

GAME OF FLOODS : PRESERVATION EDITION



ALEX WESTHOFF, AICP
MARIN COUNTY COMMUNITY DEVELOPMENT AGENCY
CA PRESERVATION FOUNDATION, 4/20/16

AGENDA

10:45 Presentation

11:15 Strategize (Individually)

11:35 Discuss (Small Groups)

12:00 Report Back (large group)

THE GAME OF FLOODS

Marin Island

START

1. To begin, each player reads the sea level rise scenario found on the back of the game board.
2. The goal is to determine who goes first. The highest roll goes first. If a tie occurs, the tied players must re-roll. Players take turns in clockwise order.

3. In turn, each player selects an asset to accommodate, defend, or retreat from. No need to duplicate assets. Use the worksheet provided to record your choice, costs, and pros and cons.
4. Next, in turn, each player places and takes about their preferred adaptation strategies on or around the island. Conflicting strategies are allowed.
5. Consider the following factors to inform the proposal: (1) Costs/funding, (2) Private property impacts, (3) Environmental impacts, (4) Equity/social justice concerns, (5) Others. Use your worksheet to take notes.

Sea Level Rise 2050 Scenario Key

RED AREA = Permanent Sea Level Rise Flooding

YELLOW AREA = Temporary 100-Year Storm Flooding



- Evacuation Route
- Marina
- Mammal Habitat
- Ranch
- Grocery
- Water
- School Site
- Parking
- Hospital
- Storm Shelter
- Gas Station
- Seabird Colony
- Agriculture
- Public Well
- Roadway
- Restaurant
- Library
- Fire Station
- Electrical Sub-Station
- Sewage Lift Station
- Aquaculture
- Sheriff
- Home
- Beach
- Historic Church
- Post Office

LEGEND

Managed Retreat

- Retreat: \$\$\$ | ●
- Move here: \$\$\$ | ●
- Post-storm prohibitions: \$ | ●
- Stricter land use zoning: \$ | ●

Accommodate Water

- Elevate Buildings: \$\$\$ | ●
- Floodable Buildings: \$\$\$ | ●
- Elevate/New Road: \$\$\$ | ●

Hard Engineering

- Revetment/Seawall: \$\$\$ | ●
- Traditional Levee: \$\$\$ | ●
- Tide Gate: \$\$\$ | ●
- Wall & Pump Station: \$\$\$ | ●

Soft Engineering

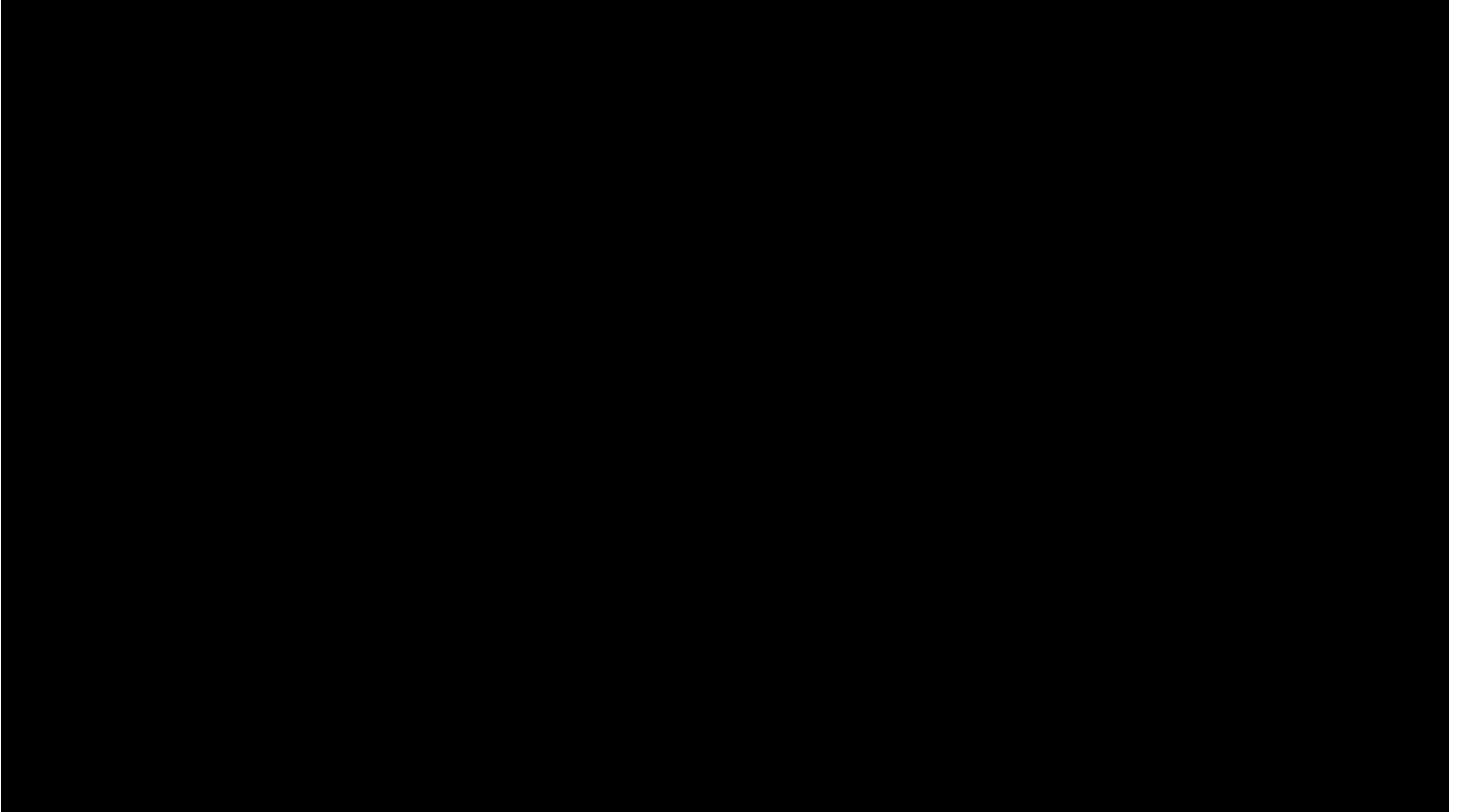
- Horizontal Levee: \$\$\$ | ●
- Wetland/shoreline vegetation: \$\$\$ | ●
- Offshore Structure: \$\$ | ●
- Beach Maintenance: \$\$\$ | ●



