Economic Valuation of Shoreline Protection provided by Natural Infrastructure

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<u>Why is this being done</u>?

- Increase knowledge and awareness of ecosystems and their contribution to human wellbeing
- Promote necessity of protecting ecosystems to provide benefits for future generations
- Gain support for restoration and for future projects that will help protect the ecosystem
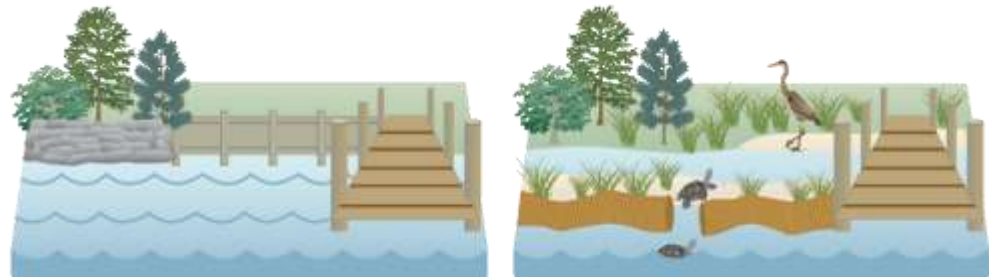
Study Outline

1. Identify marsh coverage & a series of storm scenarios

3. Determine change in damages if marsh coverage is changed by SLR

2. Identify level of protection provided by marsh

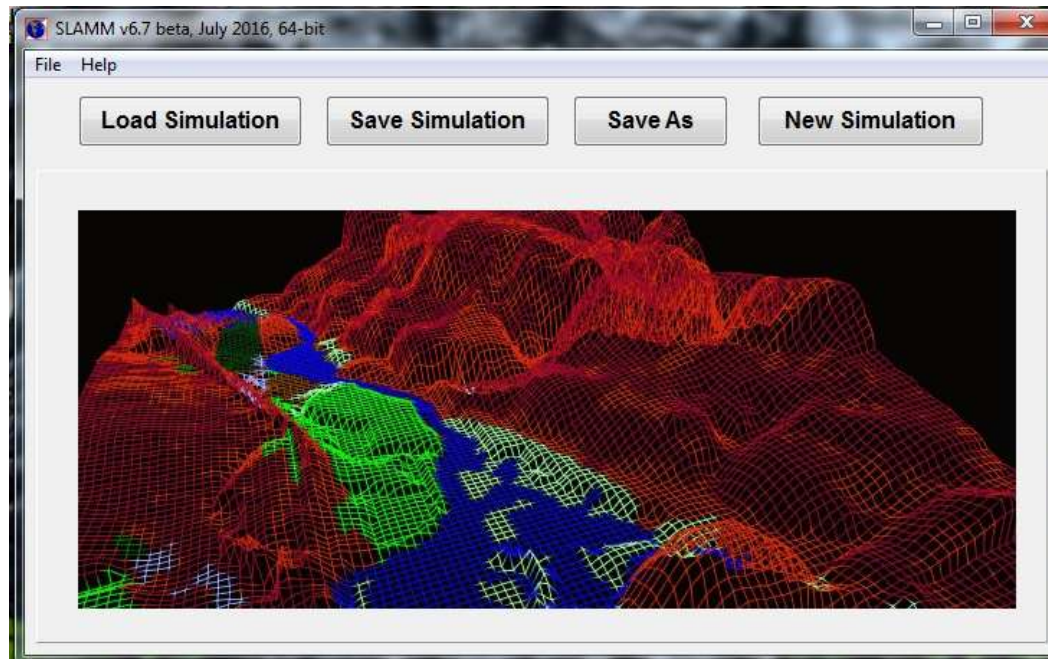4. Determine damages avoided ($$) by existence of natural habitats

Sea Level Affecting Marsh Model

Inputs:
- National Wetlands Inventory
- Digital Elevation Model
- Slope

Sea Level Affecting Marsh Model

Outputs:

Coverage Class	Base		2025				2050			
	Total Acres	% Coverage	Total Acres	% Coverage	Change from Base Acres	% Change from Base	Total Acres	% Coverage	Change from Base Acres	% Change from Base
[1] Developed Dry Land	125.08	0.77%	125.08	0.77%	0.00	0.00%	125.08	0.77%	0.00	0.00%
[2] Undeveloped Dry Land	424.87	2.62%	403.65	2.49%	-21.22	-4.99%	374.65	2.31%	-50.21	-11.82%
[3] Swamp	84.44	0.52%	84.44	0.52%	-0.00	-0.00%	80.24	0.49%	-4.20	-4.98%
[6] Tidal Fresh Marsh	4.17	0.03%	4.17	0.03%	0.00	0.00%	4.17	0.03%	0.00	0.00%
[7] Transitional Salt Marsh	19.39	0.12%	6.04	0.04%	-13.35	-68.86%	14.18	0.09%	-5.21	-26.89%
[8] Regularly Flooded Marsh	41.50	0.26%	207.94	1.28%	166.44	401.05%	807.24	4.97%	765.74	1845.09%
[10] Estuarine Beach	104.14	0.64%	107.67	0.66%	3.53	3.39%	101.22	0.62%	-2.92	-2.80%
[11] Tidal Flat	9.78	0.06%	60.66	0.37%	50.88	520.41%	87.43	0.54%	77.65	794.16%
[12] Ocean Beach	105.75	0.65%	103.18	0.64%	-2.57	-2.43%	103.74	0.64%	-2.00	-1.89%
[15] Open Water	0.53	0.00%	0.53	0.00%	0.00	0.00%	0.00	0.00%	-0.53	-100.00%
[16] Riverine Tidal Open Water	8668.20	53.37%	8640.70	53.20%	-27.51	-0.32%	8622.54	53.09%	-45.66	-0.53%
[19] Open Ocean	548.59	3.38%	594.15	3.66%	45.56	8.31%	635.34	3.91%	86.75	15.81%
[20] Irregularly Flooded Marsh	6074.87	37.40%	5875.24	36.18%	-199.63	-3.29%	5261.75	32.40%	-813.12	-13.38%
[23] Tidal Swamp	29.68	0.18%	27.55	0.17%	-2.13	-7.19%	23.41	0.14%	-6.27	-21.12%
Totals:	16241.00	100.00%	16241.00	100.00%	0.00	N/A	16241.00	100.00%	0.00	N/A

