structures that are substantially improved;

   3. 0.5 x the number of years of erosion protection required by the setback regulations for structures that are substantially damaged;

   4. 20 points, if large buildings are required to meet a 60-year setback standard;

   5. 75 points, if erosion-threatened structures must be removed within two years of such designation by the state or local government. The regulation must: (a) require the structure to be moved within two years of receiving the erosion-threatened designation; (b) identify erosion-threatened structures as those where any portion of the foundation sits within a zone of imminent collapse measured from a reference feature such as the first line of natural vegetation, or the normal high tide; and (c) define the landward boundary of the zone as being measured from the reference feature a distance of at least five times the average annual long -term erosion rate for the site, plus 10 feet.

      Credit will only be awarded where a state or local government can show that the regulation has been upheld in court.

   6. 50 points, if hardened structures, such as seawalls, revetments, and large sandbags are prohibited along the erodible shoreline; and

   7. 25 points, if all new structures must be set back at least 60 feet for the entire shoreline, including areas with accretion.

To receive credit for CER, the regulations must prohibit all new buildings from the area expected to erode over the next 30 years. If that is the only coastal erosion regulation enforced in the community, then CER = 30. Credit is provided for either local or state erosion management regulations as long as they are enforced within the community.

Additional credit is provided where regulations require substantially improved and/or substantially damaged structures to be set back at least 30 times the average annual erosion rate at the building site. The amount of credit is based on the number of years of erosion protection identified in the setback regulation. Credit is calculated by multiplying the number of years of protection by 0.5.

If the community requires all new and substantially improved large buildings (i.e., over 5,000 square feet) to be set back beyond the 60-year erosion protection line, additional credit is provided.

Communities that require the removal of erosion-threatened structures from the shoreline may receive 75 points. This regulation must specify how erosion-threatened structures will be designated and that upon such designation the property owner must move or demolish the structure within two years. Structures with any portion of the foundation in a zone of imminent collapse are considered to be erosion-threatened structures. The zone of imminent collapse extends landward from a reference feature identified in the regulation, usually the first line of natural vegetation, line of escarpment, or normal high tide line. At a minimum, the landward boundary of the zone must extend from the reference feature a distance of five times the average annual long-term erosion rate for the site plus 10 feet. For example, if the erosion rate is 2 feet per year, the building must be moved if it is located closer to the reference feature than 20 feet [(5 x 2 feet) + 10 feet = 20 feet]. Credit will be awarded only if a state or local government can show that the regulation has been upheld in court.

Permanent shoreline stabilization projects, such as groins, jetties, bulkheads, seawalls, revetments, and large sandbags, may cause the loss of the public beach. They may also increase erosion at adjacent properties by interrupting natural sand migration patterns. Communities that prohibit these types of hardened structures receive 50 points for CER.

c. Coastal dune and beach regulations (DBR)

There is no prerequisite for DBR credit under this element. Credit is provided for regulating development in coastal dune and beach areas.

DBR = the total of the following points:

1. 20 points, for regulations that prohibit vehicular and pedestrian traffic on sand dunes except on appropriate access structures.

2. 10 points, for regulations that prohibit development seaward (or lakeward) of existing buildings on waterfront properties. This includes new buildings,

additions, swimming pools, pavilions, septic tanks, bulkheads, seawalls, and similar structures that can become debris in a storm and damage buildings.

Sand dunes are important in providing protection to buildings along the coast. They act as natural barriers to dissipate waves and protect back-lying areas from flooding and erosion. Pedestrian access between a coastal building and the shoreline is often overlooked when siting decisions and plans are made. Experience shows, however, that uncontrolled pedestrian access can damage coastal vegetation and landforms, providing weak points upon which storm forces act. Dune blowouts and breaches during storms often result, and buildings landward of the weak points can be subject to increased flood, wave, erosion, or overwash effects.

432CE Impact Adjustment

Regulatory credit is adjusted based on the percentage of the shoreline mapped and regulated for the erosion hazard.

a. Option 1:

If development along the entire shoreline is regulated for coastal erosion protection, rCER = 1.0.