GAME PIECES



GAME OF FLOODS: PT. REYES STATION



HIGH SCHOOLS



PRESERVATION EDITION

Advisory assistance provided by:



**National Trust for
Historic Preservation**
Save the past. Enrich the future.™

Changes:

- More urban look and feel
- Increased assets of historical/cultural significance
- Integrity impacts
- Documentation

Developed for:

KEEPING HISTORY ABOVE WATER APRIL 10-13, 2016 | NEWPORT, RI



CALIFORNIA PRESERVATION FOUNDATION

START

THE GAME OF FLOODS

Preservation Edition

- Sea levels are rising, world-wide as warming oceans expand and melt glaciers and ice sheets. Property, infrastructure, public facilities, natural habitats, and other resources we depend on. In the face of these threats, you are tasked with collaboratively developing a Sea Level Rise Adaptation Plan using the strategies (game pieces).
- To begin, one player reads the sea level rise scenario about...
 - players must re-roll. Players take turns in clockwise order.

- In turn, each player selects an asset to accommodate, defend, or retreat from. No need to duplicate assets. Use the worksheet provided to record your choice, costs, and pros and cons around the island. Conflicting strategies are allowed.
- Use the remaining time to finalize the group's proposal by resolving conflicts.
- Environmental impacts (if Equity/social justice concerns, SD-Owners, Use your worksheet to take notes.



LEGEND

GAME PIECES

Accommodate Water

Hard Engineering

Soft Engineering

Managed Retreat

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Documentation

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Sea Level Rise 2050 Scenario Key

RED AREA = Permanent Sea Level Rise Flooding
 ORANGE AREA = Temporary Annual Storm Flooding
 YELLOW AREA = Temporary 100 Year Storm Flooding

Asset Mapping & Inventory

Mapping people; livelihoods; infrastructure, environmental, and economic, social, & cultural assets



