Cape Cod Strong: Meeting the Challenges of Coastal Storms

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(WHOI Sea Grant & Cape Cod Cooperative Extension)

October 1, 2015
Meeting the Challenges of Coastal Storms

Outline:

• ~30 min talk & time for questions

• Practical measures that can protect homeowners, renters, and their families, as well as minimize damage to homes and property from hurricanes, nor’easters, and flooding.

• Pros and cons of various shoreline stabilization techniques
5,000 copies of the handbook were first made available during Hurricane Preparedness Week (May 26 – June 1) and over ½ were distributed that 1st week.
Myth 1: “I survived Hurricanes Bob, Irene and Sandy, so I am sufficiently prepared.”

Myth 2: “If a disaster occurs, it won’t be that bad.”

Myth 6: “My house survived Hurricanes Bob and Sandy, so I do not need to retrofit for hurricanes.”

Things You Can Do to Prepare

• Gather emergency supplies

• Compile an evacuation kit

• Create an evacuation plan for both a flood and a coastal storm

• Know your property and take appropriate action

• Know your house and take appropriate action

• Don’t gamble with your house

• Gather emergency supplies

• Compile an evacuation kit

• Create an evacuation plan for both a flood and a coastal storm

• Know your property and take appropriate action

• Know your house and take appropriate action

• Don’t gamble with your house
Shelter

In place or at a designated shelter?
Arrangements for pets? Medicine?
The Severity of the Hazard Event

Your Location

How and When Your House Was Built

How Your House is Maintained

How You Strengthen Your House

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Retro-fitting

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hurricane clips
bracing - polyurethane foam
Table 4-1. Pros and Cons of Various Types of Window Protection

<table>
<thead>
<tr>
<th>Type of Protection</th>
<th>Pros</th>
<th>Cons</th>
<th>Approx. Cost for 3' x 4' Window Protection (2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roll-down Shutters</td>
<td>Easiest to deploy; Good overall protection, especially from wind-driven rain</td>
<td>Most expensive of permanent shutter systems; Motorized versions need manual backup for power outages or an emergency power source</td>
<td>$360 to $600</td>
</tr>
<tr>
<td>Accordion Shutters</td>
<td>Easily deployed; Simple manual operation; Good overall protection; Modest cost</td>
<td>Possible aesthetic issues</td>
<td>$300 to $360</td>
</tr>
<tr>
<td>Bahama Shutters</td>
<td>Easily deployed; Good protection; Provides shade</td>
<td>Blocks some light and view</td>
<td>$360 to $480</td>
</tr>
<tr>
<td>Storm Panels</td>
<td>Strong; Removable; Relatively inexpensive permanent shutter system; Good protection for the costs</td>
<td>Manual deployment required; Requires adequate space for storage when not in use</td>
<td>$144 to $168</td>
</tr>
<tr>
<td>Stainless Steel Impact Screens</td>
<td>Always in place; Provides shade.</td>
<td>Some aesthetic impact; Emergency escape issues must be considered; Less effective for wind-driven rain</td>
<td>$375 to $750</td>
</tr>
<tr>
<td>Flat Impact Polycarbonate Units</td>
<td>Always in place; Minimal aesthetic impact</td>
<td>Emergency escape issues must be considered; Care must be taken in cleaning</td>
<td>$375 to $525</td>
</tr>
<tr>
<td>Fabric Windscreen (Direct Mount)</td>
<td>Inexpensive; Easy to handle and store</td>
<td>Manual deployment required; Greater shutter deflection than metal systems</td>
<td>$105 to $180</td>
</tr>
<tr>
<td>Impact Resistant Windows and Doors</td>
<td>Attractive and energy efficient; Provides security protection and storm resistance; Always in place; Many styles and options</td>
<td>Costs vary widely and can be high; Replaces existing windows or doors; Glass can still break requiring expensive replacement</td>
<td>Wide range in costs: $360 to $600 and higher</td>
</tr>
<tr>
<td>Plywood</td>
<td>Materials readily available; Easy to install on lower levels; Inexpensive</td>
<td>Not as strong as some other shutter systems; Manual deployment is difficult on upper levels; Must be properly stored; Doesn't provide impact-resistance for winds &gt; 130 mph</td>
<td>$25 to $35 for materials only</td>
</tr>
<tr>
<td>Laminates</td>
<td>Storm, security and UV protection; Energy efficient; Always on; Allows light in; Ideal for hard-to-reach windows</td>
<td>Other systems are stronger; Need to lock laminate to frame; Frame must be strong; Window may need replacement after storm</td>
<td>$180 to $204</td>
</tr>
<tr>
<td>Plastic honeycomb</td>
<td>Strong system; Lightweight; Reasonable cost; Won't warp or rot</td>
<td>Storage of panels; Time to create and deploy. While cost is reasonable, still most expensive of deployable systems; Materials difficult to obtain</td>
<td>$140 to $170</td>
</tr>
</tbody>
</table>
Pre-Disaster Activities