It is possible that a community has designated and regulates all of its shoreline as an erosion hazard area. In this case, it should use Option 1, where rCER = 1.0. When determining the area subject to local coastal erosion regulations, the local government omits areas owned by the state and federal governments or areas in which development is prohibited by the federal government in accordance with the impact adjustment map instructions in Section 403 of the *Coordinator's Manual.*

b. Option 2:

If development along only a portion of the shoreline is regulated as an erosion hazard, a default value of 0.25 may be used for the impact adjustment ratio (rCER = 0.25).

If Option 2 is used, credit for more than one special hazard will be granted only if the hazards cover different geographic areas.

If the standard is enforced in only some of the community's shoreline, the community must use either Option 2 (the default value) or Option 3. The community may use Option 2 if it results in more points than Options 1 or 3. For example, if more than 75% of the regulatory floodplain is preserved as open space, rCEOS > 0.75 and Option 2 would provide more credit than Option 1.

c. Option 3:

rCER: The size of the area subject to coastal erosion regulations must be determined in order for the credit points to reflect the impact of the regulations. This impact adjustment is the ratio of the shoreline regulated for coastal erosion protection to the length of the entire shoreline.

$$rCER = \frac{\text{Length of shoreline subject to erosion regulation}}{\text{Length of the community's entire shoreline}}$$

If Option 3 is used, each standard for which regulatory credit is requested must be appropriately designated on the Impact Adjustment Map. The area affected by the regulatory standard must exclude areas designated as open space that are receiving OS credit under Activity 420 (Open Space Preservation).

In many communities, these regulatory standards will be applicable throughout the community's coastal erosion area, so a note on the map key will be adequate.

433CE Credit Calculation

$$cCER = (CER \times rCER) + DBR$$

434CE Credit Documentation

The community must have the following documentation available to verify implementation of this activity:

a. Application for credit for Activity 410CE for the coastal erosion hazard.

b. The state or local law or ordinance language that adopts the regulatory standard. The appropriate acronym (CER or DBR) must be marked in the margin of the sections of the ordinance that apply to this activity.

c. An explanation of the procedures followed for enforcement of the regulatory standard.

d. An impact adjustment map showing the erosion rates or areas and the regulations applicable to the shoreline.

A photocopy of the appropriate pages of the ordinance is sufficient and should be attached to the activity worksheet. The Chief Executive Officer's (CEO's) application certification is considered to include a certification that the ordinance or statute has been enacted into law and is being enforced (see Section 212.a in the *Coordinator's Manual*).

If the regulations are enforced throughout the area mapped and credited in Activity 410CE, the map for 410CE can be used as the impact adjustment map.

440CE Coastal Erosion Data Maintenance

Credit is provided for making the community's floodplain maps more current, useful, or accurate in order to improve local regulations, planning, disclosures, mitigation, and property appraisals.

CRS credit (8 points) is provided for including coastal erosion hazard map data in a geographic information system (GIS), in a digitized parcel system, or on an overlay map. This is found in Section 441.a.2(g) of the *Coordinator's Manual.*

441CE Credit Points

Erosion data maintenance (EDM) (Maximum credit: 20 points)

a. Prerequisites for credit under this element:

   1. The community must update the erosion data on at least a five-year cycle.

   2. The community must receive credit for regulating development in erosion-prone areas under Section 431CE.

b. EDM = 20, if a state or local agency maintains reference marks spaced no more than ½ mile apart and records shoreline erosion in relation to those reference marks at least every five years, OR

   EDM = 10, if a state or local agency takes new aerial photographs at least every five years to update its shoreline erosion rates.

This credit is for updating erosion data on at least a five-year cycle and adopting the new rates or maps as part of the community's erosion setback and coastal management regulations.

442CE Impact Adjustment

All of the shoreline must be included in the erosion study; therefore, there is no impact adjustment for this element.

443CE Credit Documentation

The community must provide the following documentation:

a. A description of the method used to update mapped erosion rates or regulatory maps.

b. A certification that the rates or maps are updated and adopted on at least a five-year cycle.