Hospital



Parking



School Site



Water



Grocery



Fire Station



Library



Restaurant



Roadway



Revetment



Post Office



Historic Church



Boat Launch



Beach



Historic Seawall



Home



Mammal Habitat



Marina



Landmark



Agriculture



Seabird Colony



Archaeological Site



Lighthouse



Sheriff



Public Open Space

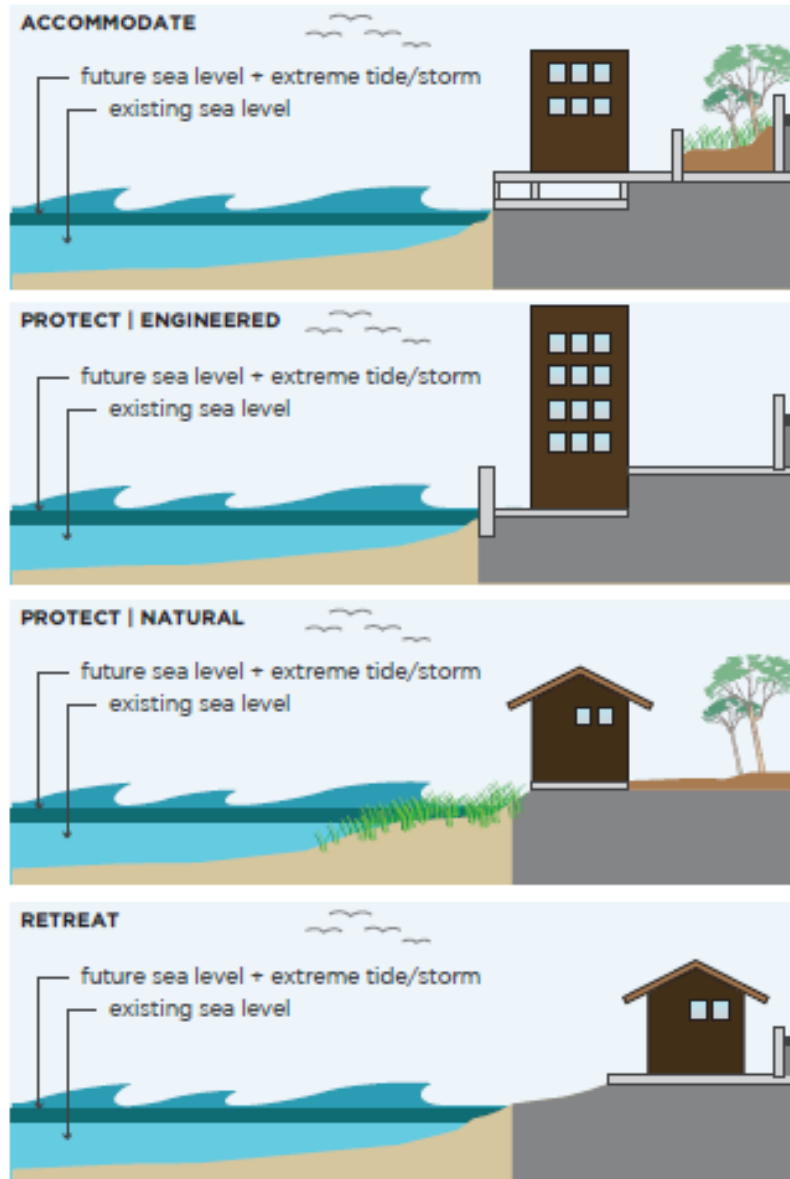


Industrial



Historic Cemetary

INTERVENTION OPTIONS







ADAPTATION MEASURES

PROTECT

Hard Engineering

 Revetment/Seawall \$\$\$ 00 EEE ●	 Tide Gate \$\$\$\$\$ 00 EEE ●
 Traditional Levee \$\$\$\$\$ 00 EEE ●	 Wall & Pump Station \$\$\$ 00 EEE ●

Soft Engineering

 Horizontal Levee \$\$\$\$\$ 0 E ●	 Offshore Structure \$\$ 0 EE ●
 Wetland Restoration \$\$\$ 0 E ●	 Beach Maintenance \$\$\$ 0 EE ●

ACCOMMODATE

Accommodate Water

 Elevate Buildings \$\$\$ 000 EE ●	 Elevate/New Road \$\$\$\$\$ 000 EEE ●
 Floodproof (Dry or Wet) \$ 00 EE ●	 Amphibiate Buildings \$\$ 0 EE ●



RETREAT

Managed Retreat

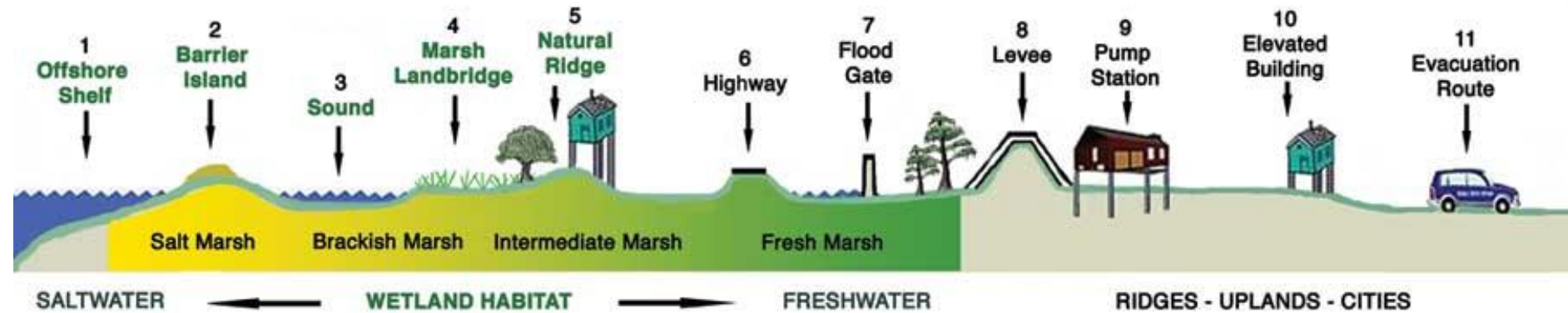
 Abandonment \$ 0000 E ●
 Relocation \$\$\$ 000 EE ●

INVENTORY

Documentation

 HABS \$\$ + 00
 Area Survey \$ + 0

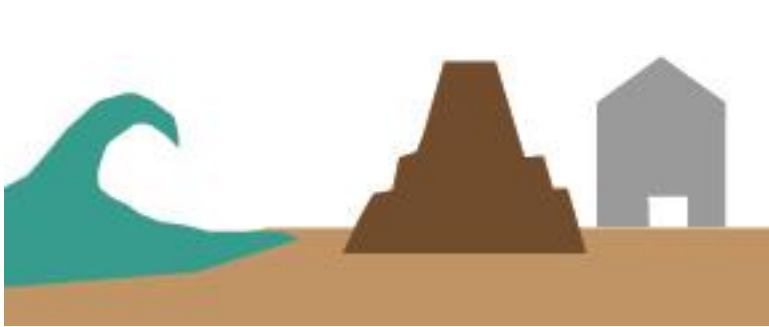
Hybrid Strategies



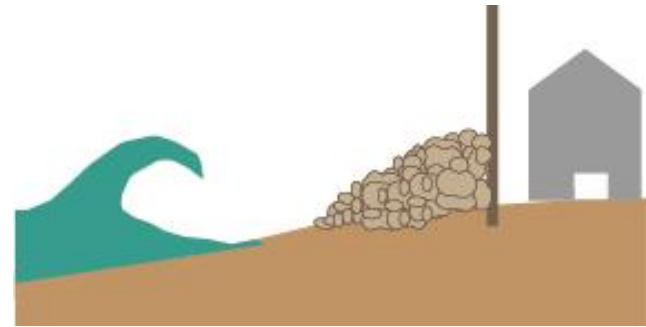
Lopez, John A., 2006, The Multiple Lines of Defense Strategy to Sustain Coastal Louisiana, Lake Pontchartrain Basin Foundation, Metairie, LA January 2006

