

# GAME OF FLOODS : PRESERVATION EDITION



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MARIN COUNTY COMMUNITY DEVELOPMENT AGENCY  
KEEPING HISTORY ABOVE WATER, 4/13/16

# AGENDA

**9:00** Introductions

**9:15** Presentation

**9:35** Play Game

**11:05** Report Back (large group)

**11:30** Game Feedback (large group)

**11:50** Evaluation

# 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
- Sewage Lift Station
- Acquaculture
- Sheriff
- Home
- Beach
- Boat Launch
- Post Office
- Electrical Sub-Station

## LEGEND

**Managed Retreat**

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

**Accommodate Water**

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

**Hard Engineering**

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

**Soft Engineering**

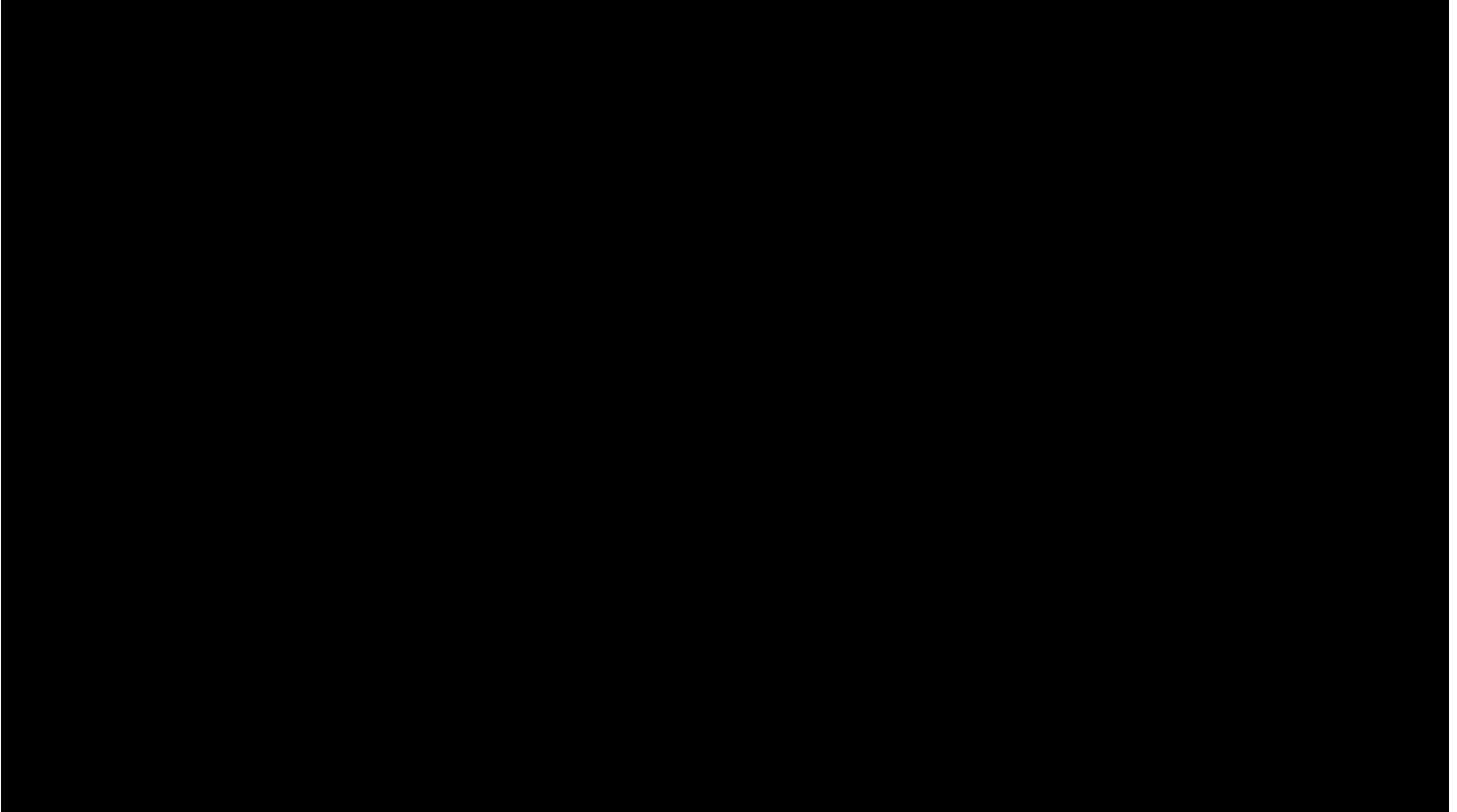
- Horizontal Levee: \$\$\$ | ●
- Wetland/shoreline vegetation: \$\$\$ | ●
- Offshore Structure: \$\$\$ | ●
- Beach Maintenance: \$\$\$ | ●



