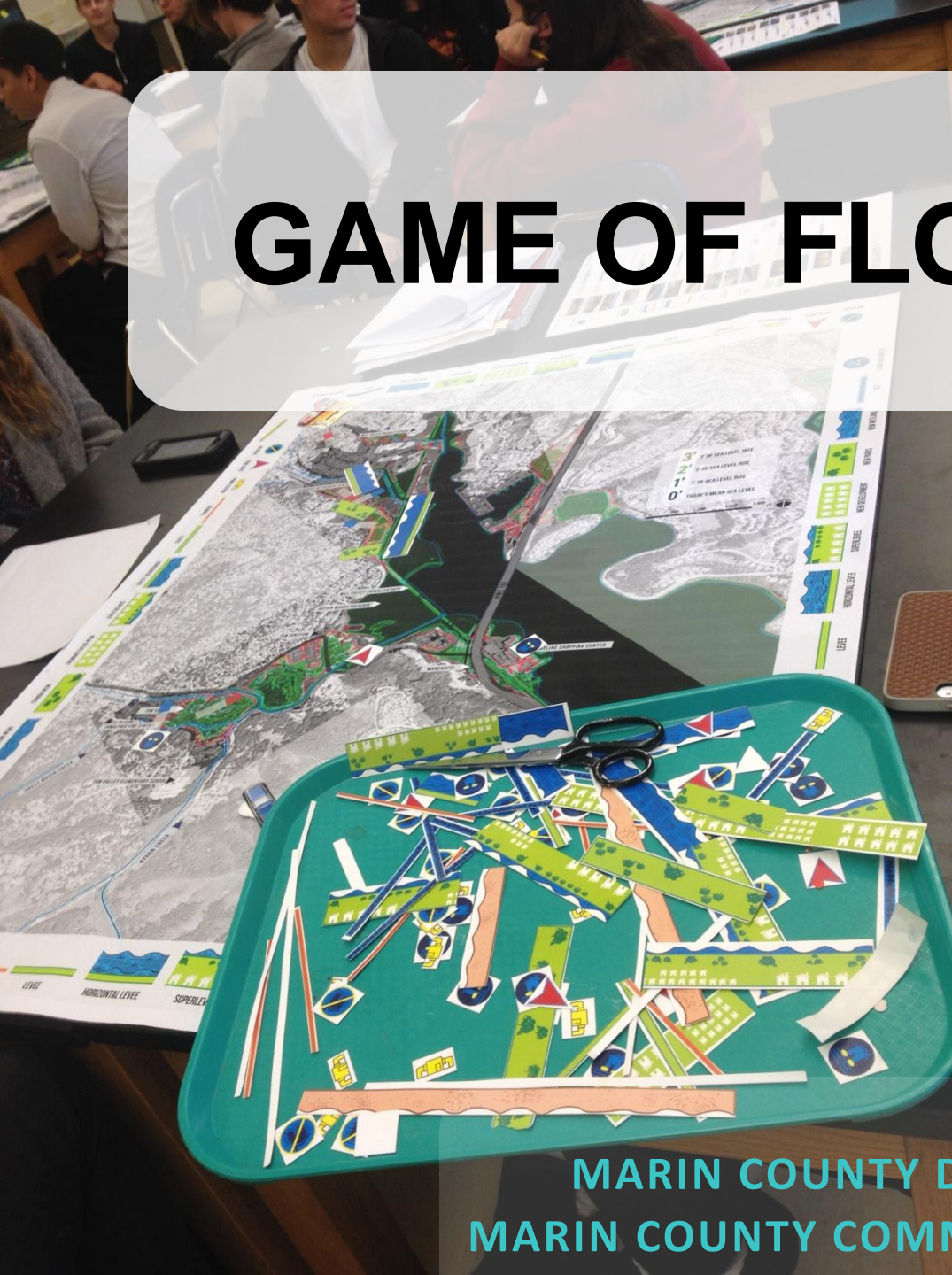


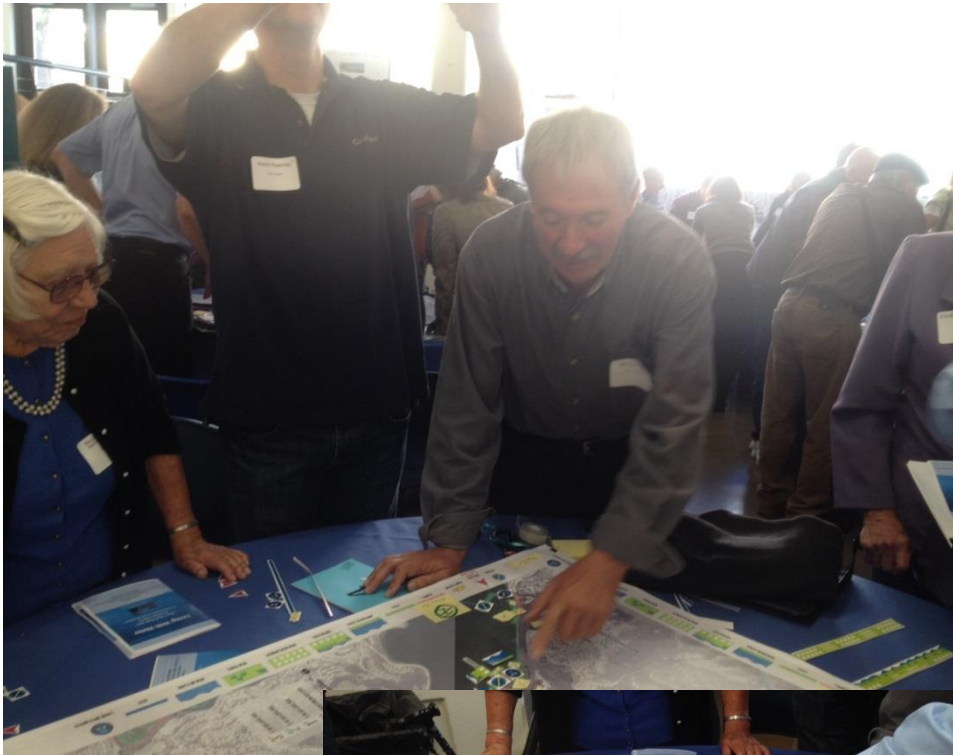
GAME OF FLOOD

MARIN COUNTY D
MARIN COUNTY COMM



GAME OF FLOOD

