

# Modeling, Visualizing, & Communicating Nor'easter and Hurricane Threats with Sea-level Rise to Support Coastal Management within New England

Management Transition Advisory Group (MTAG)

Kickoff Meeting  
1 November 2021



THE  
UNIVERSITY  
OF RHODE ISLAND



SCHOODIC  
INSTITUTE  
AT ACADIA NATIONAL PARK



PennState  
College of Arts  
and Architecture

# Agenda

*Introduce and discuss the overarching 4-year collaboration, including the role of the Management Transition Advisory Group (MTAG)*

Time	Item	Details
12:00	Welcome	Introductory remarks
12:05	Introduction to project	Purpose, team members, modeling, visualization, building blocks, resilience and adaptation planning
12:25	Introduction of MTAG members	Invite participants to introduce themselves
12:35	Project approach	Sites, tiers, timeline, engagement, permits
12:45	MTAG overview	Role and expectations, meeting schedule
12:55	Discussion, feedback, questions	Open among participants
1:25	Next steps	For project and MTAG
1:30	Adjourn	Closing remarks

Record the meeting

# Goals, Objectives, and "Why?"

*Promote informed management actions and wise expenditure of resources to improve coastal resilience and protect communities (people, infrastructure) and their ecosystems (habitats, resources, services) by investigating the combined impacts from storms - Nor-easters, hurricanes - and sea-level rise (SLR)*

**Model** – Simulate impacts of future extreme storms combined with SLR- with/without management actions

**Inform** – Provide stakeholders with data, visualizations, and other tools to build awareness and capacity for making informed decisions

**Communicate** – Promote scientist-stakeholder dialog to build awareness and enhance understanding and application of project outputs

**Tailor** - Tailor project (modeling, visualizations, deliverables) to the extent possible to address site-specific needs and enhance/expand on existing efforts

**Adaptation actions, infrastructure planning, emergency response, safe public access, natural resources and ecosystem protection and restoration**

# Management Challenges Identified

## ALL

- Resiliency (community, ecosystem)
- Adaptation strategies
- Results of taking management actions vs not
- Cultural resources

## Cape Cod, MA

- Inundation of emergency access routes, local airport, vulnerable historic structures
- Safe public access
- Salt marsh restoration

## New Bedford, MA; Providence, RI

- Infrastructure vulnerability and management options
- Engaging less-represented communities in outreach and planning
- Ecosystem restoration

## Acadia, ME

- Roads
- Access
- Emergency preparedness
- Park infrastructure
- Salt marsh restoration

## Boston Harbor, MA

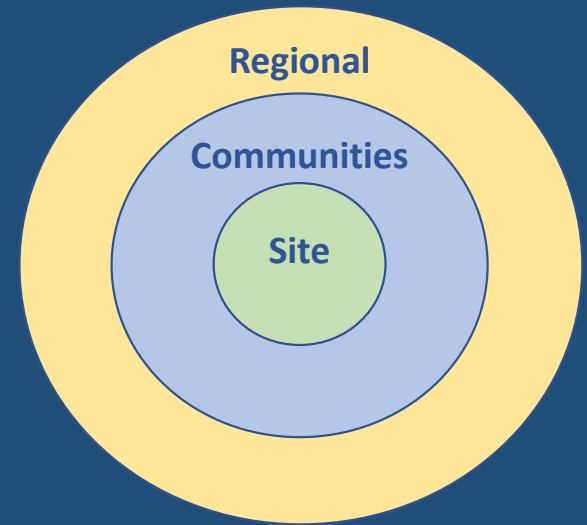
- Coordination with Climate Ready Boston
- Erosion of cultural resources

## Charlestown/S. Kingstown, RI

- Estuarine habitat vulnerability
- Adaptive capacity of ecosystem
- Blue economy

# Engagement!

- Key component of project and commitment from project team
- Engage broad range of stakeholders across the sites
- Tailored to each site