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**

# 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



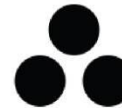
Landmark



Agriculture



Seabird Colony



Archaeological Site



Lighthouse



Sheriff



Public Open Space



Industrial



Historic Cemetary







# 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 E ●
 Wetland Restoration \$\$\$ 0 E ●	 Beach Maintenance \$\$\$ 0 E ●



## ACCOMMODATE

**Accommodate Water**

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



## RETREAT

**Managed Retreat**

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

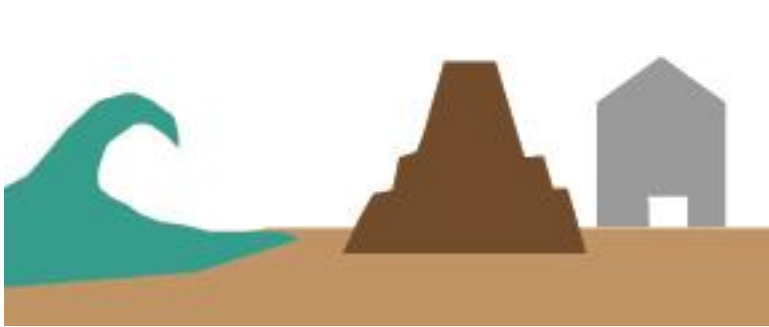
## INVENTORY

**Documentation**

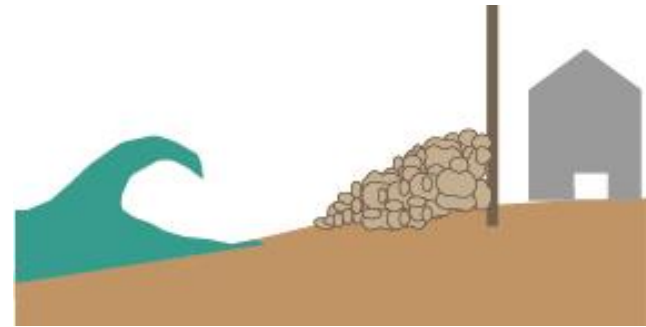
 HABS \$\$ + 00
 Area Survey \$ + 0

# 1. PROTECT

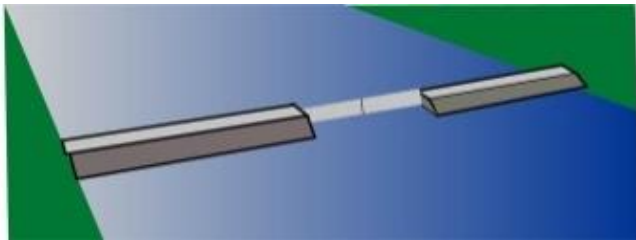
## Hard (Traditional) Engineering



Traditional levee



Seawall/Revetment



Tidal gate



Wall & Pump  
Station

# Levee



*Sacramento-San Joaquin Delta/  
Locke*

# Seawall

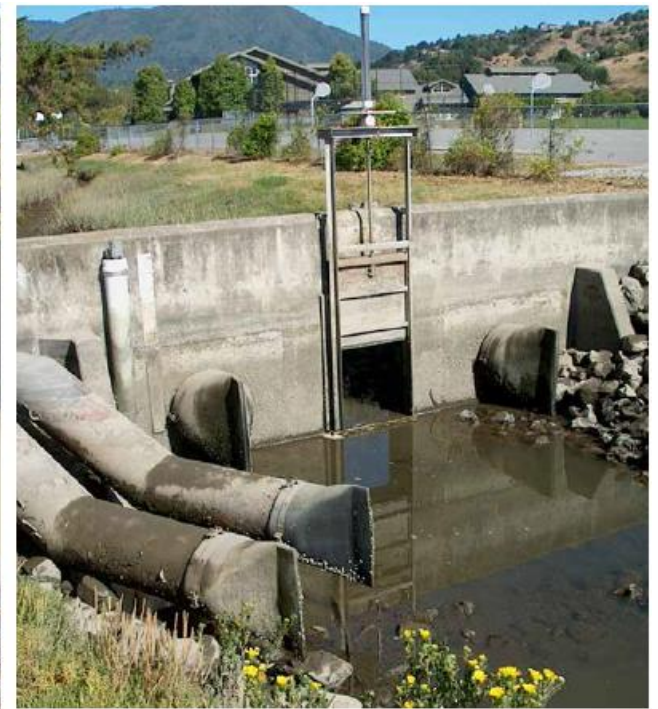
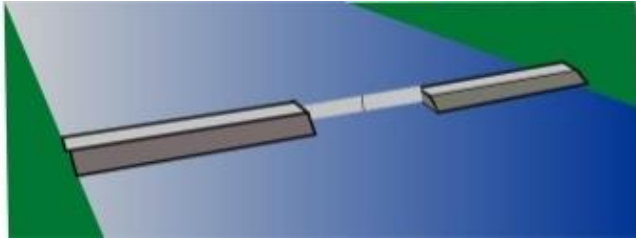