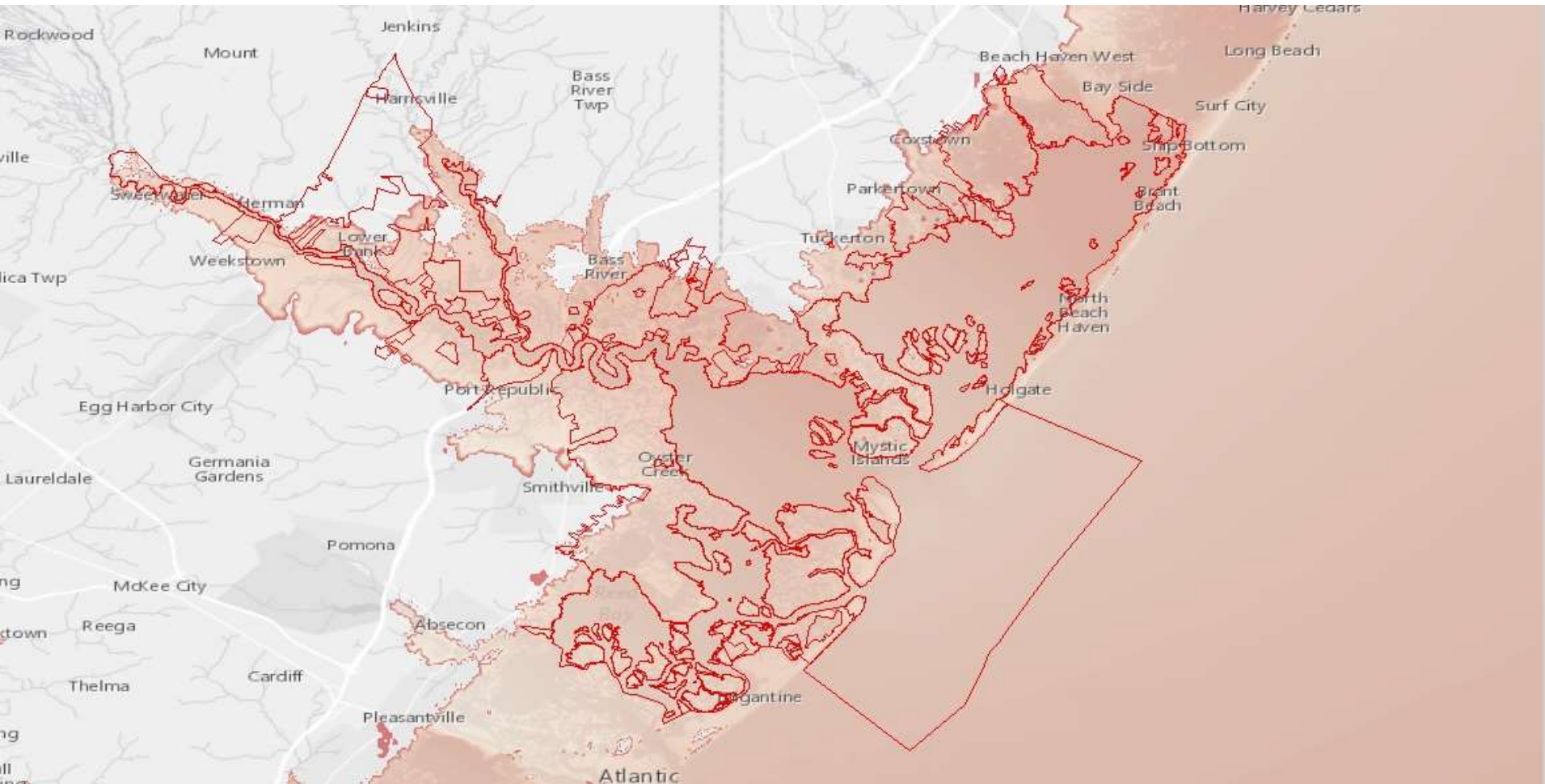# Sea Level Affecting Marsh Model
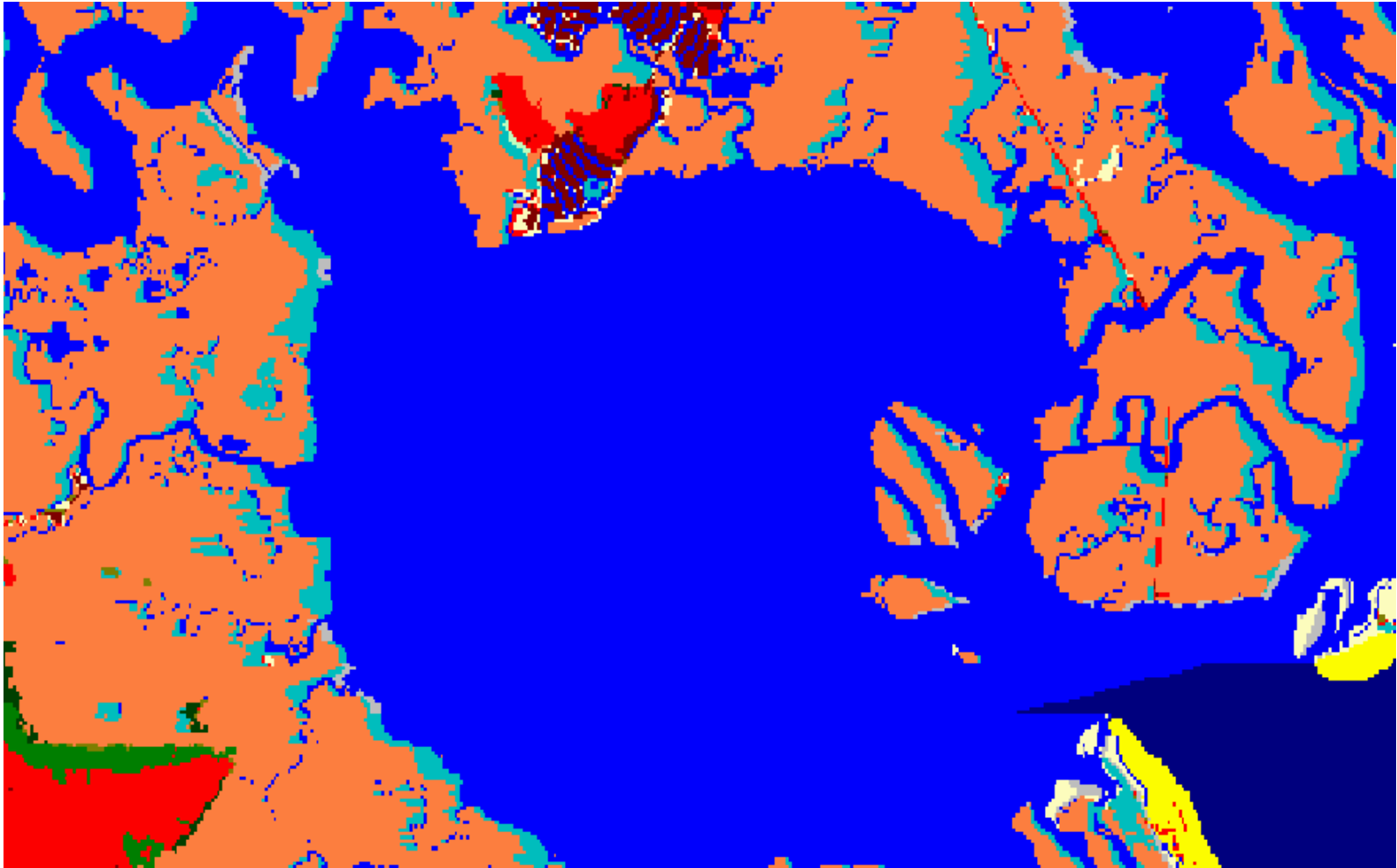
Outputs:

ADCIRC + SWAN Model

- Advanced Circulation Model (ADCIRC)
  - Outputs:
    - Water velocity
    - Water elevations
    - Water depth

- Simulating Waves Nearshore (SWAN)
  - Outputs:
    - Wave height
    - Period
    - Direction

ADCIRC + SWAN Model

Further Analyses

- Outputs from ADCIRC + SWAN
  - Parcel level data
    - Property elevated?
    - Property value
    - Tax amounts
  - ACoE Depth/Damage Functions
    - How much damage to property

Community Rating System

- The Community Rating System (CRS)
  - Three Goals:
    - Reduce flood damage to insurable property
    - Strengthen and support the insurance aspects of the NFIP
    - Encourage a comprehensive approach to floodplain management
- "Credit Points" are issued to communities that engage in these floodplain management activities

Community Rating System

CRS Class	Credit Points (cT)	Premium Reduction	
		In SFHA	Outside SFHA
1	4,500+	45%	10%
2	4,000–4,499	40%	10%
3	3,500–3,999	35%	10%
4	3,000–3,499	30%	10%
5	2,500–2,999	25%	10%
6	2,000–2,499	20%	10%
7	1,500–1,999	15%	5%
8	1,000–1,499	10%	5%
9	500–999	5%	5%
10	0–499	0	0

Open Space Preservation

- Open Space Preservation (OSP)
- The JC NERR is considered preserved open space
- Preservation of Open Space = NFIP discounts in CRS-participating communities
  - People save money on flood insurance premiums
  - Equates to additional discretionary income to spend elsewhere in the economy
- What is the economic contribution of these savings attributed to open space preservation?

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- 12 communities saved $7.86 million in flood insurance premiums in 2013 by participating in the CRS
  - $1.42 million of which can be attributed to open space preservation
- Using community-specific marginal propensity consume (MPC) data
  - Direct expenditures are expected to be infused into the economy due to these savings
- Total direct expenditures added to economy in 2013 was $1,021,930

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- The JC NERR is open space that provides protection to nearby and adjacent communities in the form of storm surge, flood, and wave mitigation

- Its presence helps nearby and adjacent communities qualify for flood insurance discounts through open space preservation, as defined by the CRS

- Preserving Open Space in this region (such as the JC NERR) led to $1.42 million in flood insurance discounts in 2013

  - Which, in turn, led to $1,021,930 in direct expenditures in 2013

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Who's Involved

- Jacques Cousteau National Estuarine Research Reserve
- National Estuarine Research Reserve System
- George Mason University
- Rutgers University