Scientists and stakeholders learn from one another



More effective and usable deliverables



Promotes science-based and effective management actions

# Meet the Team



**Isaac Ginis**  
URI Research



**JP Walsh**  
URI Research



**Stephan Grilli**  
URI Modeling



**Annette Grilli**  
URI Modeling



**Pam Rubinoff**  
URI Engagement

## URI Graduate Assistants

Deb Crowley  
Isabel Whaling  
Elin Schuh  
Alexa Leone  
Felix Groetsch



**Amanda Babson**  
NPS Engagement



**Monique LaFrance  
Bartley**  
NPS Engagement



**Catherine Schmitt**  
Schoodic Institute  
Engagement



**Peter Stempel**  
PSU  
Visualizations

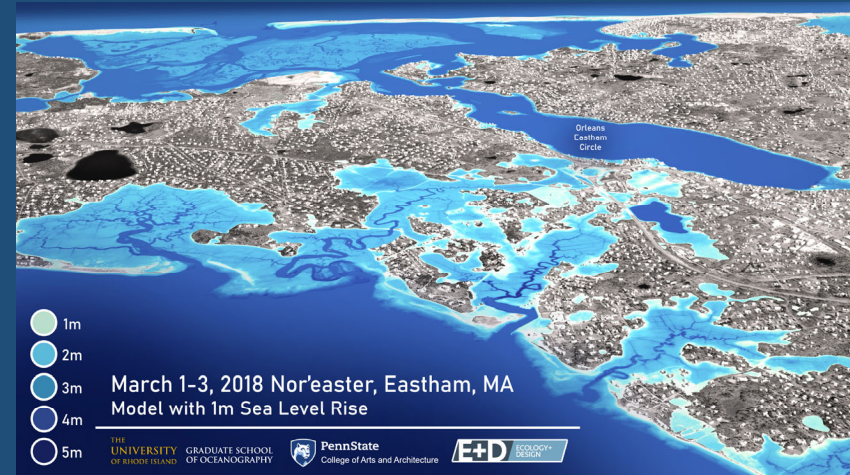
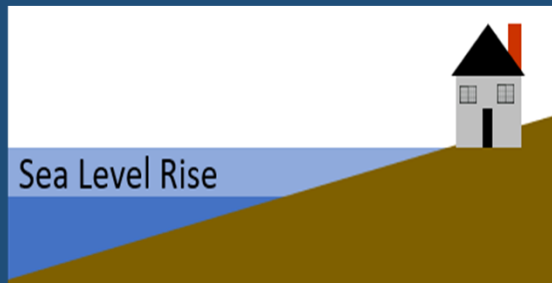
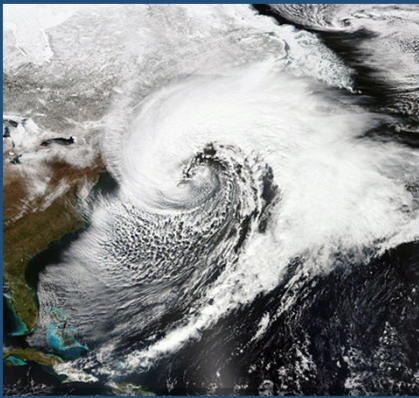


**Roland Duhaime**  
URI Data



**Chris Damon**  
URI Data

# Sea Level Rise Amplifies Impacts of Extreme Storms

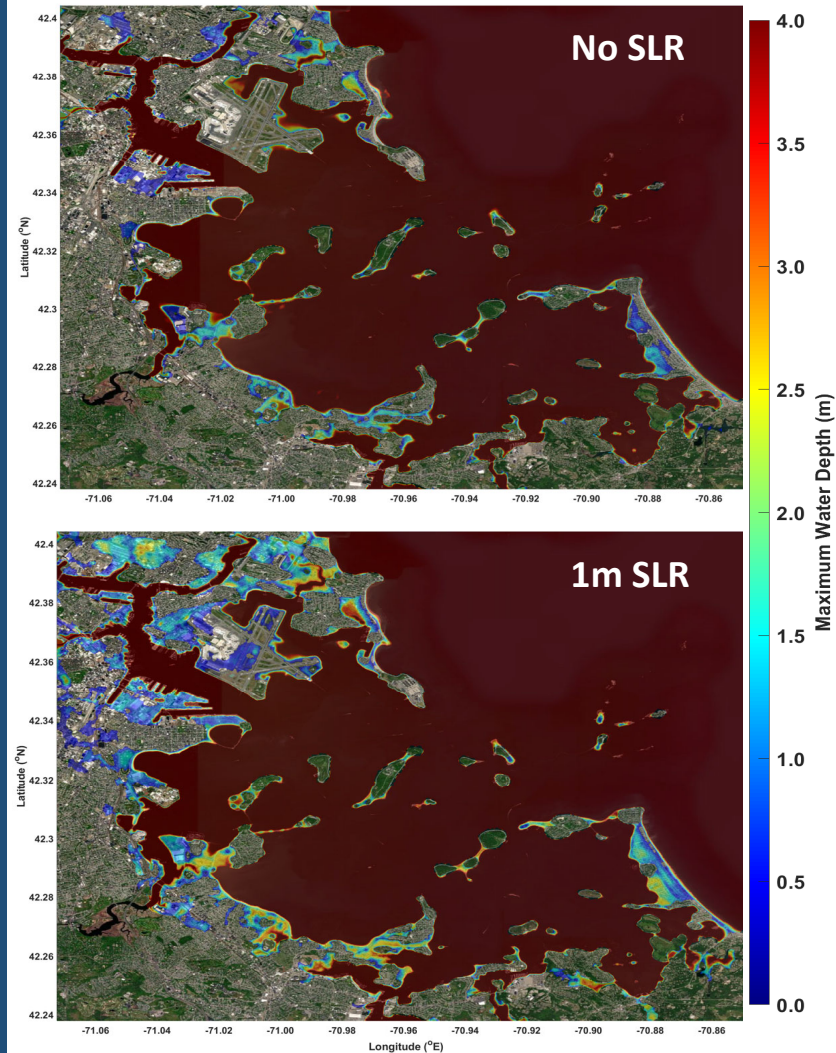




# Building On Current Study

- Modeling sea level rise effects on coastal inundation from Nor'easters at national parks
- NPS funded study, led by URI team
- 2018 - 2022
- Focused on three parks
  - Acadia National Park
  - Boston Harbor Islands National Recreation Area
  - Cape Cod National Seashore
- Modeling of coastal inundation
  - Tides
  - Storms
  - Sea level rise
- Visualizations and interpretive component