*St. Augustine, FL*

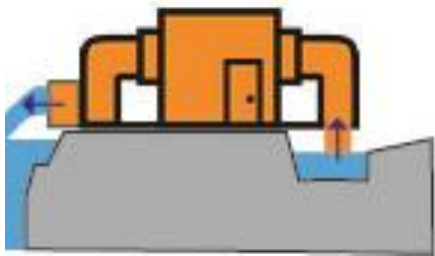


*Jones Point, Washington D.C.*

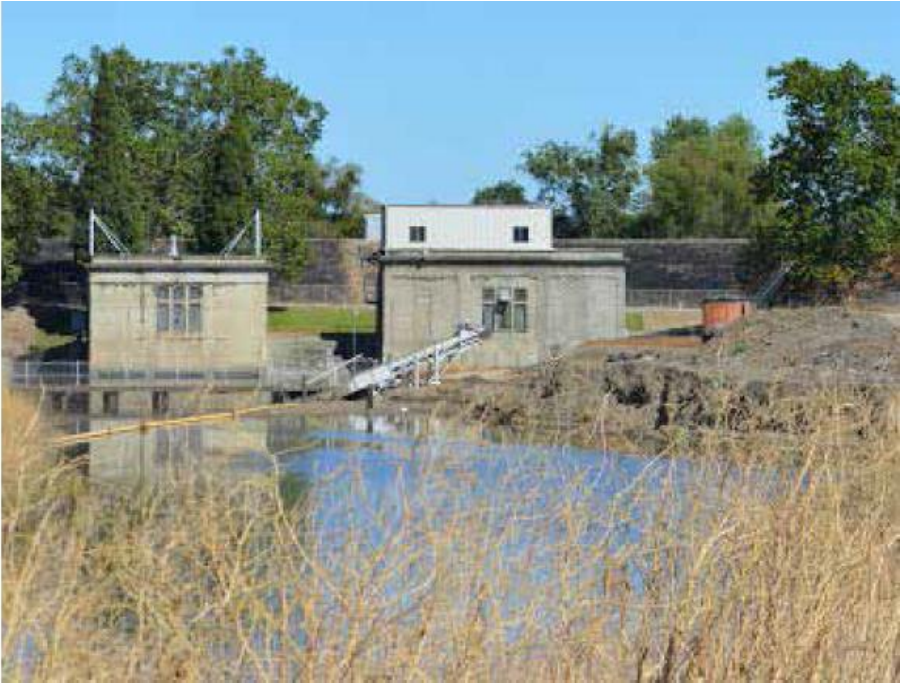
# Tidal gate



# Flood wall & Pump station

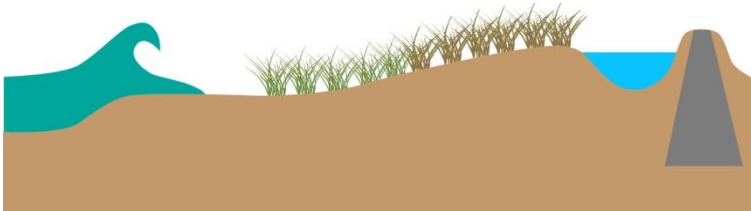


\$\$\$|00|EEE|●