500 Flood Damage Reduction Activities

Coastlines have always been a favored location for human settlements. Because of the attractiveness of coastal locations, erosion risks are often given only a second thought when buying beachfront property. With the long gaps between devastating storms, coastal communities have continued to develop with new housing, maritime facilities, and resort developments. As a result, the destructive force of coastal erosion threatens more people and facilities every year.

510 Floodplain Management Planning

Communities are encouraged to prepare and adopt coastal management plans that guide land use development, redevelopment, post-disaster recovery, and mitigation decisions. Credit for preparing, adopting, implementing, evaluating, and updating such a plan could be credited under Activity 510 (Floodplain Management Planning).

Sections 511.a(4) and 511.a(5) of the C*oordinator's Manual* provide extra points for a discussion of all special hazards that affect the community and for including a summary of the impact of each hazard on the community and its economy and tax base.

520 Acquisition and Relocation

Acquisition and relocation may be the most cost-effective way of solving the problem of threatened structures in coastal erosion areas. Although there is no extra credit for acquisition and relocation of properties in erosion hazard areas, the credit offered in Activity 520 is substantial.

Buildings threatened by imminent collapse from coastal erosion lose most of their economic value. They have substantially lower tax value and pose a potential public safety hazard if they are destroyed during a storm or abandoned. Relocation therefore may be a desirable public goal because the community can thereby avoid the loss of tax revenue and the public cost of clearing the wreckage of abandoned buildings. Relocation is a common practice in some states, including North Carolina and Maine, both of which discourage or prohibit further hardening of their shorelines.

Relocation of existing structures from eroding shorelines can also be an effective method for protecting the private investment in a threatened structure. Structures on deep lots may gain significant protection by being moved landward on the same lot. If sufficient space is not available on the existing lot, an alternate site must be acquired and prepared, substantially increasing the cost of relocation.

The technical feasibility of moving both small and large structures has been demonstrated on several occasions. Relocating readily movable one- and two-story residential buildings has proven particularly cost-effective.

Building being relocated from the erosion hazard area after Hurricane Fran, Figure Eight Island, North Carolina (photo from Berry Williams).

Under current policy, if an insured building is damaged by a flood and the state or community declares the building to be substantially damaged, an NFIP flood insurance policy claim may provide assistance to help pay to relocate the structure, up to a maximum benefit of $30,000. This is in addition to coverage for the repair of physical damage from flooding. When properties are acquired and relocated using these funds and the vacant property is preserved as open space, CRS credit is available to the community.

Thirteen coastal states have dedicated funds for direct state or local acquisition of property in floodprone or high erosion hazard areas. Some states provide financial or technical support to communities for the relocation of public or private structures and the creation, restoration, or re-vegetation of disturbed dune areas (e.g., Massachusetts and Maine), or buyouts of repeatedly damaged properties (e.g., New Jersey, Florida, Minnesota, Ohio, and Alabama).

530 Flood Protection

Elevating Buildings

There is no special credit for elevating structures due to increased flood potential that results from coastal erosion. However, local governments that consider the future condition of their eroding beaches and dunes may decide to assist property owners who elevate buildings that were built below the base flood elevation. Elevating buildings that are flood prone has proven to be a cost-effective method of property protection.

Although there is no extra credit for elevating properties in coastal hazard areas, the credit offered in Activity 530 is substantial.

Structural Flood Control

It should be noted that the CRS does not provide credit for structural flood control projects that can result in a revision to the community's FIRM. Nor does the CRS provide credit for coastal structural projects that may be installed to affect erosion rates, including seawalls, groins, and beach nourishment.

540CE Coastal Erosion Hazard System Maintenance

This element credits programs that maintain measures that protect buildings from coastal flooding or erosion. These include dune or mangrove preservation, bluff stabilization, and beach nourishment programs. The applicant must submit a description of the program and identify where it is in effect on a map.

Credit for this element is dependent on the community's having coastal erosion setback regulations. This is provided under Section 431CE. If CER = 0, then EPM = 0.

Section 540CE provides credit to encourage maintenance of erosion protection programs, such as beach nourishment and sand dune restoration. To provide property protection in case beach nourishment projects are not funded in the future, CRS credit is only provided where the projects are not reflected on a FIRM or erosion-prone area map.