January 2018 Nor'easter  
Boston Harbor Islands National Recreation Area





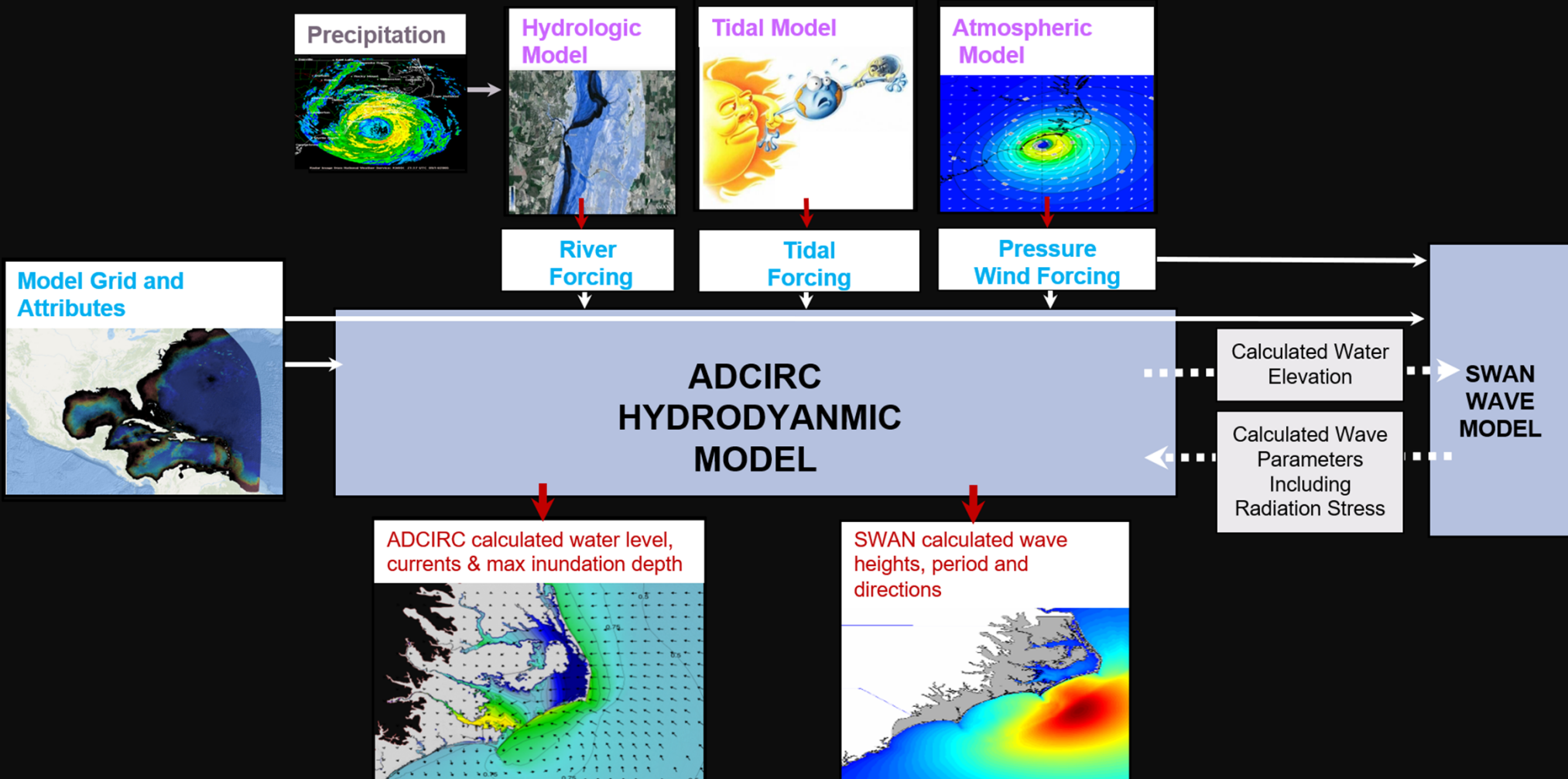


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**A hazard resilient future for Naval Station Newport within its coastal community:  
*Military Installation Resilience Review for short-term preparedness and long-term  
planning***

# ADvanced CIRCulation (ADCIRC) Model for Flood Predictions



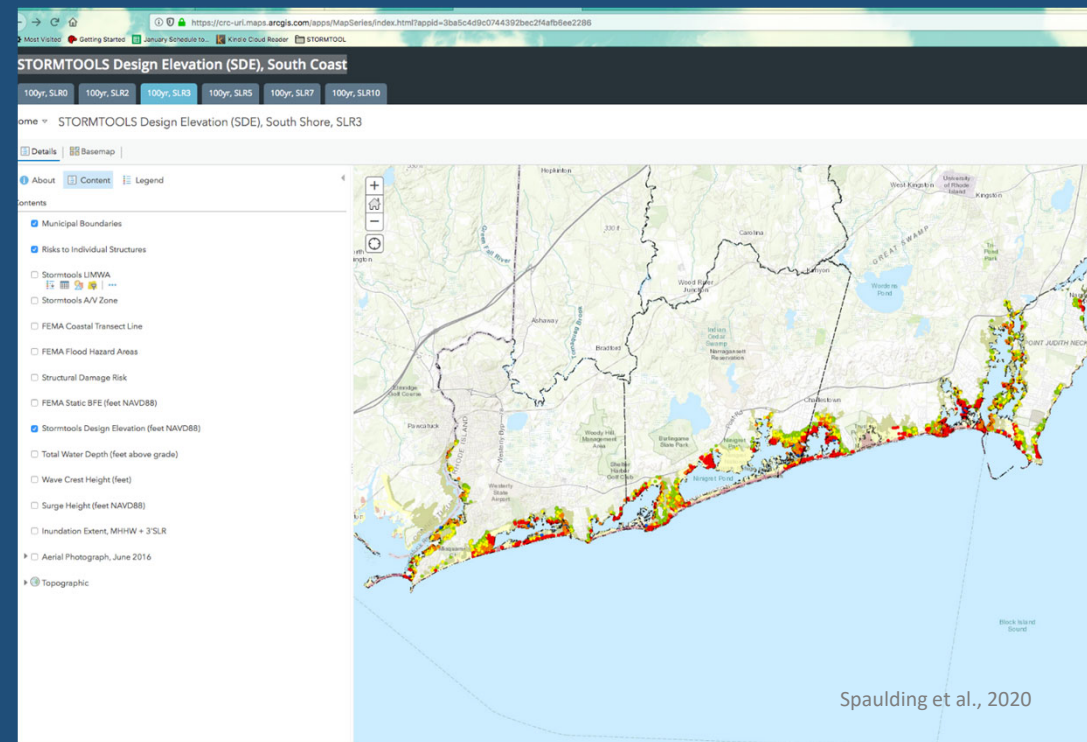
# Rhode Island Coastal hazard and risk modeling tools with SLR (STORMTOOLS)