# 1. PROTECT

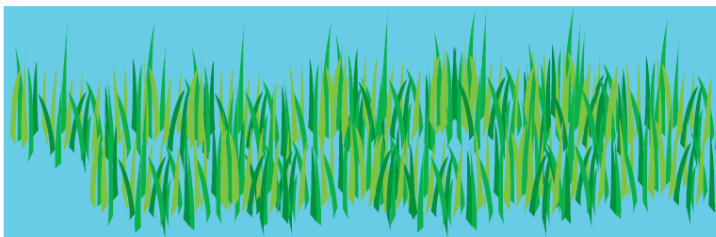
## Soft (Nature-based) Engineering



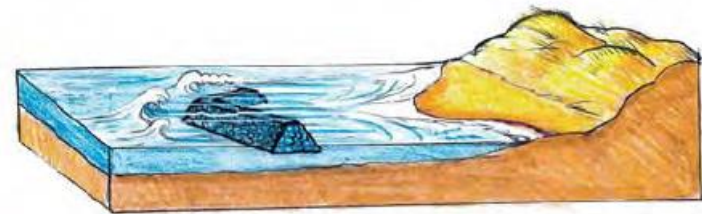
Horizontal levee



Dune restoration & Beach maintenance

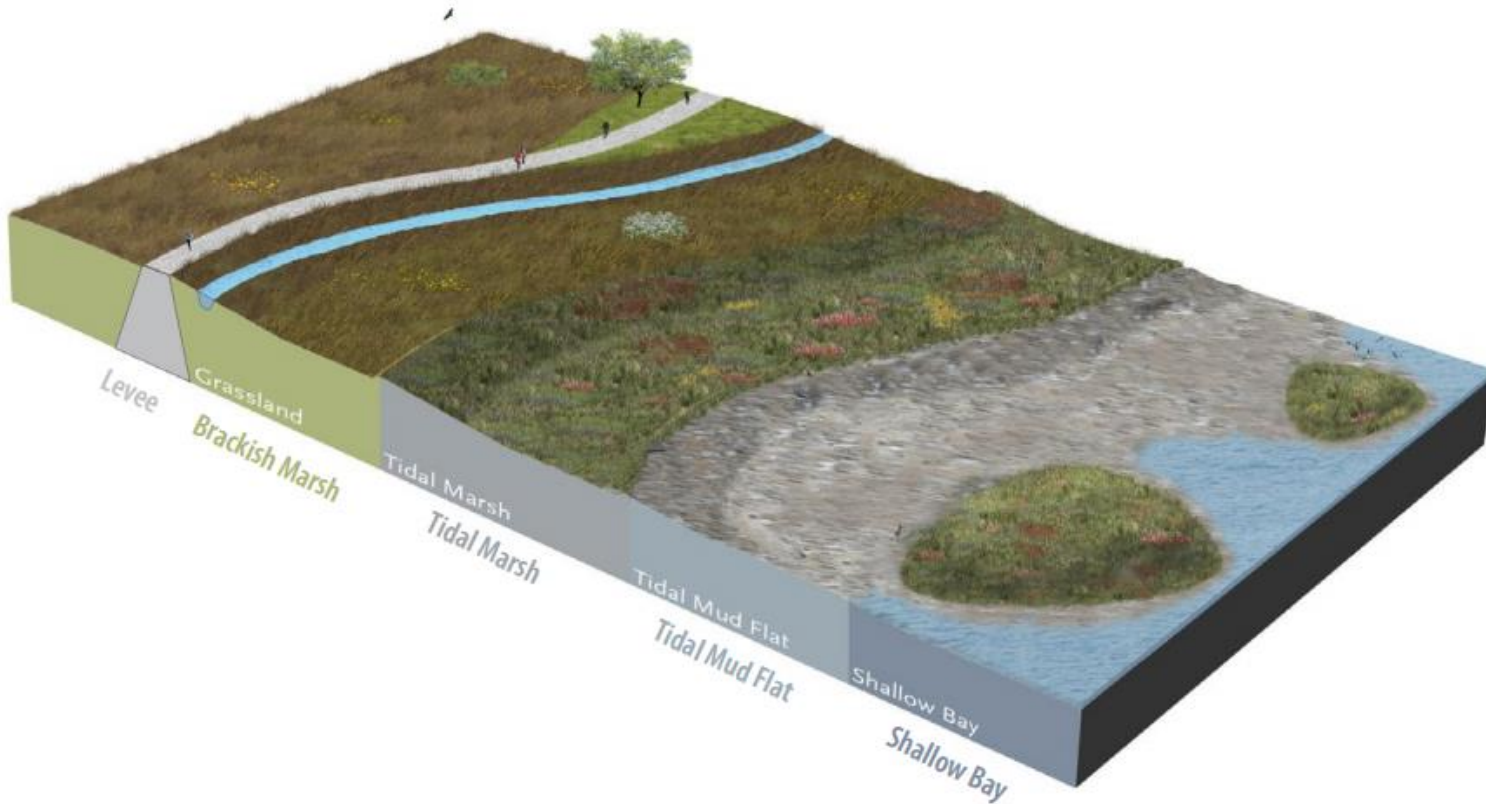
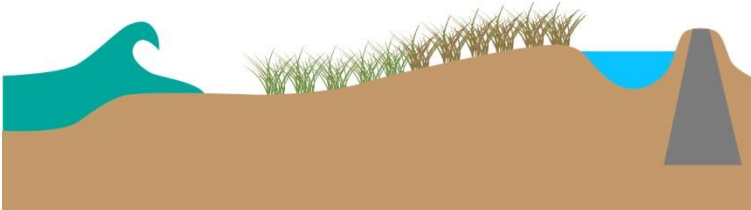