1. PROTECT

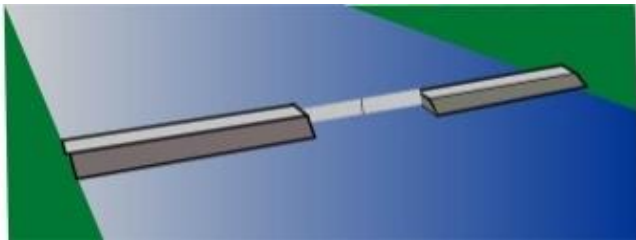
Hard (Traditional) Engineering



Traditional levee



Seawall/Revetment

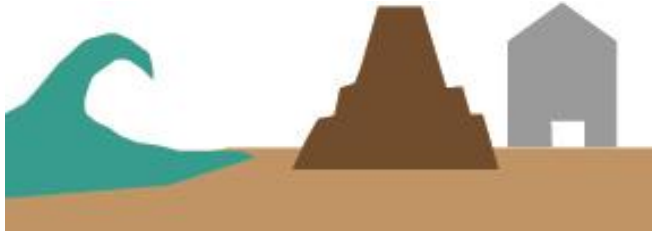


Tidal gate



Wall & Pump
Station

Levee



Costs: High
Integrity Impacts: Medium
Environmental Impacts: High
Effectiveness: Medium to Long Term



*Sacramento-San Joaquin Delta/
Locke*

Seawall

Costs: High
Integrity Impacts: Medium
Environmental Impacts: High
Effectiveness: Medium to Long Term



St. Augustine, FL



Jones Point, Washington D.C.