## 100-YEAR STORM HAZARD AND RISK ASSESSMENT TOOL

Predict expected structural damages for SLR scenarios  
Hazard includes storm surge, waves, erosion, SLR

## ACCESSIBILITY

STORMTOOLS website and APP

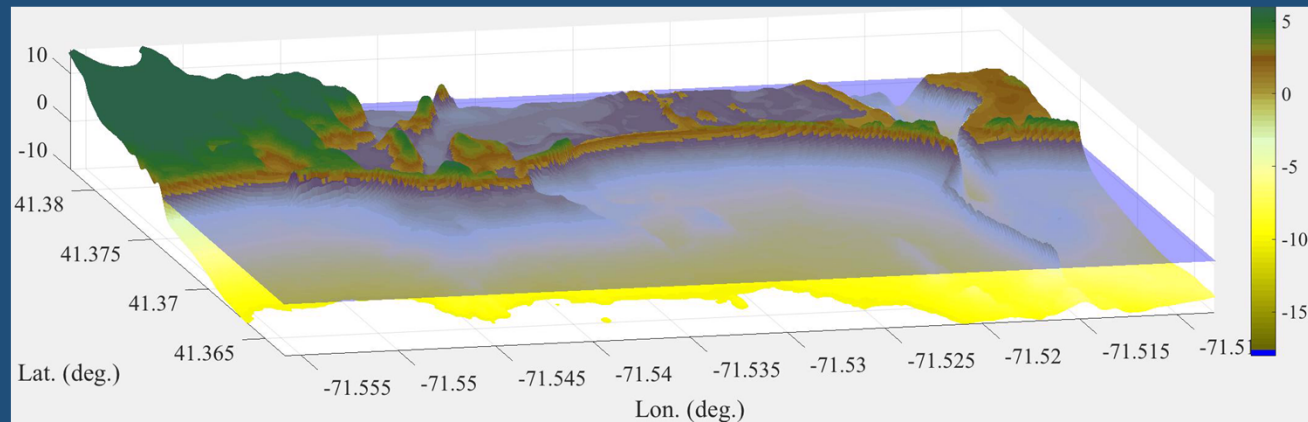


# Coastal Modeling: Beach and Dune Erosion



## ASSESS AND PREDICT

- Beach and dune erosion during storm events
- Breaching and changes in coastal morphology
- Flooding



Grilli et al., 2020

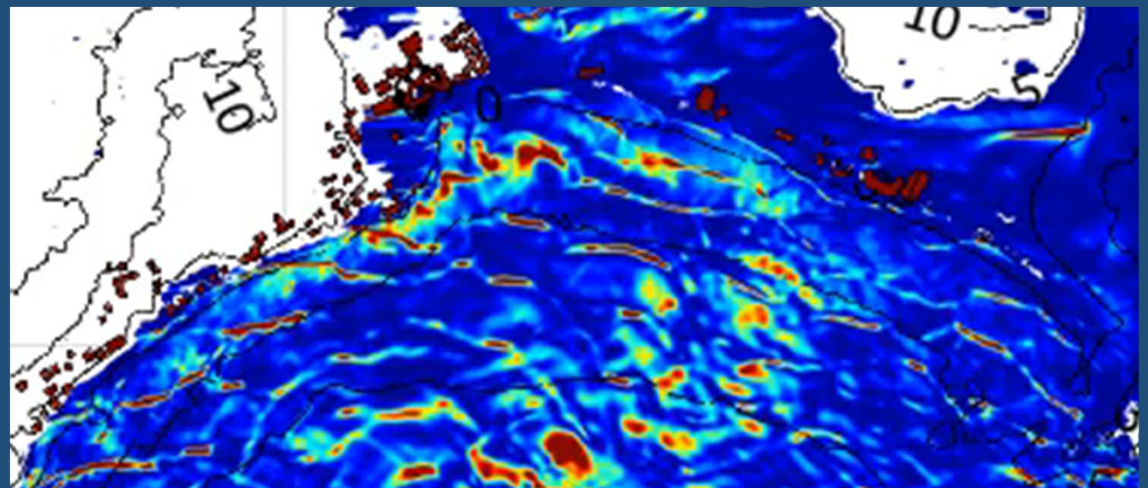
Modeling tool: Morpho-dynamic model, XBeach

