Full Strategy Listing:

1. MANAGED REALIGNMENT
2. MANAGED RELOCATION
3. CONSERVATION EASEMENTS/RESTRICTIONS
4. ROLLING CONSERVATION EASEMENTS
5. TRANSFER OF DEVELOPMENT CREDIT (TDC) / TRANSFERABLE DEVELOPMENT RIGHTS (TDR)
6. INCORPORATE WETLAND, DRAINAGE SYSTEM AND BUFFER ZONE PROTECTION INTO INFRASTRUCTURE DEVELOPMENT PLANNING
7. REGULATION OF DEVELOPMENT
8. LAND PURCHASE TO MAINTAIN UNDEVELOPED LAND
9. UNDEVELOPMENT OF LAND
10. REGIONAL SEDIMENT MANAGEMENT (RSM) PLAN
11. BEACH NOURISHMENT
12. SAND FENCING
13. BANK OR DUNE STABILIZATION WITH VEGETATION
14. BANK STABILIZATION - FIBER/COIR ROLL
15. BANK STABILIZATION - COIR ENVELOPES
16. SAND BYPASS SYSTEM
17. LIVING SHORELINE: VEGETATION ONLY
18. LIVING SHORELINE: COMBINED VEGETATION AND STRUCTURAL MEASURES
19. LIVING SHORELINE: LIVING BREAKWATER / OYSTER REEFS
20. GEOTEXTILE SAND BAGS/GEOTUBES
21. GABION
22. BREAKWATER/DETACHED BREAKWATER
23. SILL
24. GROIN
25. REVETMENT
26. SEAWALLS
27. BULKHEAD
28. JETTY
29. WAVE ATTENUATOR
30. FRESHWATER WETLAND RESTORATION
31. SALT MARSH RESTORATION
32. BARRIER BEACH OR SPIT PROTECTION
33. DUNE RESTORATION/CREATION
34. SEAGRASS BEDS
35. HURRICANE BARRIER
36. LEVEE
37. STRUCTURE ELEVATION
38. DIKE
39. DAM
40. RETROFITTING STRUCTURES FOR FLOOD MITIGATION
41. DESALINATING GROUNDWATER
42. WATER RESTRICTIONS
43. STORMWATER MANAGEMENT
44. RETROFITTING EXISTING UTILITIES AND ROADWAYS
**ADAPTATION STRATEGIES SUMMARY FACT SHEETS**

**Resilient Cape Cod Stakeholder Process - DRAFT - February 2018**

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**Strategy:**

**Managed Realignment**

**Description:** Intentionally exposing a coastal area by removing or altering existing manmade shoreline structures such as bulkheads, revetments, seawalls, and/or coir logs in order to create or expand intertidal habitats that can provide more natural flood protection.

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**Strategy:**

**Managed Relocation**

**Description:** Moving development and infrastructure away from the coastline and out of harms way.

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**Strategy:**

**Conservation Easements/Restrictions**

**Description:** The conservation of public or private property through a legally-binding agreement to preserve undeveloped land. Property owners sell, or otherwise transfer, the right to develop their land to a conservation entity in exchange for a tax benefit.
### Rolling Conservation Easements

**Description:** Private property owners sell or otherwise transfer portions of their land abutting an eroding coastline in exchange for a tax benefit. Rolling easements allow for limited development of upland areas of the property, and restrict development and/or the construction of erosion control structures along the shoreline. Use of the property thus “rolls” with the changing tide line.

<table>
<thead>
<tr>
<th>Site</th>
<th>Neighborhood</th>
<th>Community</th>
<th>Regional</th>
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### Transfer of Development Credit/Transferable Development Rights (TDR)

**Description:** TDR is a land use mechanism that encourages the permanent removal of development rights in defined “sending” districts, and allows those rights to be transferred to defined “receiving” districts. The system relies on market forces to redistribute development potential from vulnerable or sensitive areas toward areas with appropriate infrastructure to accommodate increased development potential.

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### Incorporate Wetland, Drainage System and Buffer Zone Protection into Infrastructure Development Planning

**Description:** Including protection of existing wetland, drainage system and buffer zone resources in planning will protect them from development impacts preserving them as a natural defense system.

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<tr>
<th>Site</th>
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Regulation of Development

**Description:** Creating policies to limit development in areas that are being negatively impacted.

**Strategy:**
- **Protect**
- **Accommodate**
- **Retreat**

**Scale:**
- Site
- Neighborhood
- Community
- Regional

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Land Purchase to Maintain Undeveloped Land

**Description:** Town, land trust or private entity purchasing land to limit or prevent development at that site to maintain open space and preserve the natural defense system.