Protect Your Home from Damage
Communicate with Your Insurance Agent

CRS Across Barnstable County

<table>
<thead>
<tr>
<th>Date</th>
<th>Policies In-force</th>
<th>Written Premium In-force</th>
<th>10% Savings</th>
<th>15% Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/30/2014</td>
<td>10,474</td>
<td>$15,487,001</td>
<td>$1,548,700</td>
<td>$2,323,050</td>
</tr>
<tr>
<td>2/28/2015</td>
<td>12,350</td>
<td>$17,101,036</td>
<td>$1,710,104</td>
<td>$2,565,155</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,876</td>
<td>$1,614,035</td>
<td>$161,404</td>
</tr>
</tbody>
</table>

10 months later: 2,000 more people have policies
$160,000 more to be saved
Table 6-1. Summary of observed and documented current climate trends in the Northeast region.

<table>
<thead>
<tr>
<th>Climate Change Variable</th>
<th>Current Trend in the Northeast Region</th>
<th>What This Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Temperature</td>
<td>Since 1900, the annual mean temperature has risen 1.5°F, with more rapid increases occurring over the past few decades (2°F since 1970).</td>
<td>Longer, hotter summers increasing drought potential and human health effects.</td>
</tr>
<tr>
<td>Ocean Water Temperature</td>
<td>Annual average temperatures in the waters off the southern New England coast have increased by 2.2°F since the 1970s.</td>
<td>Change in species composition and dynamics. Decline of some fish species while other southern species increase. Potential for more harmful algal blooms and invasive species.</td>
</tr>
<tr>
<td>Precipitation and Weather</td>
<td>Studies have found a 5 to 17 percent increase in regional precipitation during roughly the last 100 years.</td>
<td>More rainfall in more intense storms means increased risk of flooding. Less snow in winter.</td>
</tr>
<tr>
<td>Storminess</td>
<td>Hurricane intensity in the western North Atlantic Ocean has increased.</td>
<td>Increased erosion and damage to roads, bridges, buildings. Interruption of business.</td>
</tr>
<tr>
<td>Sea-Level Rise</td>
<td>Rates of local relative sea-level rise are variable across the Northeast region. Sea level in Massachusetts has risen 11 inches over the past 100 years.</td>
<td>Increased flooding. Loss of waterfront property and impacts to public access.</td>
</tr>
</tbody>
</table>
Massachusetts

Coastal Storms
Floods
Drought/Extreme Heat
Sea-Level Rise
Appendix B — Shelter Information

When an emergency situation requires shelter access, through local and state shelter systems, the Massachusetts Division of Community Services (MACS) offers a variety of resources to assist individuals and families. MACS maintains a statewide shelter database accessible online, which lists all available shelters and contact information. Individuals can search for shelters by location, type of service, and available amenities.

Shelter planning is an important aspect of emergency preparedness. Community members, schools, and other organizations should be familiar with local shelter resources. MACS provides guidance on creating detailed shelter plans to ensure that everyone knows where to go in times of need.

Shelter locations are continually updated, and individuals are encouraged to check for the latest information. MACS maintains a website where residents can access the most current shelter information. The site also features a searchable database of shelters, including contact information and available services.

Appendix C — Construction at the Coast, Beach Management, and Coastal Property Checklist

When planning or constructing on coastal areas, it's essential to consider the unique challenges and regulations associated with coastal property. This checklist provides guidance on aspects such as erosion control, water quality, and coastal access.

Erosion control is crucial for protecting coastal properties. Measures like dunes, sea walls, and seaweed can help mitigate erosion and preserve the natural beauty of the coastline. Landscaping practices, such as planting native species and maintaining proper drainage, are also important considerations.

Water quality and pollution prevention are vital for maintaining the health of coastal ecosystems. Proper waste disposal and stormwater management practices help prevent pollution from entering coastal waters. Local regulations often dictate specific guidelines for coastal development to ensure water quality.