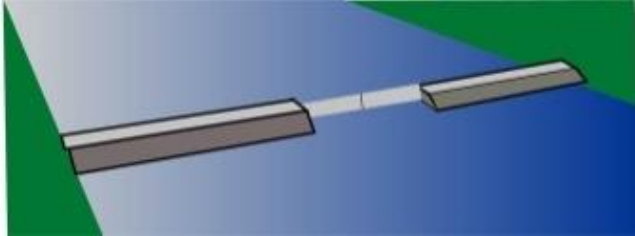
Tidal gate

Costs: Extreme

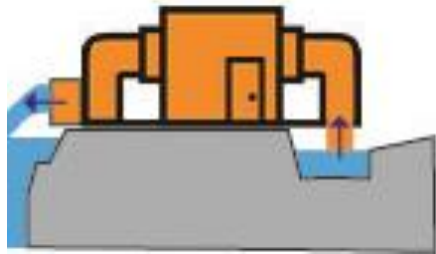
Integrity Impacts: Low to Medium

Environmental Impacts: High

Effectiveness: Long Term



Flood wall & Pump station

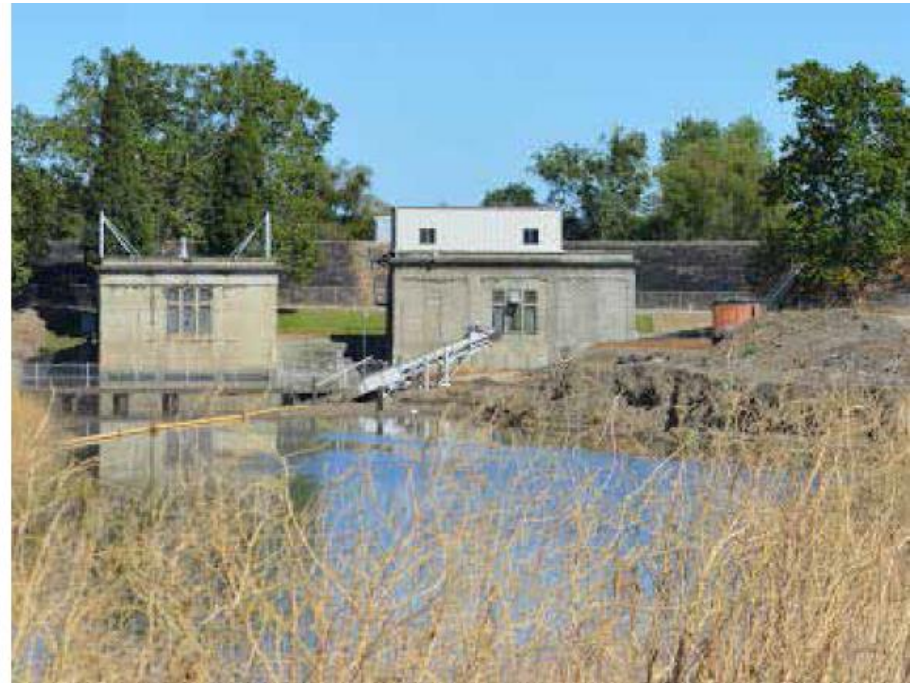


Costs: High

Integrity Impacts: Low to Medium

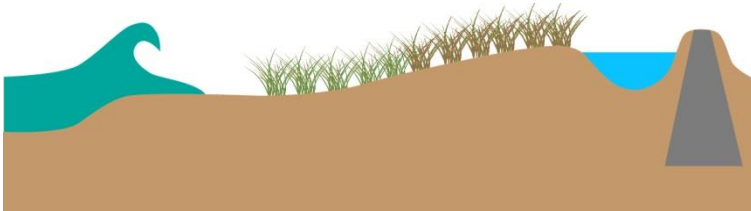
Environmental Impacts: High

Effectiveness: Medium Term



1. PROTECT

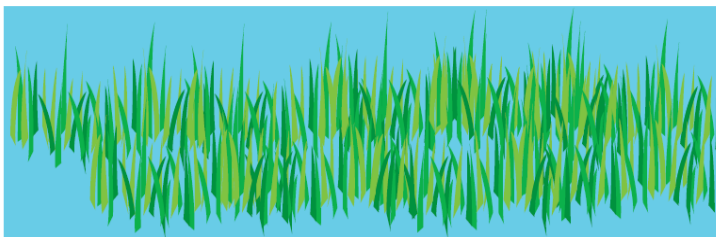
Soft (Nature-based) Engineering



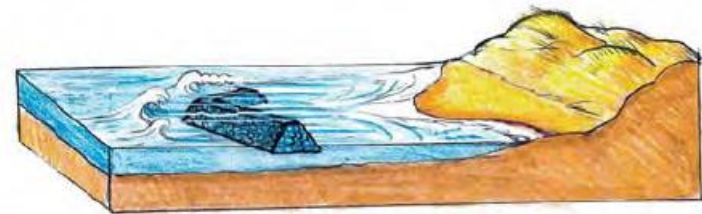
Horizontal levee



Dune restoration &
Beach maintenance



Wetland/ shoreline
vegetation



Offshore
structure

Wetland/ Living Shorelines

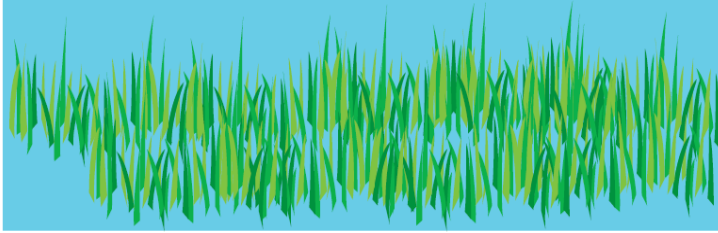
Costs: Medium

Integrity Impacts: Low

Environmental Impacts: Positive

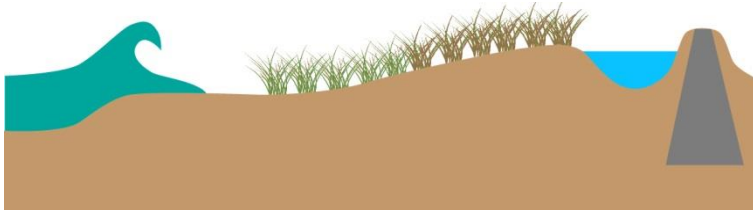
Effectiveness: Medium Term (Wave Attenuation)