541CE Credit Points

Coastal erosion protection maintenance (EPM) (Maximum 100 points)

a. Prerequisites for credit under this element:

   1. The community must receive CER credit for regulating development in erosion-prone areas under Section 431CE, Coastal Erosion Regulations.

2. The erosion protection program must not use hardened structures, such as seawalls, groins, or large sandbags more than 5 feet wide and 15 feet long when measured flat.

3. The project must have been designed or evaluated by a professional expert for the purpose of erosion management.

4. The erosion protection program must be an ongoing program with a multi-year implementation plan. The program must have been in effect for at least two years before credit is provided.

5. All required state and federal permits must have been obtained.

6. The program must be based on adding more sand to the area. Pushing sand or grading the beach is not adequate for credit.

b. Credit Points:

1. EPM= 20, if the maintenance program is for a project providing protection from a storm with a 10-year return frequency.

2. EPM= 50, if the maintenance program is for a project providing protection from a storm with a 25-year return frequency.

3. EPM= 100, if the maintenance program is for a project providing protection from a storm with a 50-year return frequency.

This credit is for ongoing maintenance performed by a public, quasi-public, or non-profit agency, such as a property owners association. It is NOT for

- Regulations that require individuals to maintain a program on their own properties,
- Maintenance of hard structural projects, or
- Implementation of one-time-only projects, such as a beach-bulldozing project.

542CE Impact Adjustment

a. Option 1: If the maintained erosion protection measures cover the entire shoreline of the erosion-prone area, rEPM = 1.0.

b. Option 2: If part of the erosion-prone shoreline is protected by one of the maintained programs, the community may use the default value for the impact adjustment ratio, rEPM = 0.20.

c. Option 3: The impact adjustment for maintaining erosion protection programs is the total length of the shoreline protected by those programs divided by the total length of the shoreline in the erosion-prone area. Because these

protection programs are linear features, area is not used as the basis for measurement.

$$rEPM = \frac{\text{Length of shoreline protected by the maintenance program}}{\text{Length of shoreline in the erosion-prone area}}$$

Option 3 produces the most accurate impact adjustment figures and in many cases, the results will be higher than those derived by using Option 2. However, it does require measuring the length of the shoreline affected.

543CE Credit Calculation

$$cEPM = EPM \times rEPM$$

544CE Credit Documentation

The community must submit the following documentation with its application:

a. A description of the erosion protection maintenance program. The description must show that the program was designed by a professional expert for the purposes of erosion management, and that all permits were obtained.

b. Documentation that shows how the community calculated the length of shoreline affected by the erosion protection program.

c. A description of the protection project components and documentation on the level of protection provided by the maintenance project.

d. A copy of the multi-year maintenance plan.

One of the keys for crediting a maintenance program is that a professional expert must have designed it to ensure that it will be effective. Some communities have implemented projects on their beaches or dunes without careful design.

The community must provide documentation of the level of protection provided by the project. This information should be in the design specifications for the project.

Because credit for coastal erosion regulations is a prerequisite for this credit, the community must have a map of the erosion-prone area. That map should be sufficient to show the shoreline subject to erosion and the portion that is covered by the program.

600 Flood Preparedness Activities

Powerful ocean waves, driven by hurricanes and other coastal storms, rising sea level, and flooding, wear away the beaches and bluffs. As erosion moves the shoreline inland, water moves closer to nearby houses, businesses, and public facilities. Once the coastline has shifted inland, flood elevations for the same magnitude storm will be higher farther inland. These changes can have a significant impact on a community's emergency preparedness plans. As homes, businesses, and public facilities become more vulnerable they may need earlier warning to take emergency protective measures or to evacuate. Public facilities may need to be closed and may not be able to perform their emergency functions during and after the coastal storm, and primary roads may become flooded and need to be abandoned as evacuation routes.

Local governments must make judgments about what levels of risks are acceptable and what kinds of development are appropriate for each hazard area. Such advanced planning gives the community time to examine storm hazards and formulate workable and effective means of mitigating them. Emergency preparedness planning should be a key component of this process.