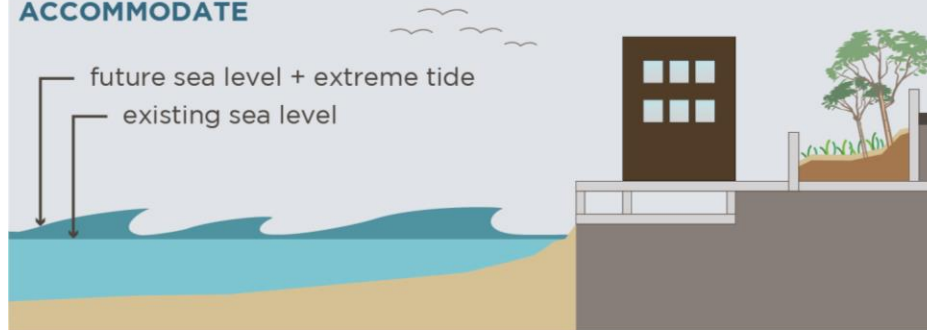
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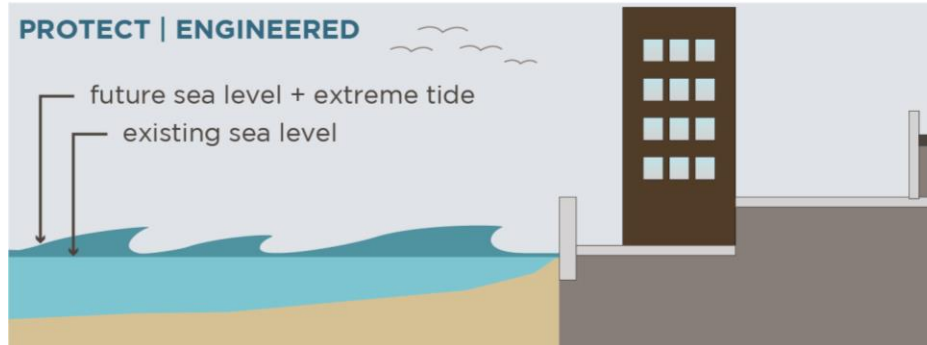