Wetland/ shoreline  
vegetation



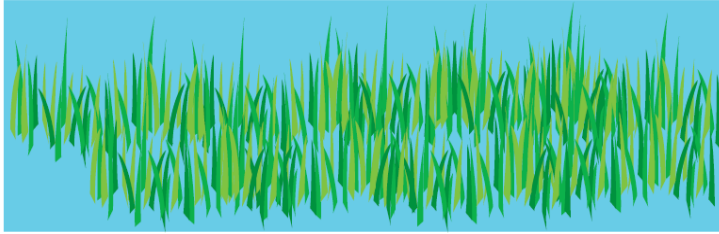
Offshore  
structure

# Horizontal levee





# Wetland/ shoreline vegetation



Giacomini Wetland Restoration, 2008

# Beach Maintenance

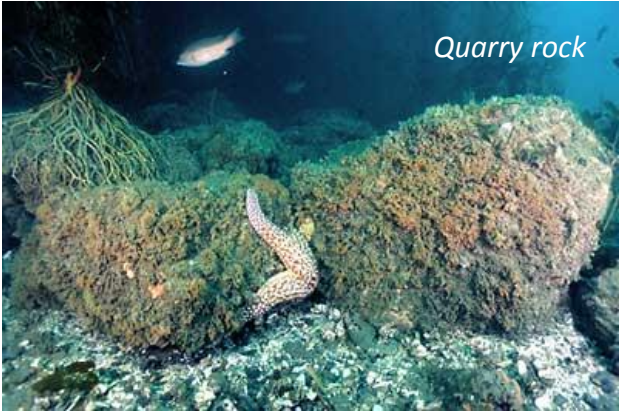
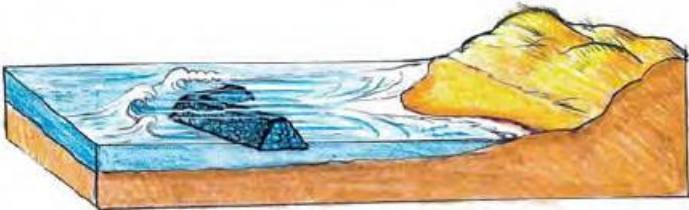


*Wikipedia*



*Ross Clark*

# Offshore structures



# 2. ACCOMMODATE



Elevate buildings



Elevate/New Road



Floodproof Buildings



Amphibiate Buildings



# Elevate Buildings



*Images: Mississippi Development Authority*

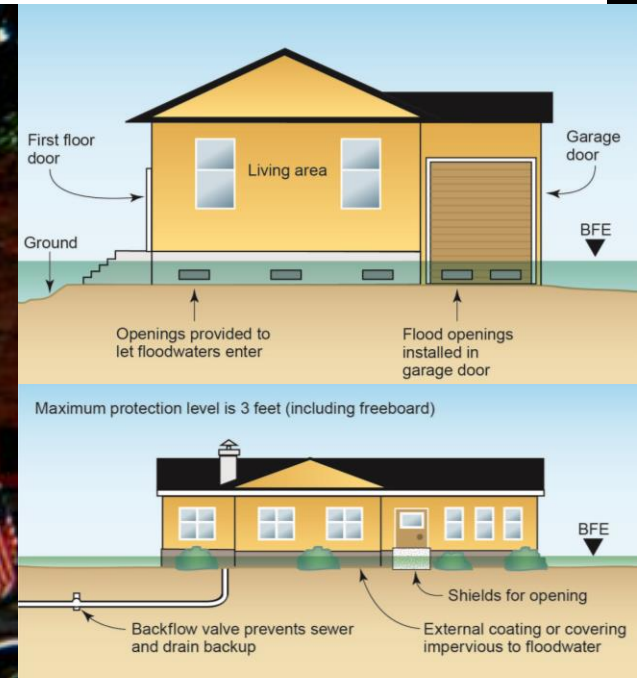
*Historic Homes in the Mississippi Gulf Coast Region*



