noaa ocean service education

Do You Want to Risk It?

Hurricanes / Grades 9-12 / Earth Science

Focus Question

How can coastal residents plan for the potential effects of natural hazards?

Learning Objectives

1. Students will define, compare and contrast the terms “risk” and “vulnerability.”
2. Students will determine the history of natural disaster events for a given county.
3. Students will discuss the relative risk from natural hazard events for selected counties based on the history of such events.
4. Students will discuss the impact of population increase on risk from natural hazards.
5. Students will use a geographic information system to investigate storm-related risks to specific facilities in a given community

Links to Overview Essays and Resources Useful for Student Research

http://oceanservice.noaa.gov/topics/coasts/assessment/
http://www.csc.noaa.gov/rvat/hazid.html

Materials

- Copies of “ Student Worksheet: Coastal Hazards Vulnerability Assessment,” found at the bottom of this lesson plan, one copy for each student group. Click here for a printable copy of the worksheet.
- Copies of "Table 1: Numeric Scales Used to Describe Risk from Storm-Related Hazards," found at the bottom of this lesson plan, one copy for each student group. Click here for a printable copy of Table 1.
- (optional) Computers with Internet access; if students do not have access to the Internet, download copies of materials cited under “Learning Procedure” and provide copies of these materials to each student group

Teaching Time

One or two 45-minute class periods, plus time for student research

Seating Arrangement

Groups of 4-6 students

Maximum Number of Students

30

Key Words

Natural hazard
Hurricane
Risk
Vulnerability

Background Information

Almost half of the people living in the United States live near the coast and the numbers are increasing. As the coastal population continues to grow, more people and property are exposed to hazards caused by hurricanes, tsunamis, shoreline erosion and other natural hazards. Homes and businesses are often built in low-lying areas and on barrier islands that are particularly vulnerable to these hazards. The potentially disastrous consequences of this trend became obvious during the summer of 2004 when residents of Florida were battered by four major hurricanes within six weeks, resulting in billions of dollars' worth of damage. Similar consequences made global headlines in August of 2005 when Hurricane Katrina wrought havoc on Gulf Coast communities in Alabama, Louisiana, and Mississippi. Much of the cost of these events is eventually borne by American taxpayers through federal government funds for for disaster relief and reconstruction.

These disasters emphasize the importance finding more effective ways to reduce the negative environmental, social, and economic impacts of natural hazards on coastal communities. To assist these efforts, NOAA's National Ocean Service provides essential information on natural hazards to government agencies and members of the general public concerned with lowering the risks associated with natural hazards. This information includes training, methods for assessing vulnerability to natural hazards, and tools that can be used to forecast threats such as floods and harmful algal blooms.

In the wake of catastrophic storms in 2004 and 2005, NOAA is spearheading a nationwide effort to lessen the impacts of such storms on coastal communities. This Coastal Storms Initiative (CSI) includes nine pilot projects to develop new ways to forecast coastal storms and new strategies to reduce their impacts. While the efforts are focused on specific regions of the country, the results are helping all coastal communities improve their ability to prepare for the inevitable coastal storm. The Risk and Vulnerability Assessment Tool (RVAT) is a CSI project that involves the development of an online tool for identifying risks and vulnerabilities to coastal storms in Brevard and Volusia Counties, Florida. This information can help communities in these counties create effective ways to reduce storm-related hazards and impacts, and provides the basis for developing similar tools for other communities.

In this lesson, students will use some of NOAA's online resources to make gather information about the vulnerability of coastal communities to storm hazards.

Learning Procedure

1. To prepare for this lesson:

- Review information on the NOS Natural Hazards Assessment program (http://oceanservice.noaa.gov/topics/coasts/assessment/), as well as the process described on the "Student Worksheet: Coastal Hazards Vulnerability Assessment Worksheet" found at the end of this lesson plan.

- Make copies of the "Student Worksheet: Coastal Hazards Vulnerability Assessment Worksheet."

- Make copies of "Table 1: Numeric Scales Used to Describe Risk from Storm-Related Hazards."

- If students do not have Internet access, download information for the selected coastal communities as described on the Worksheet.