**Strategy:**
- **Protect**
- **Accommodate**
- **Retreat**

**Scale:**
- Site
- Neighborhood
- Community
- Regional

---

Undevelopment of Land

**Description:** Removing development from an existing location by land purchase, flood insurance buy-out programs, or other means.

**Strategy:**
- **Protect**
- **Accommodate**
- **Retreat**

**Scale:**
- Site
- Neighborhood
- Community
- Regional
### Regional Sediment Management Plan

**Description:** Regional coordination of sediment (sand) management efforts along the coastline instead of focusing on individual site by site or town by town sediment management.

**Scale:**
- Site
- Neighborhood
- Community
- Regional

**Strategies:**
- Protect
- Accommodate
- Retreat

### Beach Nourishment

**Description:** The process of adding sediment (sand) to an eroding beach to widen or elevate the beach to maintain or advance the shoreline seaward. Sediment can be sourced from inland mining, dredging from navigation channels, and/or offshore mining.

**Scale:**
- Site
- Neighborhood
- Community
- Regional

**Strategies:**
- Protect
- Accommodate
- Retreat

### Sand Fencing

**Description:** Strategically placing wooden fencing, ideally coupled with beach grass, along an impaired dune to restore it or create new dunes. The wooden fencing and beach grass catches wind-blown sand and regenerates the dune.

**Scale:**
- Site
- Neighborhood
- Community
- Regional

**Strategies:**
- Protect
- Accommodate
- Retreat
**Bank or Dune Stabilization with Vegetation**

**DESCRIPTION:** Planting salt-tolerant plants with extensive root systems along the dunes to prevent erosion. Dune stabilization helps anchor sand and provide a buffer to protect inland areas from waves, flooding and erosion.

**SCALE:**

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<th>Site</th>
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<th>Regional</th>
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**ADDRESSES THE FOLLOWING HAZARDS:**

- Sea Level Rise
- Storm Surge
- Erosion

**Bank Stabilization: Fiber/Coir Roll**

**DESCRIPTION:** Cylindrical rolls, 12-20 inches in diameter & 10-20 feet long, made of coir (coconut fiber) fiber held together by a fiber mesh, covered with sand, and are planted with salt-tolerant vegetation with extensive root systems. These reinforced banks act as physical barriers to waves, tides, and currents. The rolls typically disintegrate over 5-7 years to allow plants time to grow their root systems to keep sand and soil in place.

**SCALE:**

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</table>

**ADDRESSES THE FOLLOWING HAZARDS:**

- Sea Level Rise
- Storm Surge
- Erosion

**Bank Stabilization: Coir Envelopes**

**DESCRIPTION:** Envelopes are constructed of coir (coconut fiber) fabric and are filled with local sand. The envelopes are placed in terraces along the beach, are typically covered with sand, and may also be planted with native vegetation to hold sand together and absorb water.

**SCALE:**

<table>
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<th>Site</th>
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<th>Community</th>
<th>Regional</th>
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</thead>
</table>

**ADDRESSES THE FOLLOWING HAZARDS:**

- Sea Level Rise
- Storm Surge
- Erosion
### Sand Bypass System

**DESCRIPTION:** Where a jetty or groin has interrupted the flow of sediment along the beach, sand may be moved hydraulically or mechanically from the accreting updrift side of an inlet to the eroding down-drift side.

### Living Shoreline: Vegetation Only

**DESCRIPTION:** Shoreline stabilization techniques along estuarine coasts, bays, sheltered coastlines, and tributaries. A living shoreline has a footprint that is made up mostly of native material. It incorporates vegetation or other living, natural “soft” elements alone or in combination with some other type of harder shoreline structure (e.g. oyster reefs or rock sills) for added stability. Using vegetation alone is one approach. Roots hold soil in place to reduce erosion. Provides a buffer to upland areas and breaks small waves.

### Living Shoreline: Combined Vegetation and Structural Measures

**DESCRIPTION:** Living Shoreline Combined Vegetation and Structural Measures. Shoreline stabilization techniques along estuarine coasts, bays, sheltered coastlines, and tributaries. A living shoreline has a footprint that is made up mostly of native material. It incorporates vegetation or other living, natural “soft” elements alone or in combination with some other type of harder shoreline structure (e.g. oyster reefs or rock sills) for added stability. A combined approach integrates living components, such as plantings, with strategically placed structural elements, such as sills, or breakwaters.
### Living Shoreline: Living Breakwater/Oyster Reefs

**Description:** Shoreline stabilization techniques along estuarine coasts, bays, sheltered coastlines, and tributaries. A living shoreline has a footprint that is made up mostly of native material. It incorporates vegetation or other living, natural “soft” elements alone or in combination with some other type of harder shoreline structure (e.g. oyster reefs or rock sills) for added stability. Restoring or creating oyster reefs or reef balls to serve as natural breakwaters, attenuate wave energy, and slow inland water transfer.