# Floodproof Buildings (Dry/Wet)



*Retrofitting buildings in Darlington, Wisconsin*



*Wet (above) and Dry (below) floodproofing*

# New/elevate road

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\$\$\$\$\$ | IIII | EEE | ●





# Amphibiate Buildings



*Images: Elizabeth English*



# 3. RETREAT



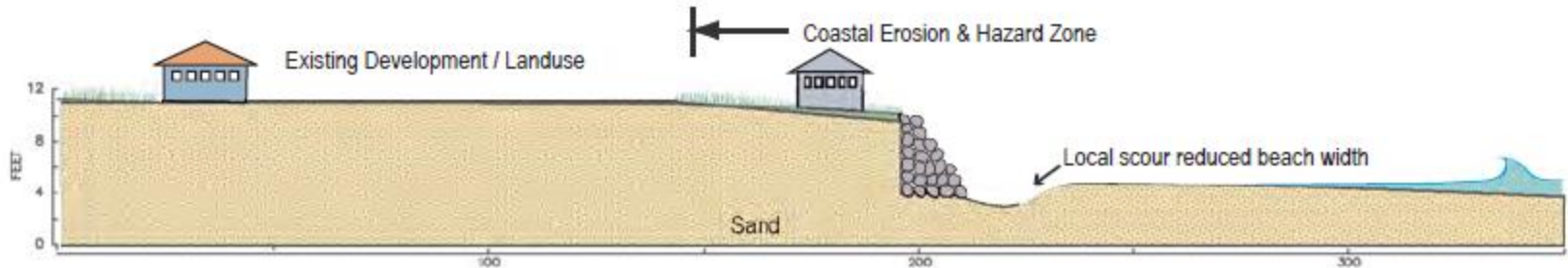
Relocation



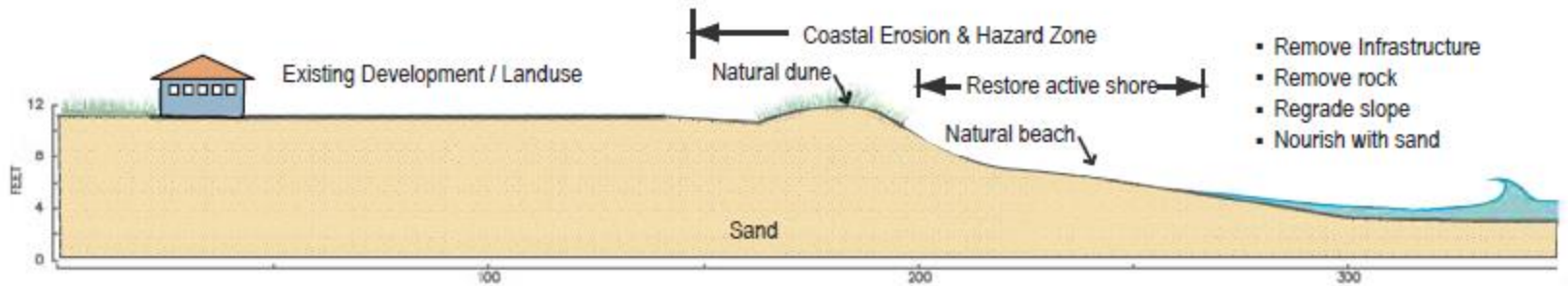
Abandonment

# Managed Retreat

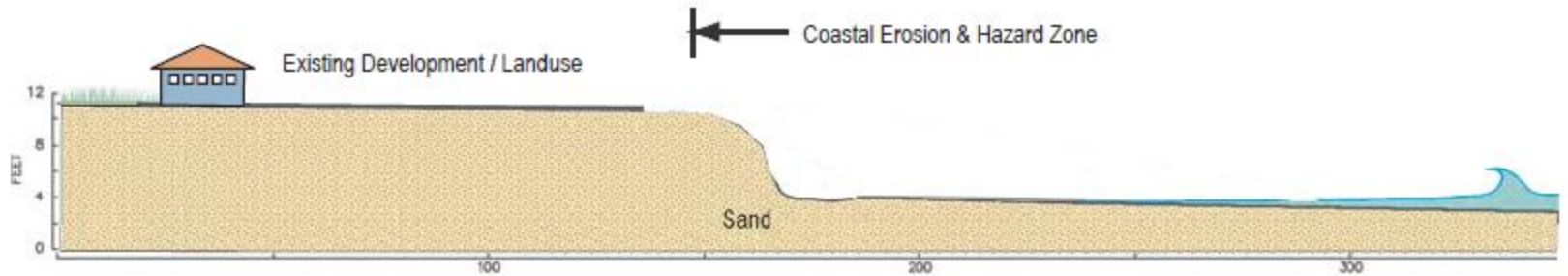