2. Briefly review the issue of coastal hazards. You may want to show some headlines from the 2004 and 2005 hurricanes in Florida and the U.S. Gulf Coast (your school or community library probably has back issues of weekly news magazines that could be used for this). Discuss the types of natural hazards that may pose a risk to coastal communities. The list should include hurricanes, floods, tsunamis, and earthquakes. Be sure students understand that increasing population in coastal communities means that an increasing number of people and their property are potentially threatened by these hazards.

   Some of sources may refer to the "100-year flood plain." Storms are sometimes characterized by how often a storm having a specific severity is expected to occur. A "100-year storm" would be a storm having a severity that is expected to occur only once every 100 years (in other words, an extremely severe storm). So, a "100-year flood plain" represents the area that would be flooded by a storm having this severity.

   Discuss the concepts of "risk" and "vulnerability." "Risk" is generally used as a measure of the likelihood of being exposed to a particular hazard. "Risk areas" are geographic regions that have a certain probability of being exposed to a given hazard. People and resources located within risk areas are considered to be "at risk" from this hazard. "Vulnerability" is a measure of the likelihood that people and/or resources will be negatively impacted by a given hazard. So, people living in a coastal community might all be at risk of being exposed to a hurricane, but their vulnerability to negative impacts could vary significantly depending upon the extent to which they were prepared to cope with this risk.

3. Tell students that their assignment is to obtain information about natural hazards that may pose a risk to a specific coastal community, and to make inferences about the relative risk of that community compared to other communities. Distribute copies of the "Coastal Hazards Vulnerability Assessment Worksheet" to each student group. Assign each group one of the following pairs of counties (the search address is to be used in Part 2 of the Student Worksheet):

- Harrison County, MS and Brevard County, FL (search address: 5000 N. West Ave., zip: 32927)

- Charleston County, SC and Volusia County, FL (search address: 367 Plaza Blvd, zip: 32188)

- Mobile County AL and Brevard County, FL (search address: 1450 Minutemen Causeway, zip: 32931)

- Plaquemines Parish, LA and Volusia County, FL (search address: 300 Mission Drive, zip: 32168)

- Bay County, FL and Brevard County, FL (search address: 500 First St, zip: 32949)

- New Hanover County, NC and Volusia County, FL (search address: 20 Seabridge Drive, zip: 32176)

4. Have each group present an oral summary of their results. When all groups have presented results for their assigned communities, each student or student group should prepare a written statement about the relative risk of their assigned counties. Lead a discussion of students' data and inferences. The following points should be included:

Harrison County, MS:

- Hurricanes category 3 or stronger since 1970: category 3 1979; category 3 1985; category 3 2004
- Trend in frequency of hazard events: major hurricane every 6-9 years since 1970
- Population trend since 1970: increasing; about 135,000 to 188,000 during this period

Charleston County, SC

- Hurricanes category 3 or stronger since 1970: Hurricane Hugo, category 4 1989
- Trend in frequency of hazard events: none evident
- Population trend since 1970: increasing; about 245,000 to 310,000 during this period

Mobile County, AL

- Hurricanes category 3 or stronger since 1970: category 3 1979; category 3 1985; category 3 1995; category 3 2004
- Trend in frequency of hazard events: major hurricane every 6-10 years since 1970
- Population trend since 1970: increasing; about 315,000 to 395,000 during this period

Plaquemines Parish, LA

- Hurricanes category 3 or stronger since 1970: category 3 1992; category 3 2005
- Trend in frequency of hazard events: none evident
- Population trend since 1970: slowly increasing, about 25,000 to 26,500 during this period

Bay County, FL

- Hurricanes category 3 or stronger since 1970: category 3 1975; category 3 1995
- Trend in frequency of hazard events: none evident
- Population trend since 1970: increasing, about 74,000 to 147,000 during this period

New Hanover County, NC

- Hurricanes category 3 or stronger since 1970: category 3 1996
- Trend in frequency of hazard events: none evident
- Population trend since 1970: increasing, about 80,000 to 160,000 during this period

Brevard County, FL

- Hurricanes category 3 or stronger since 1970: category 3 1998; category 3 2004
- Trend in frequency of hazard events: two major hurricanes since 1998
- Population trend since 1970: increasing, more than 200,000 (about double) during this period

Volusia County, FL

- Hurricanes category 3 or stronger since 1970: none
- Trend in frequency of hazard events: none evident
- Population trend since 1970: increasing, about 270,000 (more than double) during this period

Ask students which of these counties faces the greatest risk from the natural hazards listed on the worksheet. Harrison, and Mobile Counties have experienced three major hurricanes since 1970. Mobile County has a much larger population, which might suggest that of the six communities investigated, Mobile is at greatest risk from the natural hazards considered. It is worth noting, however, that the populations of New Hanover, Bay, Brevard, and Volusia Counties doubled since 1970; a trend that means increasing numbers of people are at risk from natural hazards.