Locations : Sheltered Bays, Open Coasts



Giacomini Wetland Restoration, 2008

Horizontal levee



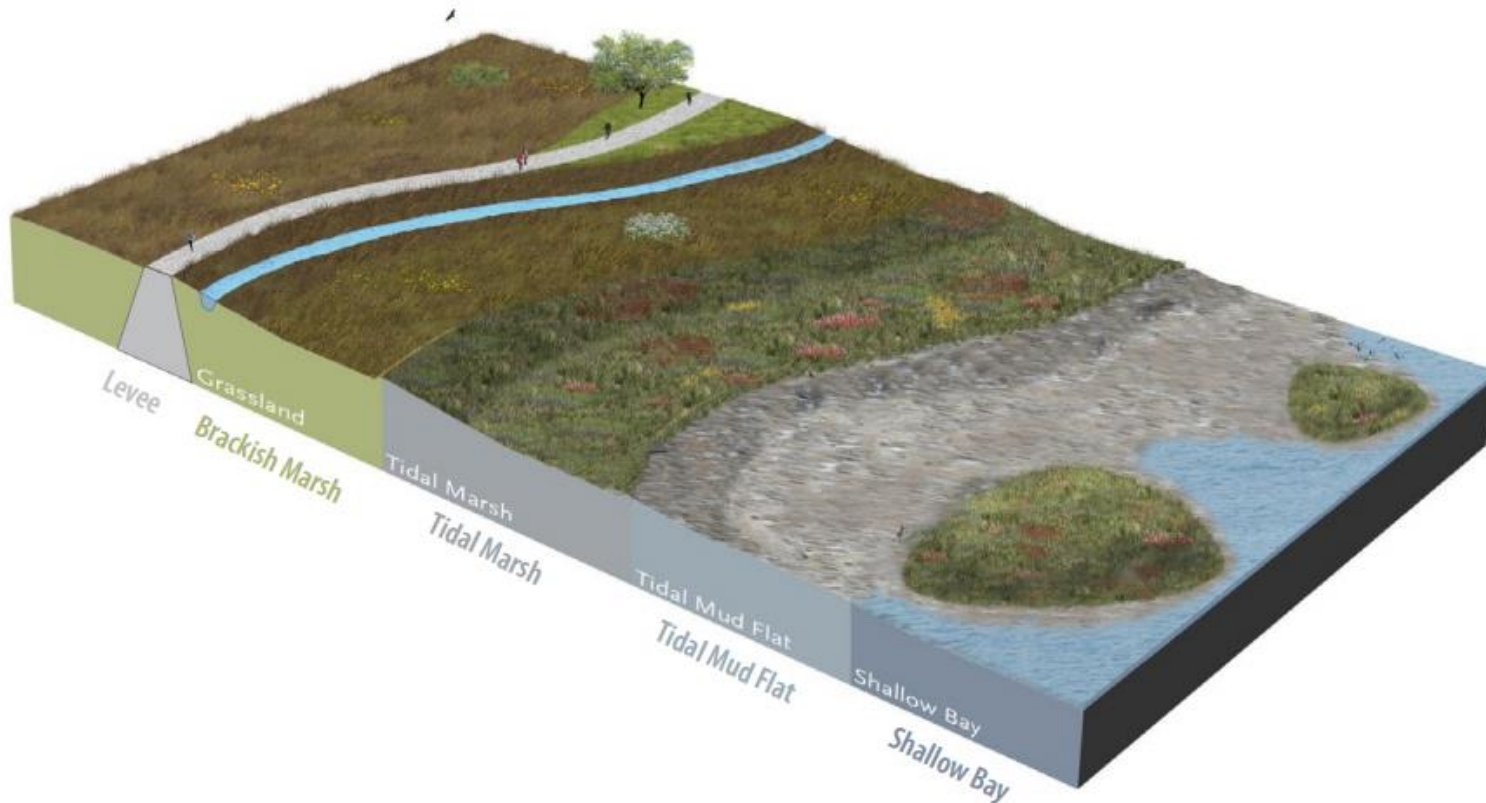
Costs: High

Integrity Impacts: Low

Environmental Impacts: Positive

Effectiveness: Long Term (waves and sea level rise)

Locations : Sheltered Bays



Beach Maintenance



Costs: Medium to High

Integrity Impacts: Low

Environmental Impacts: Negative to Positive

Effectiveness: Medium Term (Wave Attenuation)

Locations : Sheltered Bays, Open Coasts



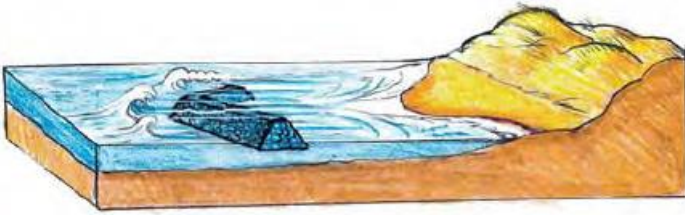
Wikipedia



Ross Clark

Offshore structures

Costs: Medium to High
Integrity Impacts: Low
Environmental Impacts: Positive
Effectiveness: Medium Term (Wave Attenuation)
Locations : Sheltered Bays, Open Coasts



2. ACCOMMODATE



Elevate buildings



Elevate/New Road



Floodproof Buildings



Amphibiate Buildings



Elevate Buildings

Costs: Medium to High

Integrity Impacts: Medium to High

Environmental Impacts: Neutral

Effectiveness: Medium Term

Locations : Sheltered Bays, Open Coasts



Images: Mississippi Development Authority

Historic Homes in the Mississippi Gulf Coast Region





Floodproof Buildings (Dry/Wet)