# Coastal Modeling: Waves and Momentum Force



## ASSESS AND PREDICT

- Runup
- Forces on structures
- Flooding



Grilli et al., 2020

Modeling tool: Phase resolving wave model, FUNWAVE

# Coastal Modeling: Natural and Nature-based Features (NNBF) Mitigation Solutions

Beach Nourishment



Dune reinforcement



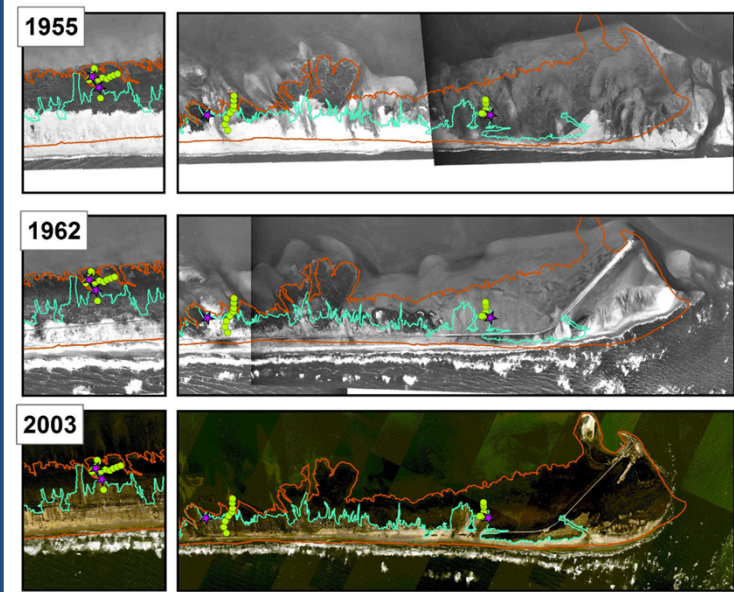
Enhanced Vegetation



# Using Historical and New Data to Inform Future Changes

- An overall goal is to understand risk today and in the future.
- In RI & on Cape, GIS and field studies will measure past and recent change.
- Use existing data and analyses to inform modeling. New data as needed.