It is also worth noting that Plaquemines Parish (which includes New Orleans) had the smallest population of the six communities investigated as well as the smallest rate of population increase (only about 6% since 1970). The experience of Hurricane Katrina shows that a scarcity of hurricanes over a 35-year period does not necessarily serve as a reliable indicator of future events. In this case, "it only takes one."

From the exercises using the Risk and Vulnerability Assessment Tool, students should realize that risk and vulnerability can be defined at a much finer scale than county-wide, but this also involves managing very large volumes of information. A geographic information system (which is the basis for the RVAT) can be an effective way to accomplish this task and can make it relatively easy for non-experts to retrieve and interpret relevant information.

Answers to questions related to specific search addresses should include:

5000 N. West Ave., Brevard County, FL 32927

- Critical facilities within 0.5 mile radius: Lil Champ Store Sewage Plant; FPL Cape Canaveral Sewage Plant; Tower
- Facility within 0.5 mile with highest Composite Risk: FPL Cape Canaveral Sewage Plant
- Numeric storm-related risks for this facility: Flood: 6.8 Wind: 8 Surge: 4 Erosion: 0 Combined: 18.8
- Natural Hazard Summary Risk on land immediately adjacent to this facility: Moderately-High
- Land uses or land cover are found within a 0.5 mile radius of this facility: Urban, Range Land

367 Plaza Blvd, Volusia County, FL 32188

- Critical facilities within 0.5 mile radius: Seabreeze High School; Bel-Aire House; Two Aviation Towers
- Facility within 0.5 mile with highest Composite Risk: Aviation Tower
- Numeric storm-related risks for this facility: Flood: 5.1 Wind: 8 Surge: 2 Erosion: 3.3 Combined: 18.4
- Natural Hazard Summary Risk on land immediately adjacent to this facility: Moderate & Moderately-Low
- Land uses or land cover are found within a 0.5 mile radius of this facility: Urban

1450 Minutemen Causeway, Brevard County, FL 32931

- Critical facilities within 0.5 mile radius: Theodore Roosevelt K-8; Cocoa Beach High School; City of Cocoa Beach Water Reclamation Facility; Cocoa Beach Sewage Plant; Cocoa Beach Municipal Pool
- Facility within 0.5 mile with highest Composite Risk: Theodore Roosevelt K-8
- Numeric storm-related risks for this facility: Flood: 6.8 Wind: 8 Surge: 4 Erosion: 0 Combined: 18.8
- Natural Hazard Summary Risk on land immediately adjacent to this facility: Moderate and Moderately-High

- Land uses or land cover are found within a 0.5 mile radius of this facility: Urban, Wetland

300 Mission Drive, Volusia County, FL 32168

- Critical facilities within 0.5 mile radius: Eagle's Wings Roy's Ranch; New Smyrna Retirement Center; Sugarlake Retirement Home; Sugar Mill Ruins Travel Park
- Facility within 0.5 mile with highest Composite Risk: Sugar Mill Ruins Travel Park
- Numeric storm-related risks for this facility: Flood: 6.8 Wind: 8 Surge: 4 Erosion: 0 Combined: 18.8
- Natural Hazard Summary Risk on land immediately adjacent to this facility:
- Land uses or land cover are found within a 0.5 mile radius of this facility:

500 First St, Brevard County, FL 32949

- Critical facilities within 0.5 mile radius: Shellfish Inc. Sewage Plant; Hudgins Fish Farm Sewage Plant; Brevard County Fire Station; Tower
- Facility within 0.5 mile with highest Composite Risk: Shellfish Inc. Sewage Plant and Hudgins Fish Farm Sewage Plant
- Numeric storm-related risks for this facility: Flood: 6.8 Wind: 8 Surge: 4 Erosion: 0 Combined: 18.8
- Natural Hazard Summary Risk on land immediately adjacent to this facility: Moderate and Moderately-High
- Land uses or land cover are found within a 0.5 mile radius of this facility: Range Land, Forest, Urban, Wetland