Costs: Low

Integrity Impacts: Low

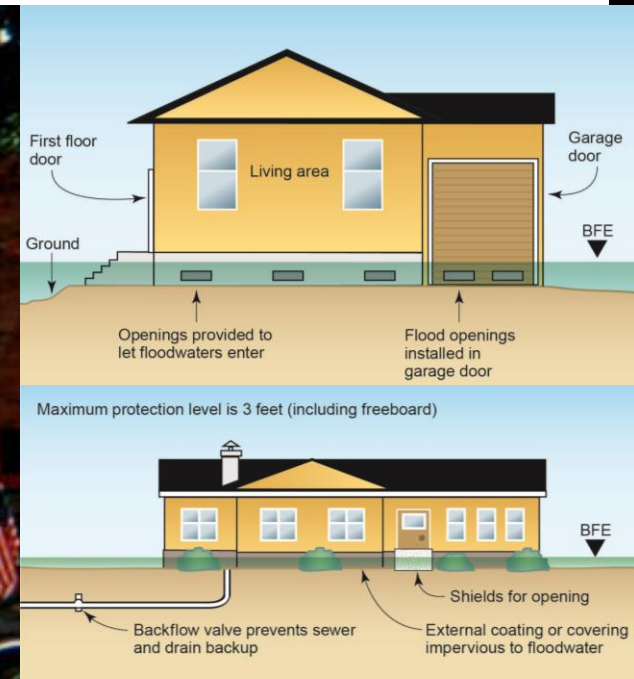
Environmental Impacts: Low

Effectiveness: Medium Term

Locations : Sheltered Bays, Open Coasts



Retrofitting buildings in Darlington, Wisconsin



Wet (above) and Dry (below) floodproofing

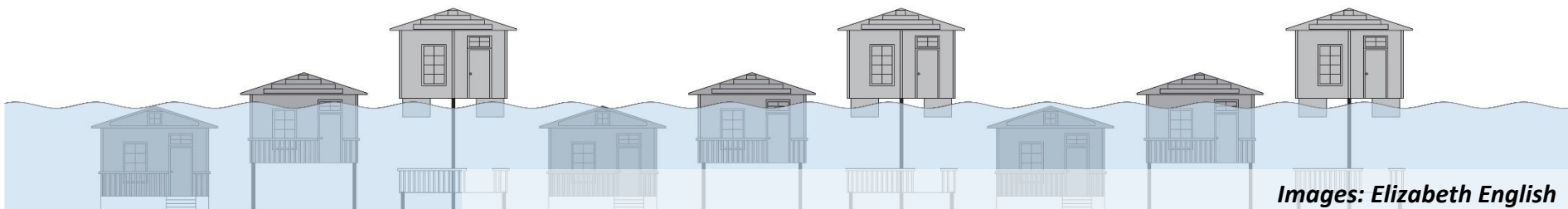


Amphibiate Buildings

Costs: Low to Medium
Integrity Impacts: Low
Environmental Impacts: Low
Effectiveness: Medium Term
Locations : Sheltered Bays

If you can elevate it, you can amphibiate it!