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OMB No. 1660-0022
Expires: June 30, 2007

National Flood Insurance Program
Community Rating System

CRS Credit for Management of Coastal Erosion Hazards

ACTIVITY WORKSHEETS

2006

FEMA

OMB No. 1660-0022
Expires: June 30, 2007

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INSTRUCTIONS

The following activity worksheets are to facilitate calculations of Community Rating System (CRS) credit points. They are not used for a community's initial application to the CRS. INITIAL APPLICATIONS FOR THE CRS ARE SUBMITTED USING THE WORKSHEET PAGES IN THE *CRS APPLICATION*.

These activity worksheets are for internal use by the community, for submittal of modifications, and for use by the ISO/CRS Specialist during verification and cycle verification of a community's program.

These worksheets are designed to be used in conjunction with the *CRS Credit for Management of Coastal Erosion Hazards*. Each section of the worksheets corresponds to a section in that supplement. If a section is missing from the worksheets, it is because the *CRS Credit for Management of Coastal Erosion Hazards* supplement shows that no data or calculations are required for that section.

It is recommended that these worksheets be photocopied before they are used.

When used for submitting a modification, the Credit Points, Credit Calculation, and Credit Documentation parts of the worksheets should be completed for each activity for which credit is requested. Fill in the blanks with the value for each variable.

Each worksheet has a Credit Documentation section. Check the blanks to denote that all of the required documentation is available. In some cases, the documentation must be provided with the modification. In others, checking the appropriate spaces confirms that you will provide the documentation when needed. Please consult *CRS Credit for Management of Coastal Erosion Hazards* if you have questions about which documentation is to be provided with the request for a modification.

ATTACH THE REQUIRED DOCUMENTATION FOR AN ACTIVITY TO THE WORKSHEET FOR THAT ACTIVITY. If the documentation is ordinance language, attach only the necessary page(s) from the ordinance.

MARK THE MARGINS OF THE DOCUMENTATION WITH THE ACRONYM for the element so the ISO/CRS Specialist can identify the basis for the credit.

[This page intentionally blank.]

Community : _____

410CE ADDITIONAL FLOOD DATA

411CE Credit Points

a. Prerequisites:

___ 1. The area mapped is subject to regulations designed to minimize future exposure to erosion damage.

___ 2. The coastal erosion prone area is identified on a map.

b. Coastal Erosion Hazards: (MCE = one of the following methods):

1. Mapping annual shoreline erosion rates (50 points) _____

2. Site-specific erosion rate analysis required with permit application (25 points) _____

3. Adoption of regulatory map that delineates the areas expected to be affected by erosion over the next 30-100 years (25 points) _____

MCE = _____

412CE Credit Calculation

cMCE = MCE cMCE = _____

Add this credit to the value for AFDSH on line 413c, page AW-410-2.

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Community : _____

414CE Credit Documentation

_____ a. A map that shows the community's entire shoreline and the coastal erosion hazard areas or the areas with erosion rates.

_____ b. A description of the method used for the mapping coastal erosion hazards.

_____ c. Documentation that shows the community receives at least 20 points under Section 431CE.

_____ d. If credit on a case-by-case approach is requested, a description of the local government's enforcement procedures.

Comments: _____

_____

_____

_____

_____

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Community : _____

420CE OPEN SPACE PRESERVATION

423CE Credit Calculation

cCEOS = _____

Add this credit to the value for cSHOS on line 423d, AW-420-1.

424CE Credit Documentation

_____ a. A map that shows the community's dune and beach area preserved as open space.

_____ b. Documentation that shows that the area meets the preservation requirements for Activity 420 (Open Space Preservation in the *Coordinator's Manual*).