20 Seabridge Drive, Volusia County, FL 32176

- Critical facilities within 0.5 mile radius: Kingston Shores Condos; Kingston Shores Condos Sewage Plant; North Peninsula Utilities; Bethesda Manor; Seabridge Waste Treatment Plant
- Facility within 0.5 mile with highest Composite Risk: Bethesda Manor
- Numeric storm-related risks for this facility: Flood: 6.8 Wind: 8 Surge: 4 Erosion: 0 Combined: 18.8
- Natural Hazard Summary Risk on land immediately adjacent to this facility: Moderately-High
- Land uses or land cover are found within a 0.5 mile radius of this facility: Urban, Forest, Wetland, Barren Land

Ask students to discuss what measures could be taken to reduce vulnerability to natural hazards. You may want to have students research appropriate preparation and response for selected hazards, particularly if students' own communities are at risk from one or more of these hazards.

The Bridge Connection

The Bridge is a growing collection online marine education resources. It provides educators with a convenient source of useful information on global, national, and regional marine science topics. Educators and scientists review sites selected for the Bridge to insure that they are accurate and current.

http://www.vims.edu/bridge/ - In the "Site Navigation" menu on the left, click on "Ocean Science Topics," then "Atmosphere," for links to information and activities related to a variety of coastal hazards including flooding, erosion, hurricanes, and tsunamis.

The "Me" Connection

Have students write a brief essay describing the extent to which potential risk from natural hazards might influence their choice of a community in which to live, and which natural hazards they consider to be most dangerous to residents.

Extensions

1. Use information on risk and vulnerability assessments (RVAs) at http://www.csc.noaa.gov/rvat/hazid.html to develop a detailed RVA for a selected community.

2. Have students research what might be done to reduce vulnerability to selected natural hazards.

Resources

http://www.educationworld.com/a_lesson/lesson/lesson015.shtml – Education World article with ideas and Web links for hurricane-related classroom activities.

http://www.miamisci.org/hurricane/index.html — Miami Museum of Science Web page, "Hurricane: Storm Science," including how storms happen, how storms are tracked, and how to make a weather station.

http://www.cln.org/themes/hurricanes.html – The Community Learning Network's Hurricanes Theme Page with links to curricular resources and instructional materials (lesson plans) on the topic of hurricanes.

http://hurricane.csc.noaa.gov/hurricanes/pop.jsp — NOAA's Coastal Services Center Coastal Population Tool

National Science Education Standards

Content Standard B: Physical Science

- Motion and Forces

Content Standard D: Earth and Space Science

- Energy in the Earth system

Content Standard E: Science and Technology

- Abilities of technological design
- Understandings about science and technology

Content Standard F: Science in Personal and Social Perspectives

- Personal and community health
- Population Growth
- Natural resources
- Environmental quality

- Natural and human-induced hazards
- Science and technology in local, national, and global challenges

Ocean Literacy Essential Principles and Fundamental Concepts

Essential Principle 3. The ocean is a major influence on weather and climate.

- Fundamental Concept a. The ocean controls weather and climate by dominating the Earth's energy, water and carbon systems.

- Fundamental Concept b. The ocean absorbs much of the solar radiation reaching Earth. The ocean loses heat by evaporation. This heat loss drives atmospheric circulation when, after it is released into the atmosphere as water vapor, it condenses and forms rain. Condensation of water evaporated from warm seas provides the energy for hurricanes and cyclones.

- Fundamental Concept c. The El Niño Southern Oscillation causes important changes in global weather patterns because it changes the way heat is released to the atmosphere in the Pacific.

Essential Principle 6. The ocean and humans are inextricably interconnected.

- Fundamental Concept a. The ocean affects every human life. It supplies freshwater (most rain comes from the ocean) and nearly all Earth's oxygen. It moderates the Earth's climate, influences our weather, and affects human health.

- Fundamental Concept d. Much of the world's population lives in coastal areas. Fundamental Concept f. Coastal regions are susceptible to natural hazards (such as tsunamis, hurricanes, cyclones, sea level change, and storm surges).

Essential Principle 7. The ocean is largely unexplored.

- Fundamental Concept e. Use of mathematical models is now an essential part of ocean sciences. Models help us understand the complexity of the ocean and of its interaction with Earth's climate. They process observations and help describe the interactions among systems

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Do You Want To Risk It?