Current



Post



Eroded





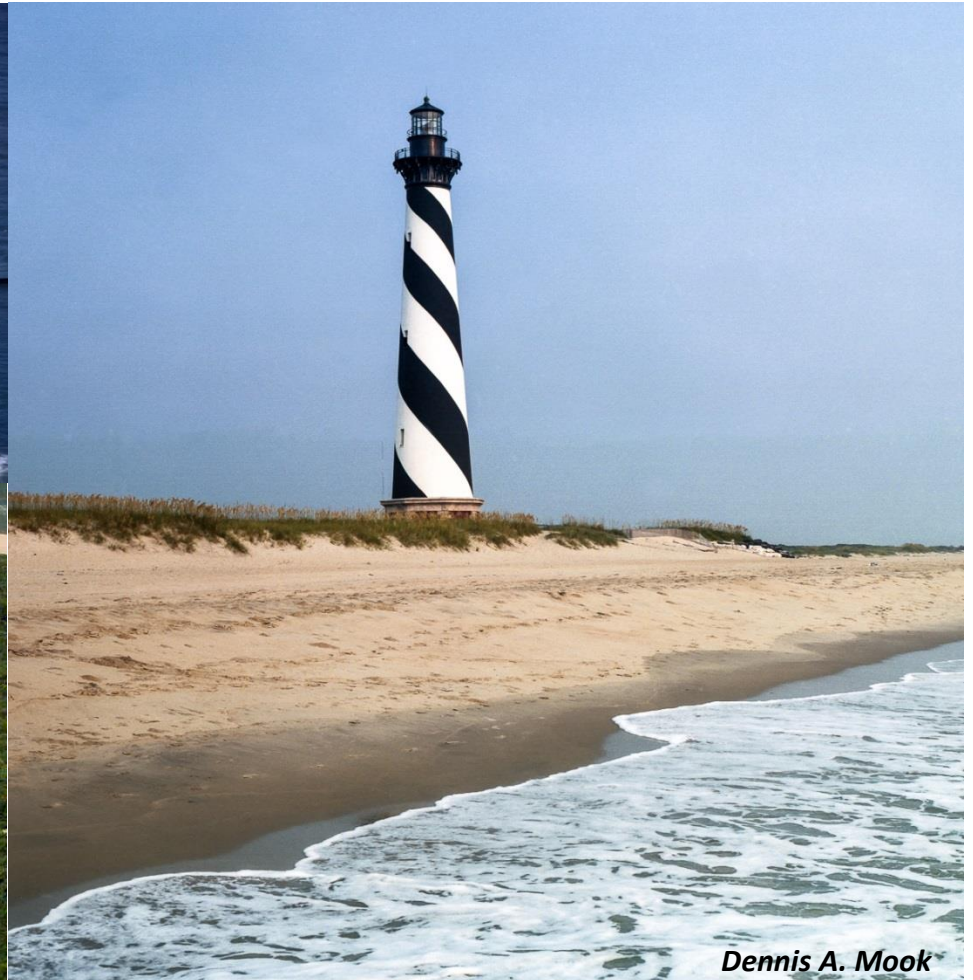
Relocation



*National Park Service*



*National Geographic*



*Dennis A. Mook*

*Cape Hatteras Lighthouse, North Carolina*



Abandonment



*Lauren Armstrong*

*Stinson Beach, CA*

# 4. DOCUMENTATION



Historic American Building Survey



Cultural Resource Inventory





# Historic American Building Survey

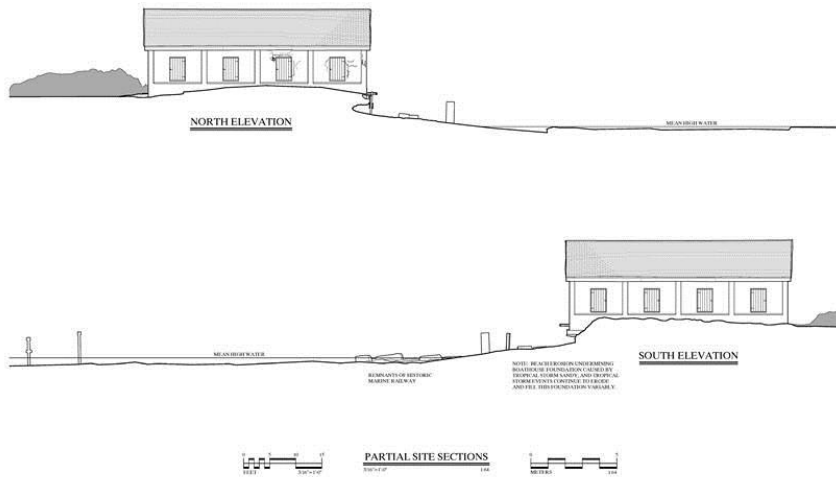
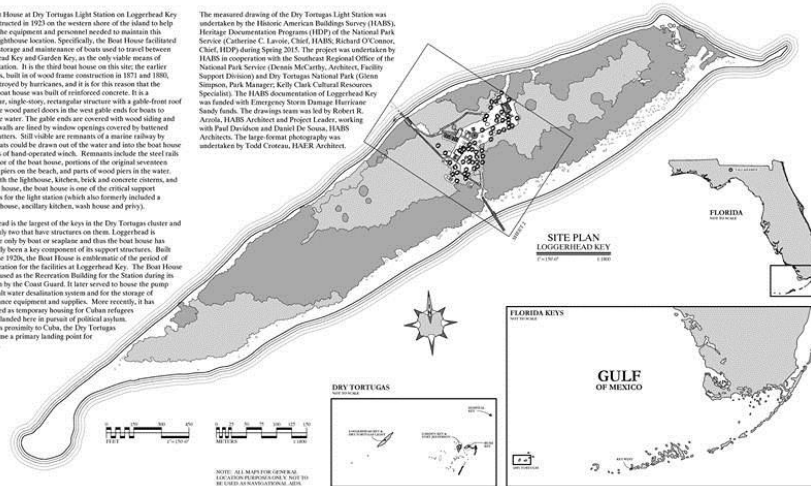