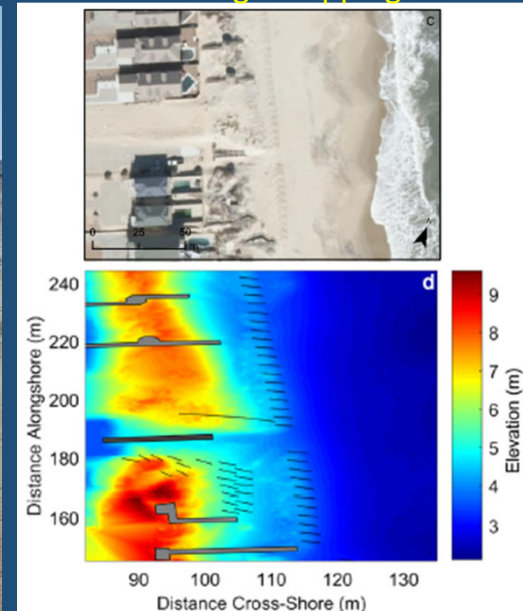
Aerial Photographic Analysis



Field Surveying and Sampling



3D Change Mapping

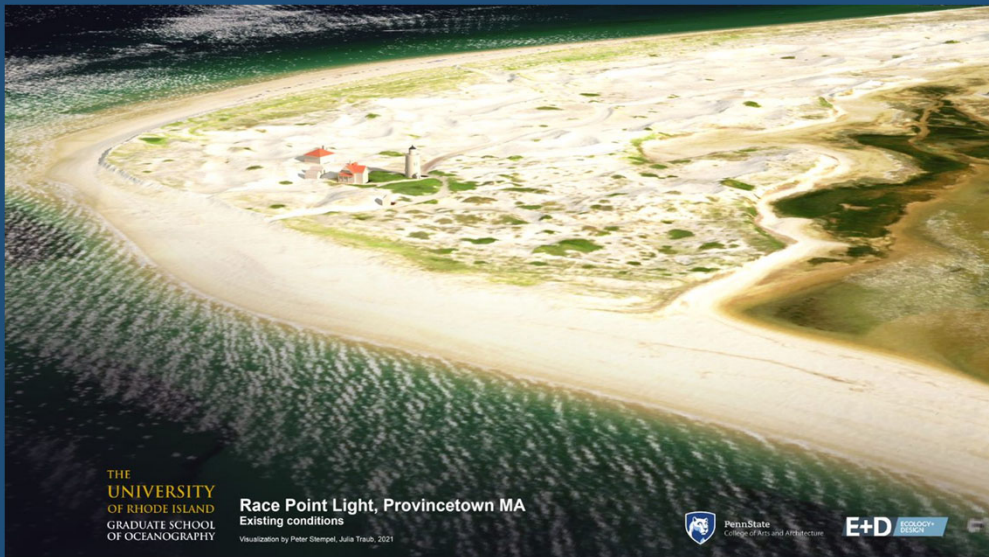
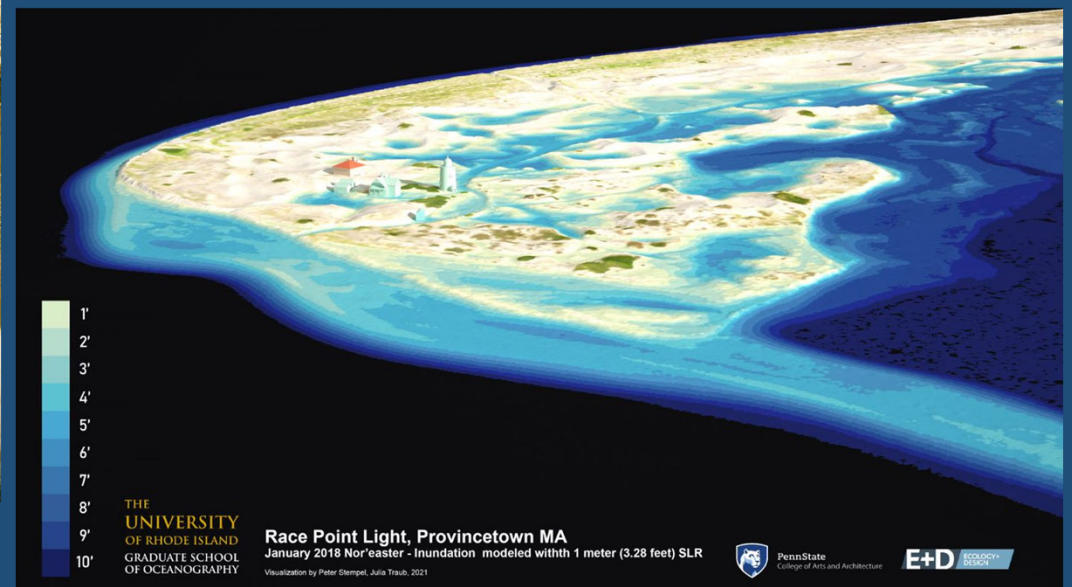
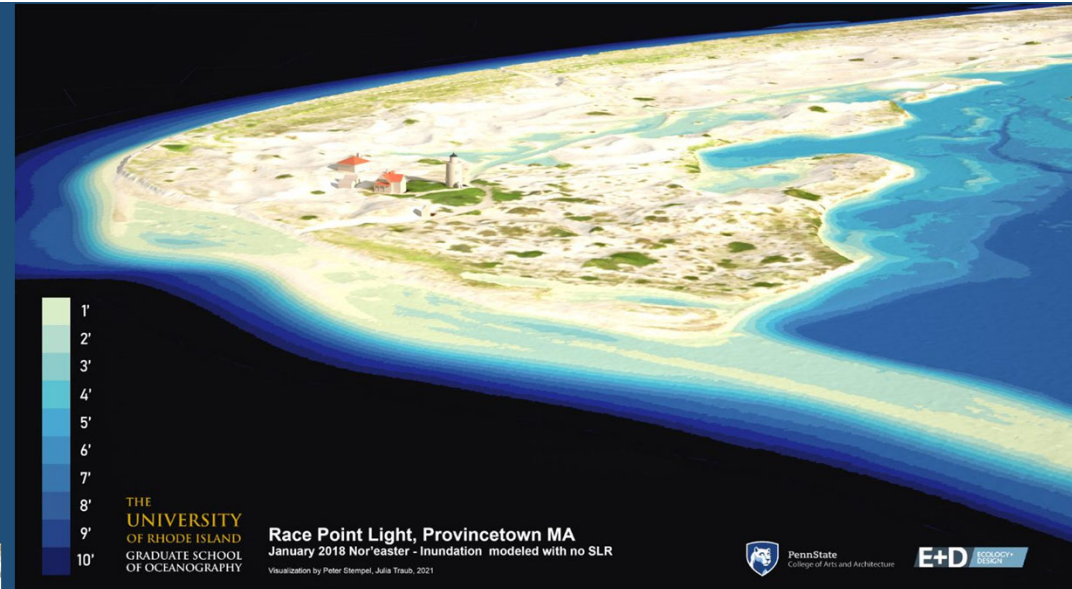