_____ c. Documentation showing that the community receives at least 20 points under 431CE.

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Community : _____

430CE HIGHER REGULATORY STANDARDS

431CE Credit Points

a. Prerequisites for CER:

___ 1. The regulations are based on the coastal erosion mapping credited in Section 411CE.

___ 2. The regulations prohibit all new buildings and substantial improvement of existing buildings in the 30-year erosion-prone area.

b. Coastal Erosion Regulations (CER)

1. Protection level for prohibition of new buildings (years of protection required by setback standard, 30 to 100) = _____
2. Protection level for substantial improvements (0.5 x _____number of years of protection required by setback standard) = _____
3. Protection level for substantial damage (0.5 x _____ number of years of protection required by setback standard) = _____
4. Protection of large buildings (20 points) = _____
5. Removal of threatened structures (75 points) = _____
6. Prohibit hardened structures (50 points) = _____
7. Setback regulations for accreting and rocky shorelines (25 points)= _____

CER = total of above: CER = _____

c. Coastal Dune and Beach Regulations (DBR) (no prerequisites)

1. Prohibit vehicular and pedestrian traffic (20 points) = _____
2. Prohibit development seaward of existing buildings (10 points) = _____

DBR = total of above: DBR = _____

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Community : _____

432CE Impact Adjustment

a. Option 1: rCER = 1.0 = _____

b. Option 2: rCER = 0.25 = _____

c. Option 3: rCER = $\frac{\text{Length of shoreline subject to coastal erosion regulation}}{\text{Length of the shoreline}}$ = _____

433CE Credit Calculation

cCER = (CER _____ x rCER_____) + DBR _____ cCER = _____

Add this credit to the value for cSH on line 433k, page AW-430-2.

434CE Credit Documentation

_____ a. Application for credit for Activity 410CE for coastal erosion.

_____ b. The ordinance(s) or law language that adopts the regulatory standard(s).

_____ c. An explanation of the procedures followed for enforcement of the regulatory standard.

_____d. An Impact Adjustment Map showing the erosion rates or areas and the regulations applicable to the shoreline.

Comments: _____

_____

_____

_____

_____

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Community : _____

440CE FLOOD DATA MAINTENANCE

441CE Credit Points

a. Prerequisites

___ 1. The community updates the erosion data on at least a five-year cycle.

___ 2. The community receives credit for regulating development in erosion-prone areas under Section 431CE.

b. Erosion Data Maintenance (EDM)

A state or local agency maintains reference marks spaced no more than ½ mile apart with erosion data updated at least every five years (20 points). = _____

A state or local agency measures average annual erosion rates based on aerial photography updated at least every five years (10 points). = _____

Add this credit to the value for EDM on line 443c, page AW-440-2.

443CE Credit Documentation

_____ a. A description of the method used to update mapped erosion rates or regulatory maps.

_____ b. A certification that the rates or maps are updated and adopted on at least a five-year cycle.

Comments: _____

_____

_____

_____

_____

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Community : _____

540CE SYSTEM MAINTENANCE

541CE Credit Points

a. Prerequisites

__ 1. The community receives credit for regulating development in erosion-prone areas under Section 431CE.

__ 2. The erosion protection program does not use hardened structures.

__ 3. The project was designed or evaluated by a professional expert.

__ 4. The ongoing program has been in effect for at least two years.

__ 5. All required state and federal permits have been obtained.

__ 6. The program is based on adding more sand to the area.

b. Coastal Erosion Protection Maintenance (EPM)

1. Maintenance program with protection at a 10-year level (20 points) = _____
2. Maintenance program with protection at a 50-year level (50 points) = _____
3. Maintenance program with protection at a 100-year level (100 points) = _____

542CE Impact Adjustment

a. Option 1: rEPM = 1.0

b. Option 2: rEPM = 0.2

c. Option 3: rEPM = $\frac{\text{Length of shoreline protected by measures}}{\text{Length of erosion-prone shoreline}}$ = _____

543CE Credit Calculation

cEPM = EPM _____ x rEPM _____ cEPM= _____

Add this credit to the value for cEPM on line 543c, page AW-540-1.

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Community : _____

544CE Credit Documentation

_____ a. A description of the erosion protection maintenance program with documentation that (1) all required permits were obtained, (2) the project was designed by a professional expert, and (3) the maintenance program is based on adding sand to the beach.

_____ b. Documentation that shows how the community calculated the length of shoreline affected by the erosion protection program.

_____ c. Documentation on the level of protection provided by the maintenance project.

_____ d. A copy of the multi-year maintenance plan.

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