## LOGGERHEAD KEY LIGHT STATION BOATHOUSE

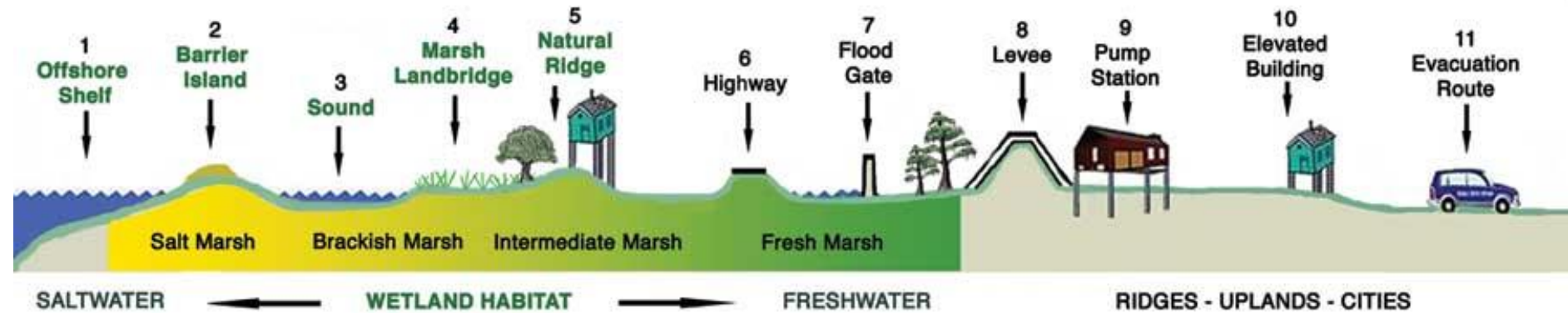
The Boat House at Dry Tortugas Light Station on Loggerhead Key was constructed in 1923 on the western shore of the island to help support the equipment and personnel needed to maintain this remote lighthouse location. Specifically, the Boat House facilitated the safe storage and maintenance of boats 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 marble 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 airplane 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 who have landed 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 (Catherine 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 (Dennis 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 Sandy funds. The drawings team was led by Robert H. Arnold, HABS Architect and Project Leader, working with Paul Davidson and David De Souza, HABS Architects. The large format photography was undertaken by Todd Coxson, HABS/R. Architect.



# Hybrid Strategies



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



# COSTS \$\$\$

**Real World – costs are messy and depend on many factors**

- + planning & engineering
- + permitting
- + maintenance & repair

**Game World – costs are simpler one-time costs and given to you per unit (i.e. mile or # of buildings)**

Adaptation Piece Reference Sheet

Name	Piece	Piece Units	Cost (\$)	Impacts		Flood Protection	Protects against					Feasibility		
				Black (extreme) Red (neg.) Yellow (caution) Green (none/pos.)	Environmental Integrity		Temp. flooding	Storm surge	Sea Level Rise	Wave impacts	Erosion	Sheltered Bay/Riverine	Open Coast	
<b>Hard (Traditional) Engineering</b>														
Traditional Levee		1 Mile	\$\$\$\$	EEE	II	med ●	x	x	x	x	x	x		
Seawall or Revetment		1 Mile	\$\$\$	EEE	II	med ●	x	x	x	x	x	x	x	
Tidal Gate		Creek width	\$\$\$\$\$	EEE	II	med ●	x	x	x			x		
Flood Wall & Pump Station	Requires electricity 	1 Mile	\$\$\$	EEE	II	short ○	x	x	x			x		
<b>Soft Engineering</b>														
Horizontal Levee		1 Mile	\$\$\$\$	E	I	long ●	x	x	x	x	x	x		
Wetland/shoreline vegetation		1 Acre	\$\$\$	E	I	med ●	x	x		x		x		
Beach Maintenance & Dune Restoration		1 Mile	\$\$\$	EE	I	short ○	x	x		x	x	x	x	
Offshore structure		1 Mile	\$\$	EE	I	med ●	x	x		x		x	x	
<b>Accommodate (flood tolerant)</b>														
Elevate buildings		4 Buildings	\$\$\$	EE	III	med ●	x	x		x		x	x	
New/elevate road	 (each piece is 2 miles)	1 Mile	\$\$\$\$\$	EEE	III	long ●	x		x			x	x	
Floodproof Buildings (Dry/Wet)		Neighborhood	\$	EE	II	med ●	x		x			x	x	
Amphibiate Buildings		4 Buildings	\$\$	EE	I	med ●	x					x		
<b>Managed Retreat</b>														
Abandonment		1 Historic Site or 4 Buildings	\$	E	III (historic sites) II (buildings)	long ●	x	x	x	x	x	x	x	
Relocation		1 Historic Site or 4 Buildings	\$\$\$	EEE	III (historic sites) II (buildings)	long ●	x	x	x	x	x	x	x	
<b>Documentation</b>														
Historic American Building Survey			\$\$	N/A	+II (positive impacts if used for mitigation)	N/A						N/A		
Neighborhood Survey			\$	N/A	+I (positive impacts if used for mitigation)	N/A						N/A		

# OBJECTIVE

*Collaboratively develop a vision for 2050 to adapt to rising seas with minimal economic, environmental, and integrity impacts.*

# ROLES

- Preservationist
- FEMA Officer
- Sustainability Coordinator
- Park Service Staff
- Entrepreneur
- Ecologist

Strategy	E = Environmental (Leaves)	I = Integrity (Diamonds)	\$ = Economic (dollar Signs)
Flood Proof	2	2	1
Horizontal levee	1	1	3
Sea wall	3	2	3
HABS	N/A	-2	2
Total	6	3	Total Above 6 = <u>3</u>

**Grand Total = Total E + Total I + \$>6 = 12**

GAME ON!



THANK YOU!



Sea Level Rise

[marinslr.org](http://marinslr.org)