# Advanced 3-D Visualization Tools

Bottom: Existing conditions

Top right: January 2018 Nor'easter

Bottom right: Nor'easter +1m SLR





# Interactive Dashboard

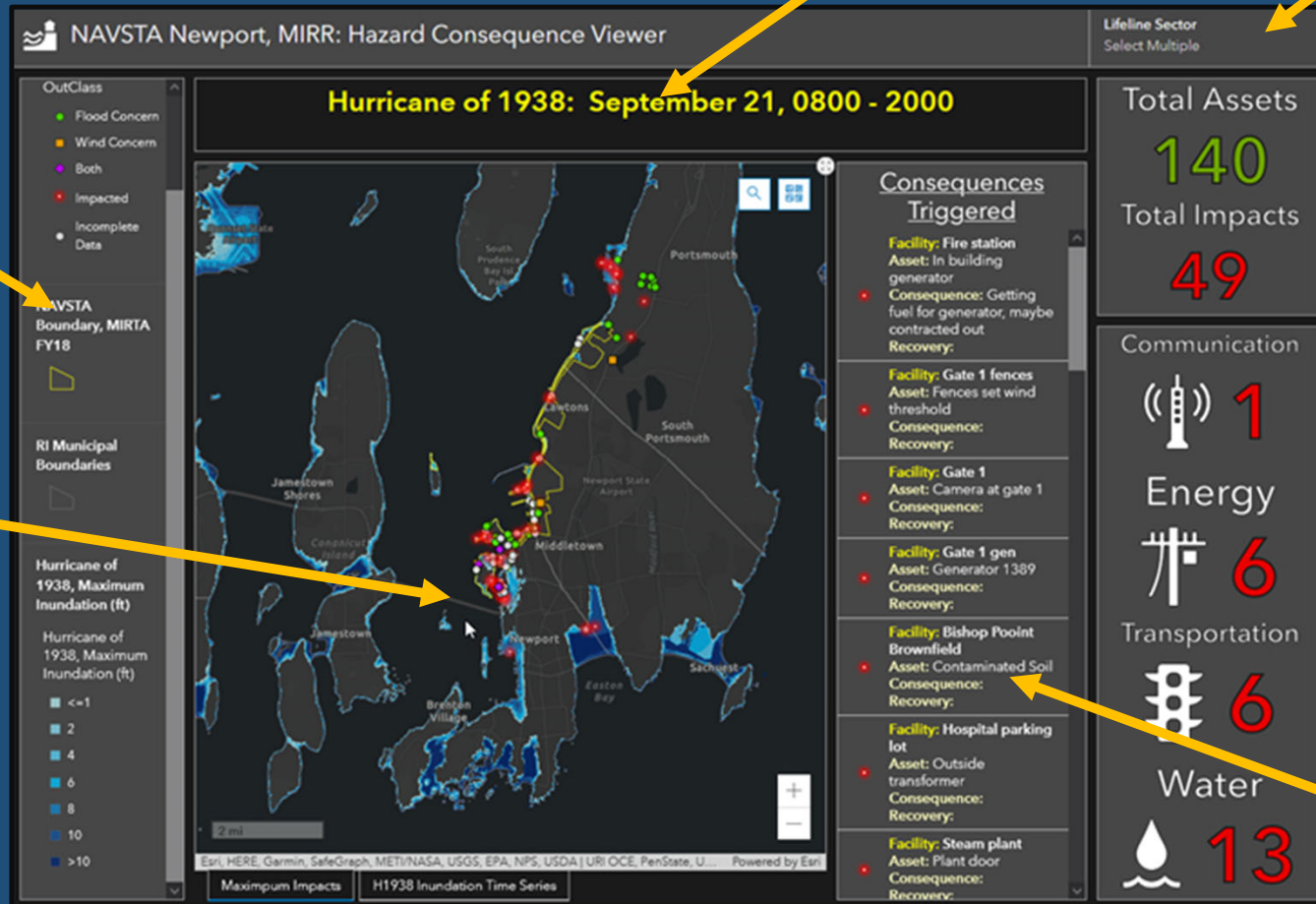
Modeling Scenario

Data Filters (map and metrics)

Map Legend

Interactive Map :

- Extent of flooding
- Depth of flooding
- Assets affected



Quantitative Summary of Impacts

Specific Asset Information

Introduce  
Yourself

**Name**

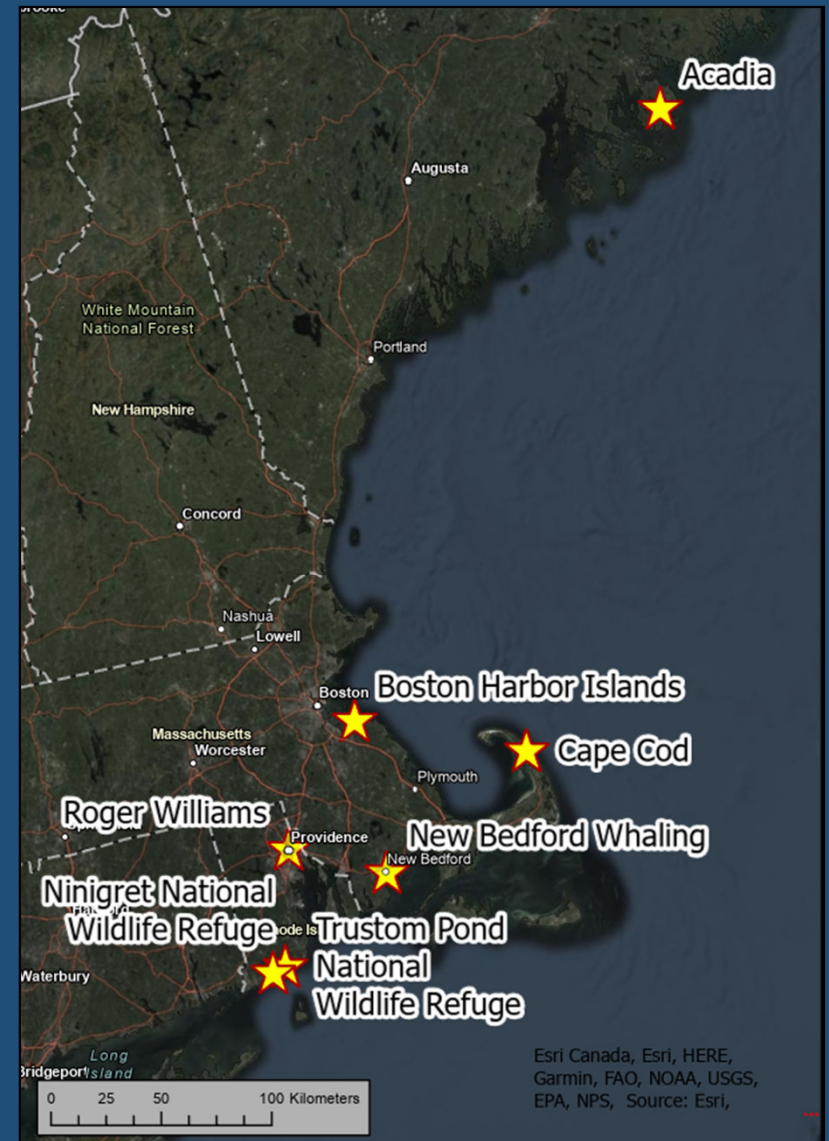
**Affiliation**

**What do you want to  
get out of this project?**



# Project Sites

- 5 National Parks
  - Acadia
  - Boston Harbor Islands
  - Cape Cod
  - New Bedford Whaling
  - Roger Williams Memorial
- 2 National Wildlife Refuges
  - Ninigret
  - Trustum Pond
- Tailored to meet site-specific needs
  - Management
  - Model and data availability
  - Existing planning efforts