Student Worksheet: Coastal Hazards Vulnerability Assessment

In this exercise, you will use online tools to gather information about the vulnerability of coastal communities to storm hazards.

Use the following tools to obtain information about your assigned community:

- National Ocean Service Coastal Population Tool (http://hurricane.csc.noaa.gov/hurricanes/pop.jsp)
- NOAA's Coastal Services Center's Risk and Vulnerability Assessment Tool (RVAT) (http://www.csc.noaa.gov/rvat/)

1. First, let's look at the National Ocean Service Coastal Population Tool (CPT). From the CPT home page, enter a state and then a county in the appropriate boxes, then click "Submit." A graph will appear showing population trends in ten-year intervals. The graph also shows when hurricanes and severe storms occurred in the county. Now use the Coastal Population Tool to answer the following questions about your two assigned counties:

    a. What was the year of occurrence for any hurricane of category 3 or stronger since 1970?

    b. Does there seem to be any trend in how often these hazards occur?

    c. What is the population trend in this community since 1970?

2. Next, let's explore a few features of the RVAT. From the RVAT home page, click on the link to the Hazards Locator Tool. Enter the following information on the left side of the page:

    County: Volusia
    Street: 5400 Landis Avenue
    Zip Code: 32129

    Click the "Locate Address" button. Shortly, the page should reload with a map showing the location of this address, which turns out to be in Harbor Oaks, FL. On the left side of the page is a box titled "Potential Risk Level" that describes the risk from storm-related floods, wind, surge, and erosion. If you aren't sure what these terms mean, click the "About Hazards" button below the risk level box.

    At the top of the map are tool buttons for zooming in and out (magnifying glass with a plus or minus symbol), panning the map (hand symbol), and getting information about a particular feature (the "i" symbol, which stands for "Identify"). The tool on the far left (two overlapping rectangles) shows or hides the small map in the upper left corner that shows the location of the address within Volusia and Brevard Counties.

    Above the risk level box are tab buttons labeled "Legend," "Find," "Results," "Print," "Help," and "Info." Click on "Help" for more information about these tabs. The "Legend" tab is particularly important. RVAT maps are based on a Geographic Information System (GIS), which is a computer-based system that can be used to organize and analyze information about specific geographic locations. Data about these locations are stored in "layers," with each layer containing a specific type of data. A GIS allows researchers to manipulate and analyze these layers one-by-one or in combination with other layers. One of the most powerful features of a GIS is the ability to display information graphically - especially on maps - which often makes it much easier to understand relationships between locations.

    Click on the "Legend" tab, and the risk level box will be replaced with a list of data layers available for the map (cities, railroads, bridges, etc.) and buttons that allow you to control which layers are visible, see what the map symbols mean, and control which layer is "activated" for the Identify tool. A description of these buttons is listed under "Legend Help" at the bottom of the frame. The small square

button with either a plus or minus sign is used to show the map symbols for each type of data. Click on the small square button to the left of "CIty," and you will see that cities on the map are indicated by a small blue circle. Click on the small square button to the left of "Bridge," and you will see that bridges on the map are indicated by a yellow line.

The larger square buttons control which layers are visible. If there is a check in one of these boxes, that layer should be visible on the map (of course, if the mapped area doesn't contain a certain feature then you won't see the symbol for that feature on the map even if the data layer button is checked). Below the layer list is a "Refresh Map" button, and below that is a box labeled "Auto Refresh." If "Auto Refresh" is checked, then the map will automatically re-draw each time you click on one of the large square buttons. Click on the "Auto Refresh" box so that it is not checked. Now click on the larger square buttons so that only the square box next to "HLT Layer" is checked. Click on the "Refresh Map" button and the map will re-draw so that only the searched location is visible on a blue background. Click on the large square box next to to "Road," then click the "Refresh Map" button and the map will re-draw so that roads are once again visible.