HIGH SCHOOLS

ACCOMMODATE



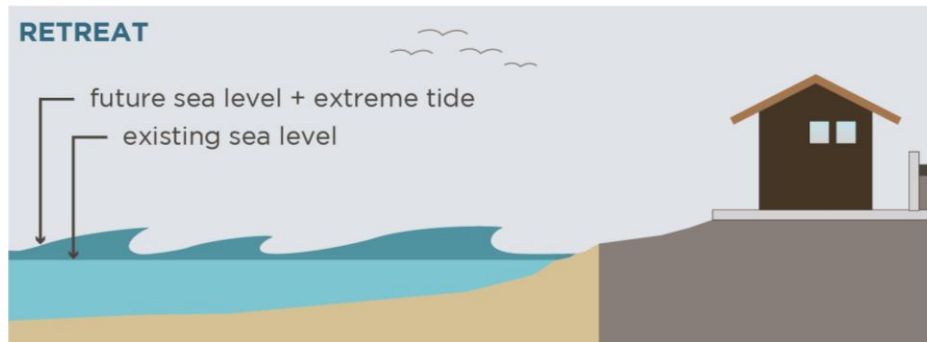
PROTECT | ENGINEERED



PROTECT | NATURAL



RETREAT



Elevate Buildings (Accommodate)



Costs: Medium

Environmental Impacts: Neutral to Positive

Effectiveness: Medium Term



Floodproof Buildings (Accommodate)



Costs: Medium

Environmental Impacts: Neutral

Effectiveness: Medium Term



Elevate/New Road

(Accommodate /Retreat)

Costs: High

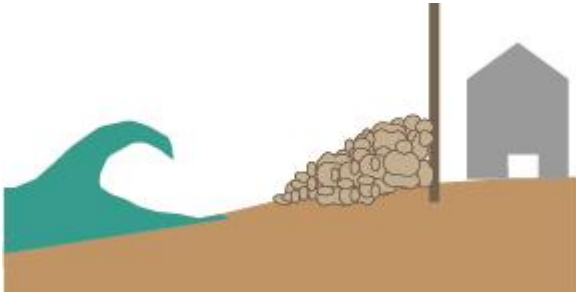
Environmental Impacts: High

Effectiveness: Long Term



Coastal Armoring

(Protect-Engineered)

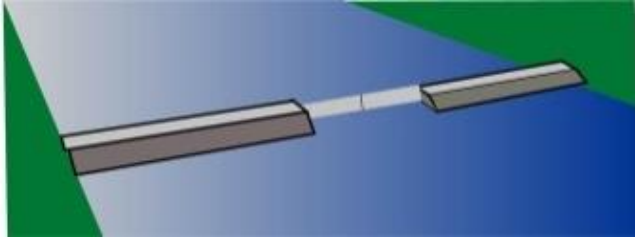


Costs: High
Environmental Impacts: High
Effectiveness: Medium to Long Term



Tidal gate

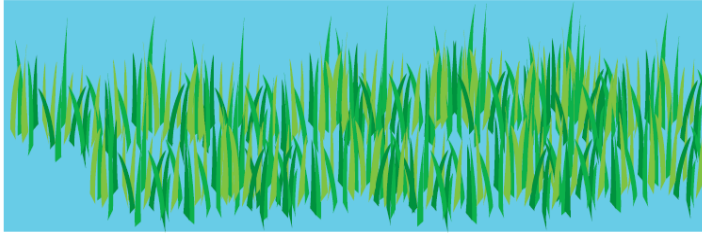
(Protect/Engineered)