### Geotextile Sand Bags/Geotubes

**Description:** Geotextile sand bags are usually made of polyethylene bags or fabric and are filled with sand, stacked along the edge of an impaired bank, and then buried with sand.

### Gabion

**Description:** Baskets made of a steel mesh that are filled with rocks and stacked on top of each other along an eroding bank slope.
### Breakwater/Detached Breakwater

**Description:** Offshore structures intended to break waves, reducing the force of wave action on the shore, and encouraging sediment accretion. Can be floating or fixed to the ocean floor, attached to shore or not, and continuous or segmented. A gapped approach allows for habitat connectivity, greater tidal exchange, and better waterfront access.

**Strategy:**
- Protect
- Accommodate
- Retreat

**Addresses the Following Hazards:**
- Erosion
- Storm Surge
- Sea Level Rise

**Scale:**
- Site
- Neighborhood
- Community
- Regional

### Sill

**Description:** A low elevation structure (typically stones) located in the intertidal zone parallel to shore which is designed to reduce wave energy and stabilize sediment. The area landward of the sill is filled with sand, and may be planted with salt marsh grasses.

**Strategy:**
- Protect
- Accommodate
- Retreat

**Addresses the Following Hazards:**
- Erosion
- Storm Surge
- Sea Level Rise

**Scale:**
- Site
- Neighborhood
- Community
- Regional

### Groin

**Description:** A hard structure projecting perpendicular from the shoreline. Designed to intercept water flow and sand moving parallel to the shoreline to prevent beach erosion, retain beach sand, and break waves. Historical practice. Part of existing shorelines. Ongoing maintenance but few new groins being installed.

**Strategy:**
- Protect
- Accommodate
- Retreat

**Addresses the Following Hazards:**
- Erosion
- Storm Surge
- Sea Level Rise

**Scale:**
- Site
- Neighborhood
- Community
- Regional
### Revetment

**Description:** Sloped wall of boulders constructed along eroding coastal banks designed to reflect wave energy and protect upland structures.

**Strategy:**
- Protect
- Accommodate
- Retreat

**Scale:**

<table>
<thead>
<tr>
<th>Site</th>
<th>Neighborhood</th>
<th>Community</th>
<th>Regional</th>
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</table>

### Seawalls

**Description:** Structures built parallel to the shore with vertical or sloped walls (typically smooth) to reinforce the shoreline against forces of wave action and erosion.

**Strategy:**
- Protect
- Accommodate
- Retreat

**Scale:**

<table>
<thead>
<tr>
<th>Site</th>
<th>Neighborhood</th>
<th>Community</th>
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### Bulkhead

**Description:** Vertical retaining wall structures built parallel to the shoreline to stop wave energy and prevent erosion of coastal banks. Typically made out of timbers, vinyl sheeting, or steel.

**Strategy:**
- Protect
- Accommodate
- Retreat

**Scale:**

<table>
<thead>
<tr>
<th>Site</th>
<th>Neighborhood</th>
<th>Community</th>
<th>Regional</th>
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</thead>
</table>
### Jetty

**DESCRIPTION:** Large structures built perpendicular to the shoreline at tidal inlets to keep the channel open.

### Wave Attenuator

**DESCRIPTION:** A structure anchored to the bottom, where the device sits both above and below the water, and reduces wave energy reaching the shoreline.

### Freshwater Wetland Restoration

**DESCRIPTION:** Protect, restore or create freshwater wetlands within the floodplain to enhance flood storage capacity.
### Salt Marsh Restoration

**Description:** Protecting, restoring, and creating salt marsh as a buffer to storm surges and sea level rise to provide natural flood protection.

**Strategy:** Protect

**Scale:**
- Site
- Neighborhood
- Community
- Regional

### Barrier Beach or Spit Protection

**Description:** Protecting, bolstering, or creating natural barrier beach systems or spits to act as buffers for wave energy.