-Dr. Elizabeth English
the Buoyant Foundation



Images: Elizabeth English

New/elevate road

Costs: High

Integrity Impacts: Low to High

Environmental Impacts: High

Effectiveness: Long Term

Locations : Sheltered Bays, Open Coasts



3. RETREAT



Relocation



Abandonment



Relocation

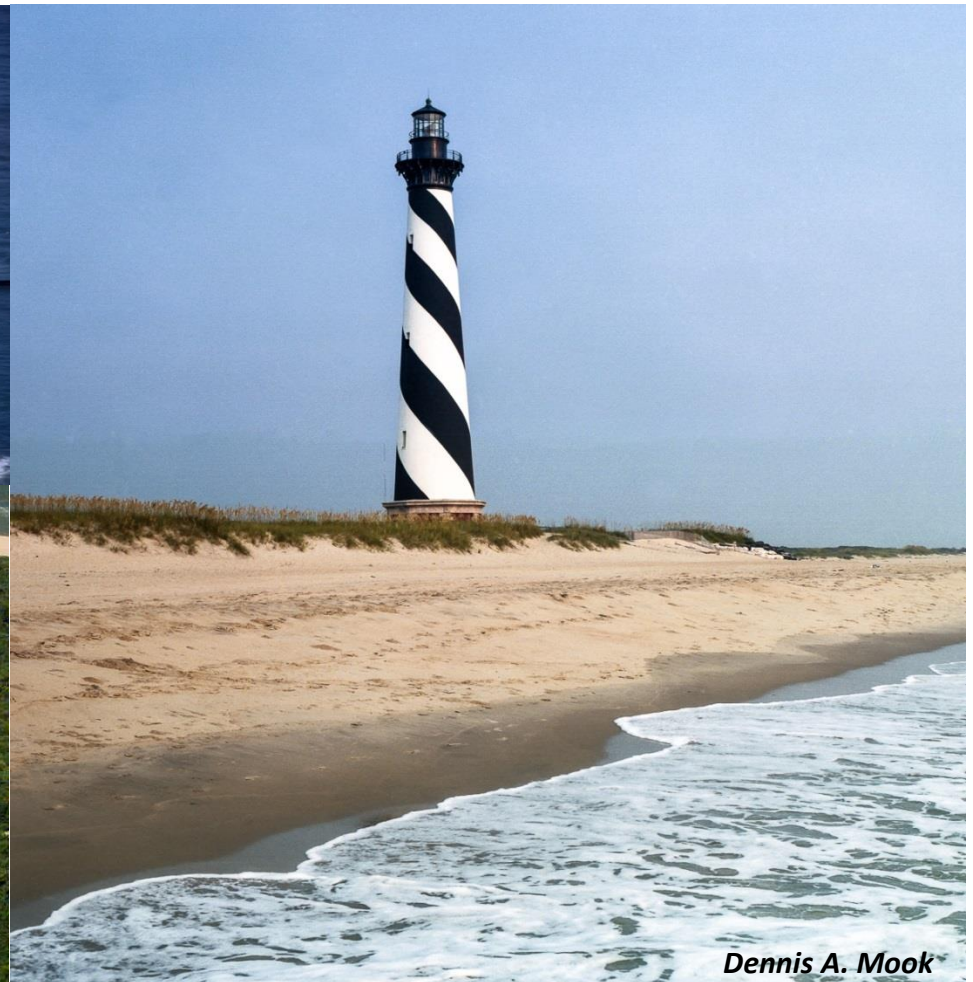
Costs: High

Integrity Impacts: High

Environmental Impacts: Positive

Effectiveness: Long Term

Locations : Sheltered Bays, Open Coasts



Cape Hatteras Lighthouse, North Carolina



Abandonment

Costs: High

Integrity Impacts: Extreme

Environmental Impacts: Positive

Effectiveness: Long Term

Locations : Sheltered Bays, Open Coasts



Lauren Armstrong

Stinson Beach, CA

4. DOCUMENTATION



Historic American Building Survey



Cultural Resource Inventory



Inventory

Column 1	Column 10	Column 11	Column 12	Column 13	Column 14	Column 15	Column 16
Name and Address of Asset Subject to Hazard (same as previous page)	Level of Property Vulnerability (High, Medium, Low)	Loss to Structure (\$)	Loss to Contents (\$)	Loss of Function or Use (\$)	Displacement Cost	Total Loss for Hazard Event	Level of Community Value for Ranking Purposes (High, Medium, Low)
<i>HAZARDVILLE OPERA HOUSE 50 MAIN STREET</i>	<i>MEDIUM</i>	<i>\$300 K</i>	<i>\$150 K</i>	<i>\$30 K</i>	<i>\$190 K</i>	<i>\$670 K</i>	<i>MEDIUM</i>
<i>LEHMAN GARDENS CORNER OF MAIN AND NORTH</i>	<i>HIGH</i>	<i>N/A</i>	<i>\$20 K</i>	<i>N/A</i>	<i>N/A</i>	<i>\$20 K</i>	<i>HIGH</i>



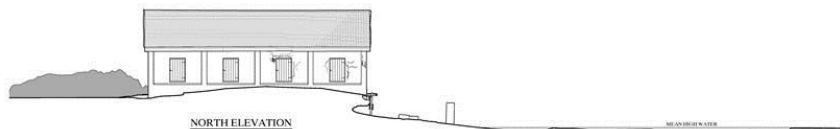
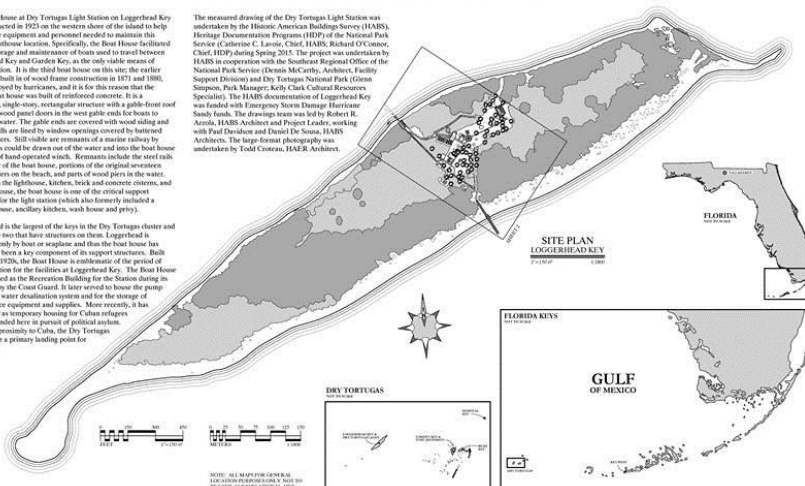
Historic American Building Survey

LOGGERHEAD KEY LIGHT STATION BOATHOUSE

The Boat House at Dry Tortugas Light Station on Loggerhead Key was constructed in 1923 on the western shore of the island to help support the equipment and personnel needed to maintain this remote lighthouse location. Specifically, the Boat House facilitated the safe storage and maintenance of boats used to travel between Loggerhead Key and Garden Key, as the only viable means of transportation. It is the third boat house on this site; the earlier structures, built in of wood frame construction in 1871 and 1880, were destroyed by hurricanes, and it is for this reason that the current boat house was built of reinforced concrete. It is a vernacular, single-story, rectangular structure with a gable-front roof with large wood panel doors in the west gable ends for boats to access the water. The gable ends are covered with wood siding and the side walls are lined by window openings covered by horizontal wood shutters. Still visible are remnants of a mariner railway by which boats could be drawn out of the water and into the Boat House by means of hand operated winch. Remnants include the steel rails in the floor of the boat house, portions of the original concrete concrete piers on the beach, and parts of wood piers in the water. Along with the lighthouse, kitchen, mess and concrete cistern, and a new oil house, the boat house is one of the critical support structures for the light station which also formerly included a keeper's house, auxiliary kitchen, wash house and privy).

Loggerhead is the largest of the keys in the Dry Tortugas cluster and one of only two that have structures on them. Loggerhead is accessible only by boat or seaplane and thus the boat house has historically been a key component of its support structures. Built during the 1920s, the Boat House is emblematic of the period of modernization for the facilities at Loggerhead Key. The Boat House was also used as the Reservation Building for the Station during its operation by the Coast Guard. It later served to house the pump for the salt water desalination system and for the storage of maintenance equipment and supplies. More recently, it has also served as temporary housing for Cuban refugees. More recently, it has been included here in pursuit of political asylum. Due to its proximity to Cuba, the Dry Tortugas has become a primary landing point for refugees.

The measured drawing of the Dry Tortugas Light Station was undertaken by the Historic American Building Survey (HABS) Heritage Documentation Program (HDP) of the National Park Service (C. Lavette, Chief HABS; Richard O'Connor, Chief HDP, during Spring 2011. The project was undertaken by HABS in cooperation with the Southeast Regional Office of the National Park Service (Deanna McCarthy, Architect, Facility Support Division) and Dry Tortugas National Park (Green Simpson, Park Manager; Kelly Clark, Cultural Resources Specialist). The HABS documentation of Loggerhead Key was funded with Emergency System Damage Restoration Funds. The drawings were made by Robert H. Arndt, HABS Architect and Project Leader, working with Paul Davidson and David De Rosa, HABS Architects. The large format photography was undertaken by Todd Coxson, HABS, Architect.



BLANK

GAME ON!



THANK YOU!



Sea Level Rise

marinslr.org