Costs: Extreme
Environmental Impacts: High
Effectiveness: Long Term



Wetland/Living Shorelines



Costs: Medium
Environmental Impacts: Positive
Effectiveness: Medium Term



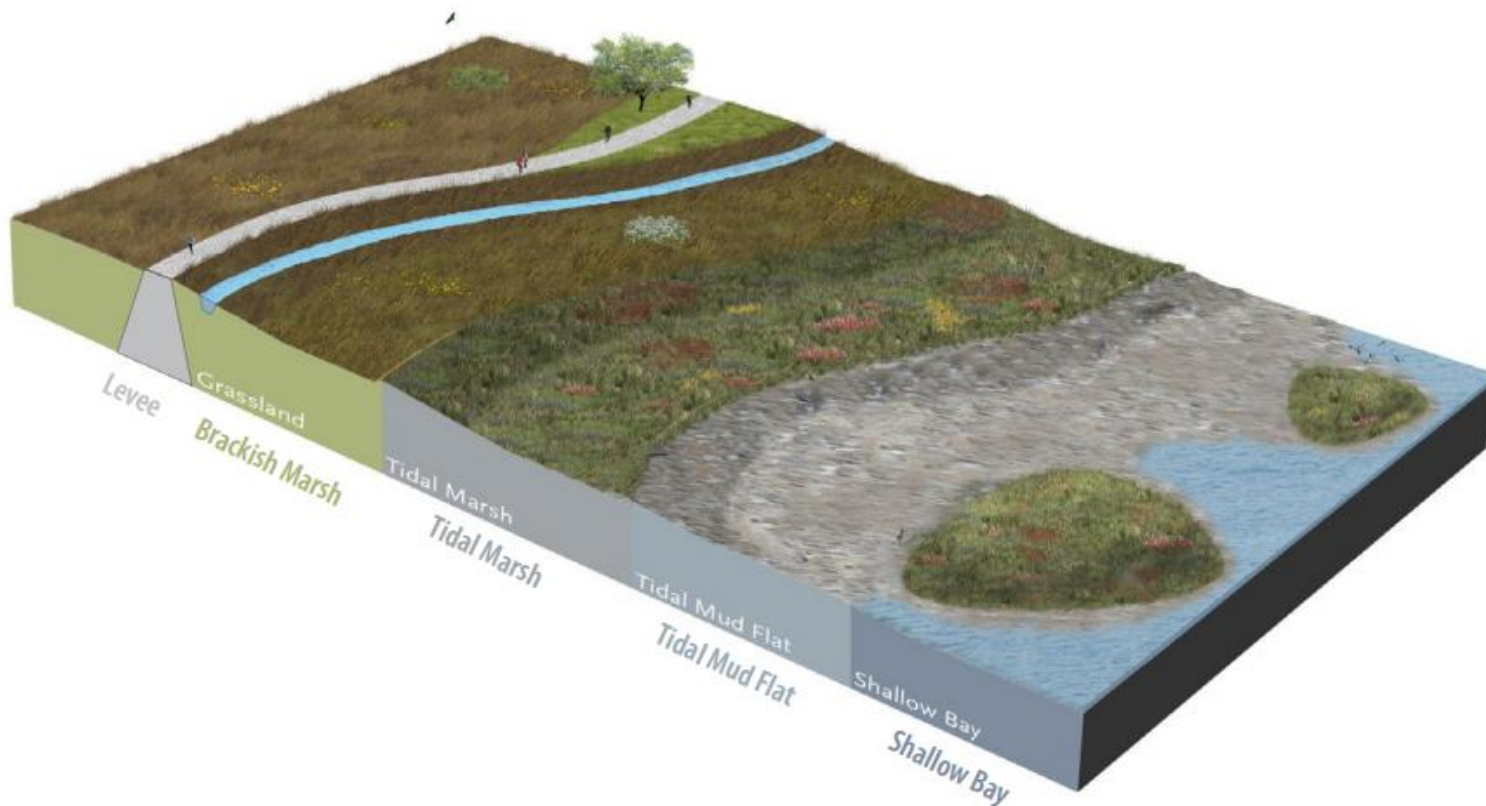
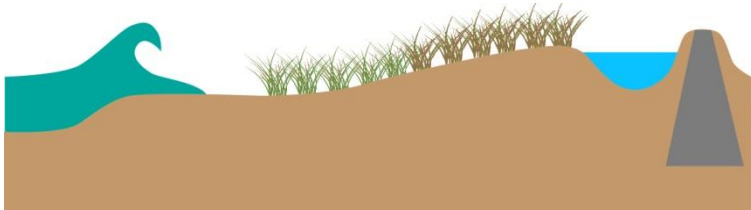
Horizontal levee