The round buttons control which layer is "active;" only one layer can be active at a time. To see what this means, let's load the map with a different set of layers that contain data about critical facilities ("critical facilities" are locations that may be important during an emergency, such as shelters, fire stations, hospitals, etc.). On the right side of the RVAT page is a list of available datasets ("Observations and Forecasts," "Hazards," "Critical Facilities," etc.). Click on "Critical Facilities." In a few moments the map will re-draw and a new layer list will appear on the left side of the page. Notice that the data layers are arranged in several folders. To see which layers are in a particular folder, click on the file folder symbol. The "CriticalFacilityLayers" folder should be open, showing the names of the 17 layers in that folder. The large square box next to "Composite Critical Facility Risk" should be checked, indicating that this data layer is visible. Click on the small square box next to "Composite Critical Facility Risk" to show the symbols used. Each of the colored circles on the map corresponds to the location of a specific "critical facility." The color of the circle indicates the combined risk from storm-related floods, wind, surge, and erosion. The risk from each of these hazards is estimated on a numeric scale, and then the individual risk values are added together to find the "Composite Critical Facility Risk" (Table 1 below).

The map shows about ten yellow circles, which indicate critical facilities that have a "moderate" composite risk. To find out more about these facilities, click on the round button next to "Composite Critical Facility Risk" to make that layer active, then click the "Identify" ("i" symbol) button on top of the map. When you move your cursor over the map, and cross-hair symbol will appear. Put the cross-hair over the yellow circle near Landis Avenue and click once. The layer list to the left of the map should be replaced by a horizontal table containing information about the facility corresponding to the dot near Landis Avenue, including the name of the facility, address, latitude and longitude, and emergency functions performed at the facility. Near the right side of the table you will find the individual risk values for floods, wind, surge, and erosion.

Other types of information are contained in other datasets. Clicking on the link to the "Hazards" dataset will produce a map that is shaded to show the "Natural Hazard Summary Risks" which are the combined risks from storm-related floods, wind, surge, and erosion (similar to the Composite Critical Facility Risk, except for the entire land area of the map instead of specific facilities). The "Societal" dataset contains information on areas with various social needs. The "Economic" dataset includes information on various types of businesses and land use. The "Environmental" dataset has information about areas with high ecological value or that may pose environmental threats during a storm (such as facilities that store oil or hazardous chemicals). The "Mitigation Opportunities" dataset has information on areas that have experienced high losses in previous storms, or that are particularly susceptible to such losses (such as mobile homes).

3. Now that you a somewhat familiar with the RVAT, use this tool to answer the following questions about your assigned location in Volusia County or Brevard County:

    a. What critical facilities are within a 0.5 mile radius of the assigned search address?

    b. Which facility has the highest Composite Risk?

    c. What are the numeric risks from storm-related floods, wind, surge, and erosion for this facility? What is the numeric value of the combined risk?

    d. What is the Natural Hazard Summary Risk on land immediately adjacent to this facility?

    e. What land uses or land cover are found within a 0.5 mile radius of this facility?

Do You Want To Risk It?

Table 1: Numeric Scales Used to Describe Risk from Storm-Related Hazards

Flood Risk

8.5 = High (areas in the "Velocity" zone)
6.8 = Moderately-High (areas in the 100-year floodplain)
5.1 = Moderate (areas in the 500-year floodplain)
3.4 = Moderately-Low (flood-prone soils outside above areas)
1.7 = Low (other areas)

Wind Risk

8 (areas likely to experience winds of 120 mph or higher)
6.4 (areas likely to experience winds of 110 – 119 mph)
4.8 (areas likely to experience winds of 100 – 109 mph)

Surge Risk

4 (Storm surge category 1 and 2)
3 (Storm surge category 3)
2 (Storm surge category 4 and 5)

1 (Storm surge buffer (0.25 mile from entire surge coverage)
0 (outside surge area)

Erosion Risk

3.3 (Seaward of the CCCL*)
2.2 (CCCL to 30-year average erosion line)
1.1 (30-year average to 50-year average erosion line)
0 (other areas)
99 = No data available

Composite Risk

High = Combined flood, wind, surge, and erosion values of 19.7 - 23.8
Moderately-high = Combined flood, wind, surge, and erosion values of 16.3 - 19.7
Moderate = Combined flood, wind, surge, and erosion values of 14.3 - 16.3
Moderately-low = Combined flood, wind, surge, and erosion values of 11.0 - 14.3
Low = Combined flood, wind, surge, and erosion values of 4.8 - 11.0

** - The Coastal Construction Control Line (CCCL) defines the zone along the coastline that is susceptible to flooding, erosion, and other impacts during a 100-year storm. Properties located seaward of the CCCL are subject to State-enforced elevation and construction requirements.*