Coastal access is a critical issue for many coastal residents. Access points should be designed to accommodate recreation and tourism while minimizing environmental impact. Beach access should be easily accessible, and public schools should be incorporated into beachfront developments to enhance educational opportunities.

Endnotes

1. N/A

Aronyms and Acronyms

Appendix D — Glossary

Useful Links and Resources

Appendix E — Bibliography

Appendix F — Acknowledgments

Appendix G — Index

Appendix H — Resources for Further Information

Appendix I — Legal Notices
Dealing With Erosion: The Spectrum of Coastal Erosion Control Methods
The Spectrum of Coastal Erosion Control Methods

Do nothing

1. Will system recover by itself?

2. How far is the structure from the water?

3. Grandfathering protects structures (not lawn) before August 10, 1978

Photo Credit: Ann McNichol
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation

**Plant Natives:**
- Root systems stabilize.
- Take up water.
- Break the impact of raindrops or wave-splash.
- Slow down runoff

**Remove Invasive**
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
- Managed retreat
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- **Beach nourishment = Fill of a CRA**

**Sacrificial**

**Cobble (Mixed)**
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment

Popponesset Beach

Before

After

South Cape Beach

Repair

Repair
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- **Sand fencing**
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls

Diameter 12”-20”
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls
- **Coir Envelopes**
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls
- **Coir Envelopes**

Photo Credit: 2Fathom
Do nothing
Vegetation
Re-grade
Managed retreat
Beach nourishment
Sand fencing
Fiber rolls
Coir Envelopes
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls
- Coir Envelopes

**C E S**

**WPA:** Coastal engineering structure means, but is not limited to, any breakwater, bulkhead, groin, jetty, revetment, seawall, weir, riprap or any other structure that is designed to alter wave, tidal or sediment transport processes in order to protect inland or upland structures from the effects of such processes.
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls
- Coir Envelopes
- Groin

C E S

notch
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls
- Coir Envelopes
- Groin
- Jetty

Source: MORIS: CZM's Online Mapping Tool
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
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- Beach nourishment
- Sand fencing
- Fiber rolls
- Coir Envelopes
- Groin
- Sand Bags
- Jetty
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
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- Sand fencing
- Fiber rolls
- Coir Envelopes
- Groin
- Sand Bags
- Gabion
- Jetty

Gabion (10-20 yrs)
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls
- Coir Envelopes
- Groin
- Sand Bags
- Gabion
- Breakwater / Sill
- Jetty
The Spectrum of Coastal Erosion Control Methods

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- Breakwater
- Revetment
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- Jetty
The Spectrum of Coastal Erosion Control Methods

- Do nothing
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C E S

- Groin
- Sand Bags
- Gabion
- Breakwater / Sill
- Revetment
- Seawall
- Jetty
- Bulkhead
The Spectrum of Coastal Erosion Control Methods

How the “Spectrum” could be used:

Notice of Intent (NOI) →→→→ Alternative Analysis

...start at top and move down, explaining why each one isn’t suitable.
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
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- Groin
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- Gabion
- Breakwater / Sill
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- Seawall
- Bulkhead

*Not a complete list (and methods are being invented/modified)*
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
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- Not a complete list (and methods are being invented/modified)

- With revetments...if neighbors don’t do the same then you’ll have to keep extending return.
The Spectrum of Coastal Erosion Control Methods

- Do nothing
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- Coir Envelopes

• Not a complete list (and methods are being invented/modified)

• With revetments...if neighbors don’t do the same then you’ll have to keep extending return.

• Very few projects only employ 1 method, and when we are determining if it’s a CES we need to use the “hardest” aspect of the project.
The Spectrum of Coastal Erosion Control Methods

- Do nothing
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- Sand Bags
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- Breakwater / Sill
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- Jetty
- Seawall
- Bulkhead

Combination
The Spectrum of Coastal Erosion Control Methods

- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- **Fiber rolls**
- Coir Envelopes

**Combination**

- Groin
- Sand Bags
- Gabion
- Breakwater / Sill
- Revetment
- Seawall
- Bulkhead
<table>
<thead>
<tr>
<th>Coastal Erosion Control Methods</th>
</tr>
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<tbody>
<tr>
<td>Do nothing</td>
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The Spectrum of Coastal Erosion Control Methods

↑ Resilience ≠ ↓ Natural Systems

Thank you