Protect/Natural

Costs: High

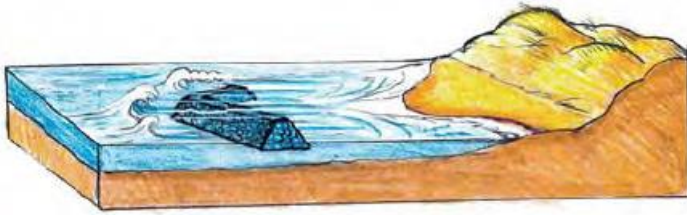
Environmental Impacts: Positive

Effectiveness: Long Term



Offshore structures

Protect/Natural



Costs: Medium to High

Environmental Impacts: Positive

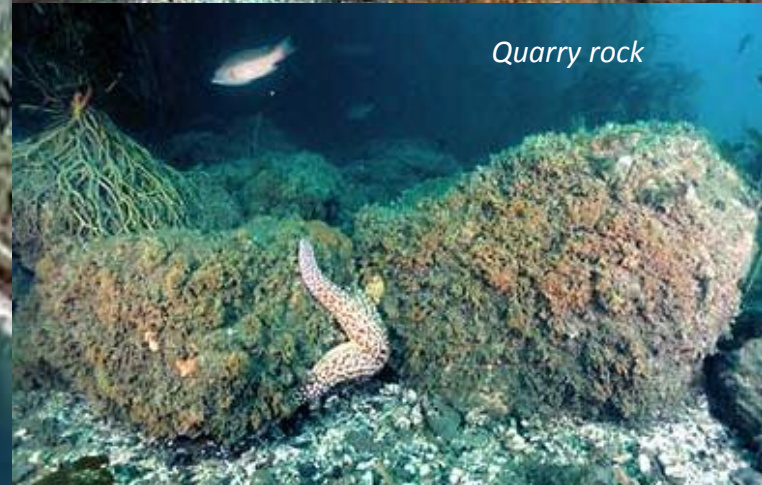
Effectiveness: Medium Term



San Clemente artificial reef experiment



Concrete



Quarry rock

Managed Retreat



Retreat

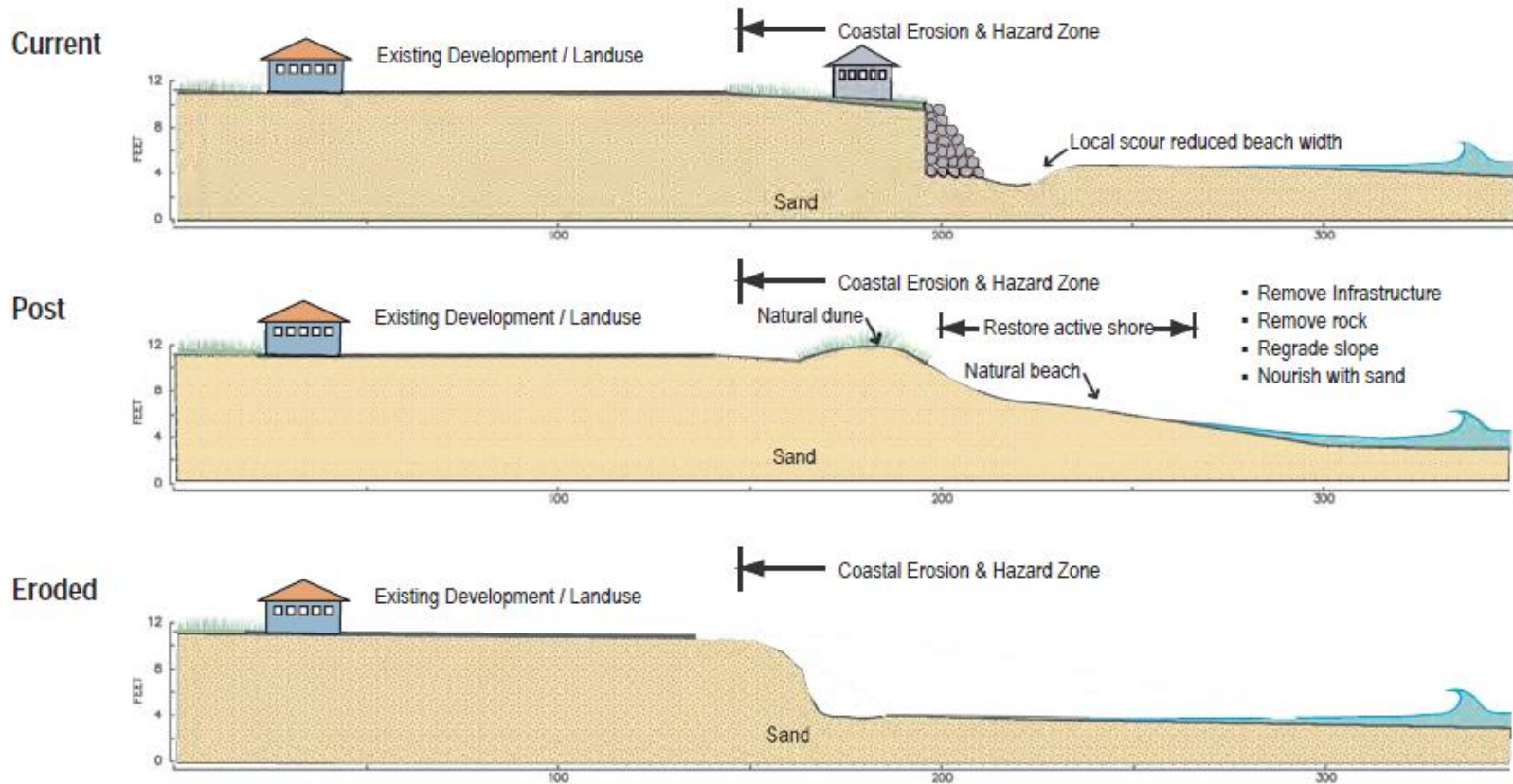


Rebuild here

Costs: High

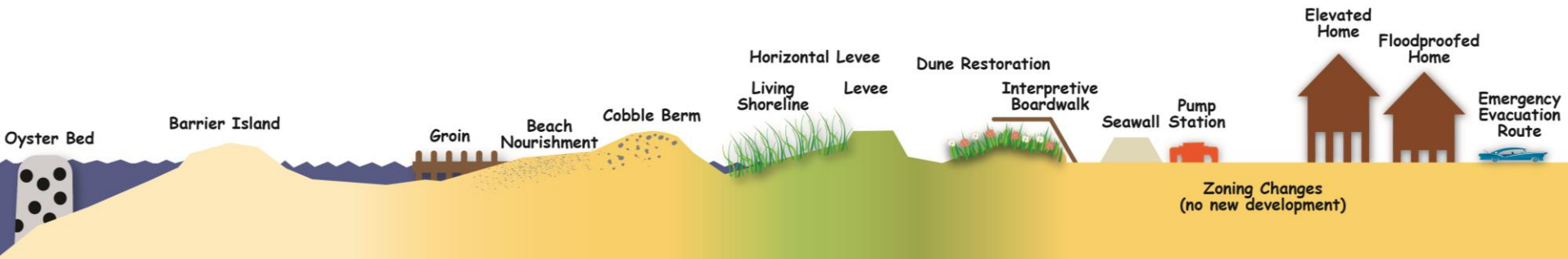
Environmental Impacts: Low to Medium

Effectiveness: Long Term



BLANK

Hybrid Strategies



THE GAME OF FLOODS

Your Island

Sea levels are rising world-wide as warming oceans expand and melt glaciers and ice sheets. Stronger storms coupled with rising seas can significantly damage—even destroy—property, infrastructure, public facilities, natural habitats, and other resources we depend on. Adaptation planning is essential to help communities develop a sea level rise adaptation plan using the strategies (game pieces).

1. To begin, you'll need the sea level rise scenario about which you'll be making decisions.
2. Read the scenario and determine the sea level rise. The highest will occur first. If it occurs, the tide players must enroll. 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 states aloud their preferred adaptation strategies or measures. Conflicting strategies are allowed.
5. Consider the following factors to inform the proposal: (1) Costs/benefits, (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 Sea Level Rise Flooding
GREEN 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
- Home
- Beach
- Restaurant
- Library
- Fire Station
- Electrical Sub Station
- Sewage Lift Station
- Acquaculture
- Sheep
- Home
- Beach Launch
- Historic Church
- Post Office

LEGEND

GAME PIECES

Managed Retreat

- Retreat: \$1000
- Post-storm prohibitions: \$1000
- Move here: \$1000
- Stricter land use zoning: \$1000

Accommodate Water

- Elevate Buildings: \$500
- Floodable Buildings: \$500
- Elevate/New Road: \$500

Hard Engineering

- Revetment/Seawall: \$500
- Traditional Levee: \$500
- Tide Gate: \$500
- Wall & Pump Station: \$500

Soft Engineering

- Horizontal Levee: \$500
- Wetland/shoreline vegetation: \$500
- Offshore Structure: \$500
- Beach Maintenance: \$500