**Strategy:** Protect

**Scale:**
- Site
- Neighborhood
- Community
- Regional

### Dune Restoration/Creation

**Description:** Restoring existing dunes or creating new dunes to protect the shoreline against erosion and flooding.

**Strategy:** Protect

**Scale:**
- Site
- Neighborhood
- Community
- Regional
<table>
<thead>
<tr>
<th>STRATEGY:</th>
<th>Seagrass Beds</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESCRIPTION:</td>
<td>Protection and restoration of seagrass beds to assist with wave attenuation (wave energy) and to stabilize or slow sediment transport.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STRATEGY:</th>
<th>Hurricane Barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESCRIPTION:</td>
<td>A combination of structures, including dikes and gates, which can be closed against a storm to block flooding.</td>
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<table>
<thead>
<tr>
<th>STRATEGY:</th>
<th>Levee</th>
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</thead>
<tbody>
<tr>
<td>DESCRIPTION:</td>
<td>A ridge or embankment of sand running along a river or stream which is designed to protect adjacent land from flooding from overtopping of the river.</td>
</tr>
<tr>
<td>STRATEGY:</td>
<td>ADDRESSES THE FOLLOWING HAZARDS:</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>Structure Elevation</td>
<td>Sea Level Rise, Storm Surge, Erosion</td>
</tr>
<tr>
<td>DESCRIPTION:</td>
<td>Elevating a structure above base flood</td>
</tr>
<tr>
<td></td>
<td>elevation in order to protect the structure</td>
</tr>
<tr>
<td></td>
<td>from possible flooding.</td>
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<tr>
<td>SCALE:</td>
<td>Site, Neighborhood, Community, Regional</td>
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<tr>
<th>STRATEGY:</th>
<th>ADDRESSES THE FOLLOWING HAZARDS:</th>
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<tbody>
<tr>
<td>Dike</td>
<td>Sea Level Rise, Storm Surge, Erosion</td>
</tr>
<tr>
<td>DESCRIPTION:</td>
<td>An embankment constructed of earth or</td>
</tr>
<tr>
<td></td>
<td>stone to hold back water and flooding</td>
</tr>
<tr>
<td></td>
<td>either from the ocean or a river.</td>
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<tr>
<td>SCALE:</td>
<td>Site, Neighborhood, Community, Regional</td>
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<tr>
<th>STRATEGY:</th>
<th>ADDRESSES THE FOLLOWING HAZARDS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dam</td>
<td>Sea Level Rise, Storm Surge, Erosion</td>
</tr>
<tr>
<td>DESCRIPTION:</td>
<td>A barrier built to hold back water of a</td>
</tr>
<tr>
<td></td>
<td>river, stream or creek and raise its</td>
</tr>
<tr>
<td></td>
<td>level, often for creating a pond or</td>
</tr>
<tr>
<td></td>
<td>reservoir or historically for mills.</td>
</tr>
<tr>
<td>SCALE:</td>
<td>Site, Neighborhood, Community, Regional</td>
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</table>
### Retrofitting Structures for Flood Mitigation

**Strategy:** Structural modifications to a building to reduce flood damage (e.g. wall coatings, waterproofing compounds, flood panels, etc.).

**Description:**

**Protect**

**Accommodate**

**Retreat**

#### Addresses the Following Hazards:

- [ ] Erosion
- [ ] Storm Surge
- [ ] Sea Level Rise

#### Scale:

- Site
- Neighborhood
- Community
- Regional

### Desalinating Groundwater

**Strategy:** Removing salt from the water in the aquifer after it has been inundated with salt water.

**Description:**

**Protect**

**Accommodate**

**Retreat**

#### Addresses the Following Hazards:

- [ ] Erosion
- [ ] Storm Surge
- [ ] Sea Level Rise

#### Scale:

- Site
- Neighborhood
- Community
- Regional

### Water Restrictions

**Strategy:** Placing restrictions on water use to conserve freshwater if the aquifer is moderately-severely inundated with salt water.

**Description:**

**Protect**

**Accommodate**

**Retreat**

#### Addresses the Following Hazards:

- [ ] Erosion
- [ ] Storm Surge
- [ ] Sea Level Rise

#### Scale:

- Site
- Neighborhood
- Community
- Regional
### Stormwater Management

**Description:** Investing in more advanced stormwater management Best Management Practices and Low Impact Development to address increased flooding and intensity of storm events.

**Strategy:** Accommodate

**Scale:**
- Site
- Neighborhood
- Community
- Regional

### Retrofitting Existing Utilities and Roadways

**Description:** Modifying (raising, relocating, waterproofing or putting below ground) existing utilities and roads to make more resilient to flooding.

**Strategy:** Accommodate

**Scale:**
- Site
- Neighborhood
- Community
- Regional