# Building Upon Existing/Ongoing Efforts

## TOWN OF CHARLESTOWN RHODE ISLAND NATURAL HAZARD MITIGATION



National Park Service  
U.S. Department of the Interior

Natural Resource Stewardship and Science

### Resist-Accept-Direct (RAD)—A Framework for the 21st-century Natural Resource Manager

Natural Resource Report NPS/NRSS/CCRP/NRR—2020/ 2213

Remnar



## BOSTON HARBOR NOW



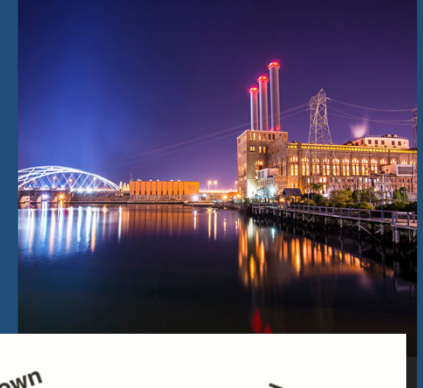
## NB RESILIENT

NEW BEDFORD'S PLAN FOR COMMUNITY CLIMATE ACTION + RESILIENCE

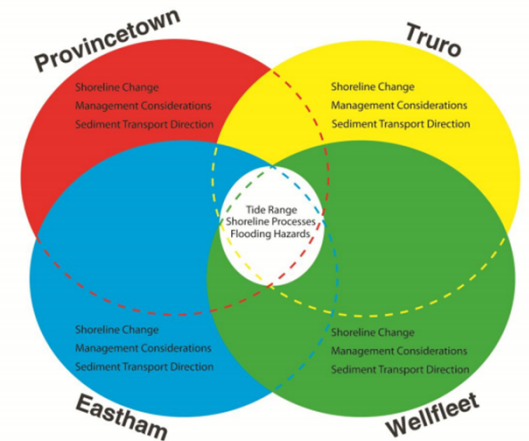
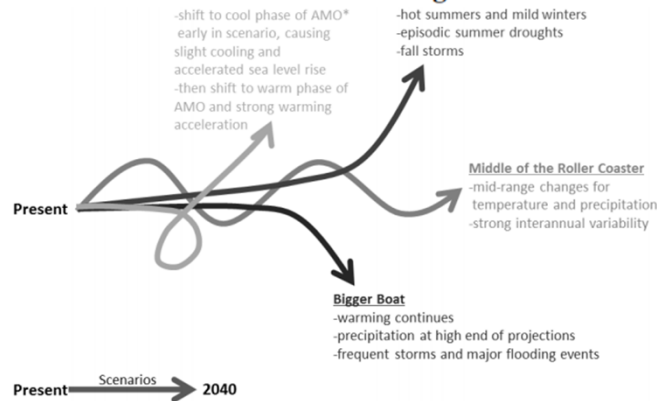


## TOWARDS A RESILIENT PROVIDENCE

ISSUES | IMPACTS | INITIATIVES | INFORMATION



## Acadia National Park Climate Change Scenario Planning



# Three-tiered stakeholder-driven approach

Tier	Community education and outreach	Hydrodynamic modeling	Development of 3D visualization tools	Hazard impact and coastal vulnerability assessment	Mitigation strategies implementation	Sustained Involvement
Tier 1 (CACO, NITR)	✓	✓	✓	✓	✓	✓
Tier 2 (ACAD)	✓	✓	✓			
Tier 3 (NEBE, BOHA, ROWI)	✓	✓	✓			

# Timeline of Activities (initial proposal)

## YEAR 1

- Staggered start tier 1 and 2 sites
- Kickoff site teams and site visits
- Modeling, asset exposure and vulnerability; visualizations
- Data portal development
- MTAG meetings

## YEAR 2

- Engagement – sites and MTAG
- Initiate tier 3: BOHA, ROWI, NEBE
  - Kickoff site teams and site visits
  - Modeling, asset exposure and vulnerability; visualizations
- Continue visualizations, vulnerability assessments and modelling for CACO, NITR, and ACAD
- Finalize vulnerability assessments tiers 1 and 2

## YEAR 3

- Engagement – sites and MTAG
- Continue visualizations, vulnerability assessments and modeling for all sites

## YEAR 4

- Engagement – sites and MTAG
- Complete deliverables and user interface
- Transition to end users

# MTAG Purpose



**SERVE AS POINT OF CONTACT** to provide information



**PROVIDE GUIDANCE** with respect to establishing overall direction, accomplishing objectives related to management, and resolving issues that may arise



Review and help **REFINE RESULTS AND DELIVERABLES** (e.g. reports, visualizations, dashboard)



Provide synergistic opportunities for **SHARING KNOWLEDGE AND LESSONS LEARNED ACROSS SITES**, discussion, and collaboration



Help ensure project and deliverables can be used **TO GUIDE MANAGEMENT ACTIONS** and help translate outcomes to end-users



Assist with **OUTREACH TO END-USERS** during and beyond project period to build awareness and capacity for making informed decisions

# Today's Discussion



What results/outcomes would you like to see from this project?



How could this add to your ongoing efforts?



Recommendations to best tailor to meet needs of specific users/issues?



What strategies can we employ for effectively working together?



Questions and other comments



## Next Steps

- Who else to engage? Community, tribal etc
- Site 1 kickoff - Dec/Jan; Site 2 kickoff – late winter.
- Technical modeling and field work scoping. Permits?
- Information gathering – models, data, and reports
- WWW development – highlight activities and partners
- MTAG meeting – Spring 2022

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*For more information*

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