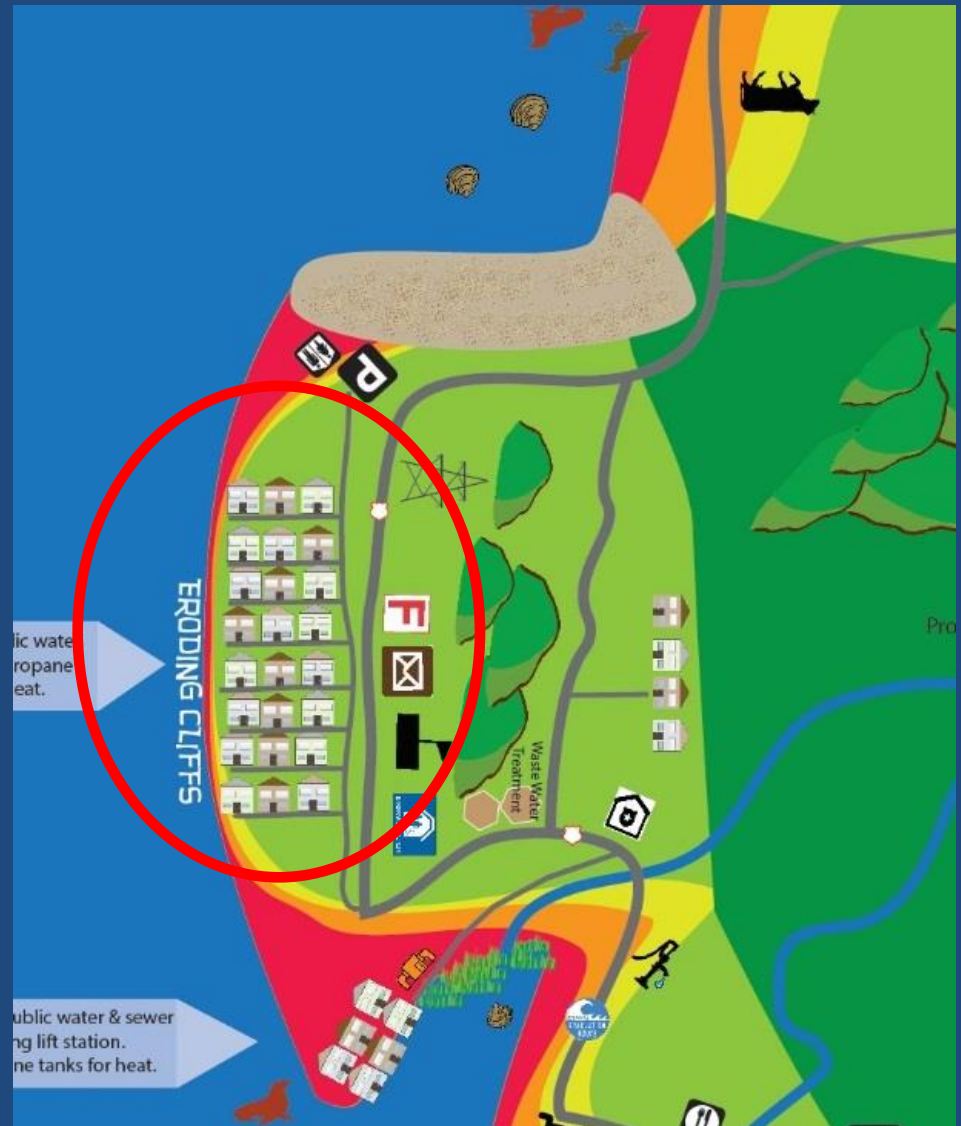
Downtown Zappa

- Commercial hub of the island
- Protected by undersize levees and vulnerable to both riverine and tidal flooding



Eroding Cliff Heights

- Residential community threatened by cliff erosion
- Zoning and shoreline protection challenges



Mudflat Manor

- Large residential community threatened by SLR
- Vocal community of property owners demanding protection



Desolation Court

- Small poor isolated community threatened by SLR
- In danger of being cut-off from services



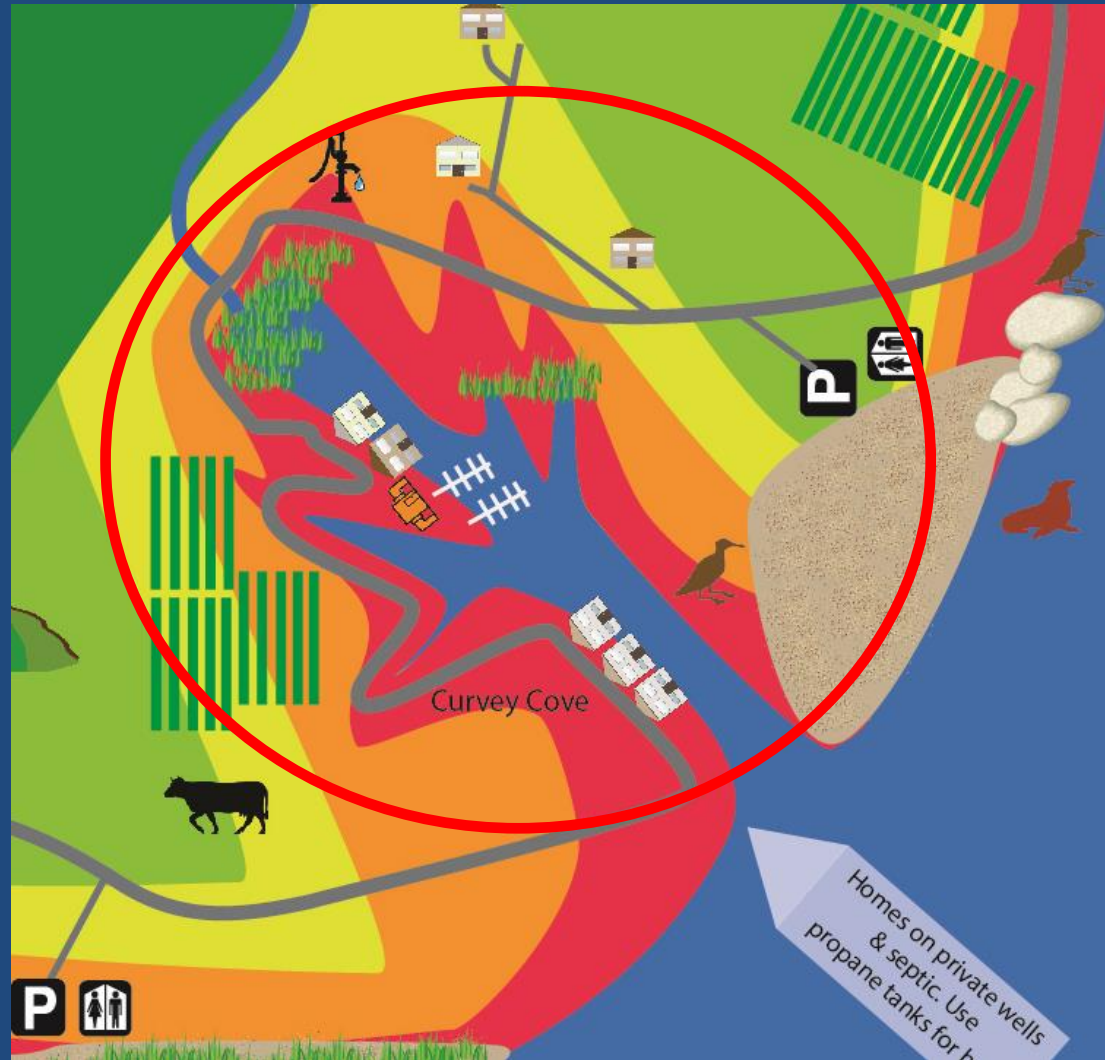
Shoreline Marina

- Water-based commercial business and associated businesses threatened by SLR
- In danger of being cut-off from road access at high tides



Curvey Cove

- Historic Ag based community with access and crops threatened by SLR
- In danger of being cut-off from road access at high tides



Seaspray Estates

- Large vacation and second home community with access and homes threatened by SLR
- In danger of being cut-off from road access at high tides













Costs \$\$\$

Real World – costs are messy and depend on many factors

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

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

Name	Piece	Piece Unit	Cost (\$)	Environmental Impacts Red (neg.) Yellow (neutral/caution) Green (pos.)	Flood Protection	Protects Against					Feasibility	
						Temp. Flooding	Storm Surge	Sea Level Rise	Wave Impacts	Erosion	Sheltered Areas	Open Coast
Protect - Engineered												
Coastal Armoring		1 Mile	\$\$\$	EEE	med	x	x	X	x		X	x
Tidal Gate		Creek width	\$\$\$\$\$	EEE	long	x	x	x	x		x	
Protect - Natural												
Horizontal Levee		1 Mile	\$\$\$\$	E	long	x	x	x	x		x	
Wetland/ shoreline vegetation		1 Acre	\$\$\$	E	med	x	x		x		x	
Offshore structure		1 Mile	\$\$	E	med	x	x		x		x	x
Accommodate												
Elevate Buildings		4 Buildings	\$\$\$	EE	med	x	x		x		x	x
Floodproof Buildings		4 Buildings	\$\$	EE	med	x	x				x	x
New/Elevate Road		1 Mile	\$\$\$\$\$	EEE	long	x	x	x	x		x	x
Retreat												
Retreat		4 Buildings	\$\$	E	long	x	x	x	x	x	x	x
Move Here		4 Buildings	\$\$	EEE	long	x	x	x	x	x	x	x

THANK YOU!

A stylized illustration of a green island with a blue sea level line and a yellow sun with a tide graph.

Sea Level Rise

marinslr.org