



1. Welcome to Know Your Risk. This module is focused on using mapping tools to make informed decisions that reduce impacts from hazards in our coastal cities and towns. This is part of the online series called, Providing Resilience Education for Planning in Rhode Island (or PREP- RI). Rhode Island offers several user-friendly mapping tools for use at the local level to inform decision-making in support of coastal resilience.

Building Tools in Partnership



Why Does It Matter?

PREP-RI

[GROVER]

As noted in another PREP-RI module titled, “Climate Change in Rhode Island,” Rhode Island has been experiencing changes in recent years, although nothing that would equate to an extreme event such as the Great Hurricane of 1938, or Hurricane Carol in 1954. However, we do know that the rate of sea level rise is accelerating, storms are becoming more frequent and intense, coastal erosion has been altering many segments of our shorelines, and flooding events are becoming more commonplace. In order to understand risks, plan wisely, and prepare for the future, GOOD MAPPING TOOLS ARE CRUCIAL.

Using past storm events as a guide, we can estimate the CURRENT RISK of flooding and storm damage along Rhode Island’s coast. Estimating FUTURE RISK, however, requires that we use the best available science and modeling to GLANCE INTO THE FUTURE and consider what the coastline may look like with higher daily tides from sea level rise, and how storms may reach farther inland and bring deeper flooding conditions with a future increase in sea levels.

Erosion along Rhode Island's coastline



PREP-RI

[GROVER]

Rhode Island has seen erosion along our coastline and also different techniques to combat shoreline erosion, to varying degrees of success. Monitoring coastal erosion over time has been an important function of the CRMC, and we are working now to project what future erosion might look like with periodic storm events, and how these are likely to accelerate erosion with sea level rise and wave action. Shoreline protection structures that have been successful in the past may become insufficient to protect properties from future conditions.

R: Moonstone Beach

L: Westerly, MyCoast -Lauren Butler

Flooding from High Tides and Storms



PREP-RI

[GROVER]

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Sea Level Rise is Accelerating



PREP-RI

[GROVER]

The Newport tide gauge has been collecting data on sea level rise since 1930 and has shown us that there has been about 10 inches of sea level rise since then. Using the best available science from the National Oceanic and Atmospheric Administration's (NOAA) researchers, we are able to project what sea level rise might look like in the future. The curves you see here reflect new data released in 2017 by NOAA, and the CRMC has adopted the numbers to reflect NOAA's "high curve" into Rhode Island's coastal policy. With the new estimates available, Rhode Island is now planning for 1 foot of sea level rise by 2025, 3 feet by 2050, and over 9 feet of sea level rise by 2100.

The sea level estimates shown in this graph allow coastal planners and municipal decision makers to estimate how much time coastal property owners are likely to have before their properties are subject to flooding from daily high tides. This information shows us that over the course of a 30-year mortgage, or by the year 2050, the tides are likely to be 3-feet higher than what we are seeing in 2017. Through use of the mapping tools that reflect these higher sea levels, property owners can be better prepared for how this tide water will flow across their landscapes and start to take action and prepare for impacts of coastal flooding.



[GROVER]

To better understand what risk actually looks like, the mapping tools presented in this module can be used to visualize the CURRENT RISK from storm events and also assess FUTURE RISK from coastal erosion and sea level rise, coupled with future storm events. The tools illustrate both the extent of potential flooding across the landscape, and also the depth of flooding from different scenarios.

In the case example of sewage treatment plants, also covered in the PREP-RI Infrastructure module, the maps illustrating storm scenarios allowed the Town of Narragansett to assess the long-term risk from both sea level rise and storm surge, and consider how to upgrade their facility over time to meet future conditions. The town of Narragansett worked with the CRMC, using the maps to inform how their Wastewater Treatment Facility can be “built to last”, and ensure that the Town gets a bigger “bang for their buck” when they invest public dollars to improve the facility over the long term.

The Rhode Island Department of Environmental Management completed a study of ALL Rhode Island’s wastewater treatment facilities, and the Town of Warren is

currently using this information to assess what is needed to upgrade their facility for long-term functionality and resilience.

What Can We Do?

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[GROVER]

Using the variety of mapping tools outlined in this module will help you to better understand your community's risk and provide you with tools to be proactive in applying this information to site-based decisions and overarching municipal plans.

Teresa will walk you through the tools we have available.

Rhode Island's Mapping Toolbox

Past and Present

1. Floodplain Mapper



2. Coastal Erosion



PREP-RI

3. STORMTOOLS



4. SLAMM



5. MyCoast



6. e-911 Exposure



7. Property Values *(in progress)*



8. CERI *(in progress)*



RI FLOODPLAIN MAPPING TOOL

*Visualize current regulatory FEMA FIRM maps
(Also available from FEMA's Map Service Center)*



[TERESA]

The RI Floodplain Mapping Tool helps visualize current regulatory FEMA flood insurance rate, or FIRM, maps. The tool allows you to zoom into any location in the state of RI and get an assessment of the designated FEMA floodplain, and elevation of storm waters. These maps illustrate flood zones calculated using past storm events and current risk ONLY. THEY DO NOT project future conditions.

RI FLOODPLAIN MAPPING TOOL

Where are the FEMA flood zones that form the basis for flood insurance rates?

What is the approximate base flood elevation for a particular property?

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These maps inform property owners and flood insurance policy holders about the level of flood risk which determines the flood insurance rate for a given property in the floodplain. The floodplain designation also carries with it development requirements outlined in the Rhode Island Building Code.

Home • FEMA's National Flood Hazard Layer (Official)

Search [Address] [Go]

Map [Layers] [Full Screen] [Print] [Home]

Type your address here

Flood Insurance Rate Maps

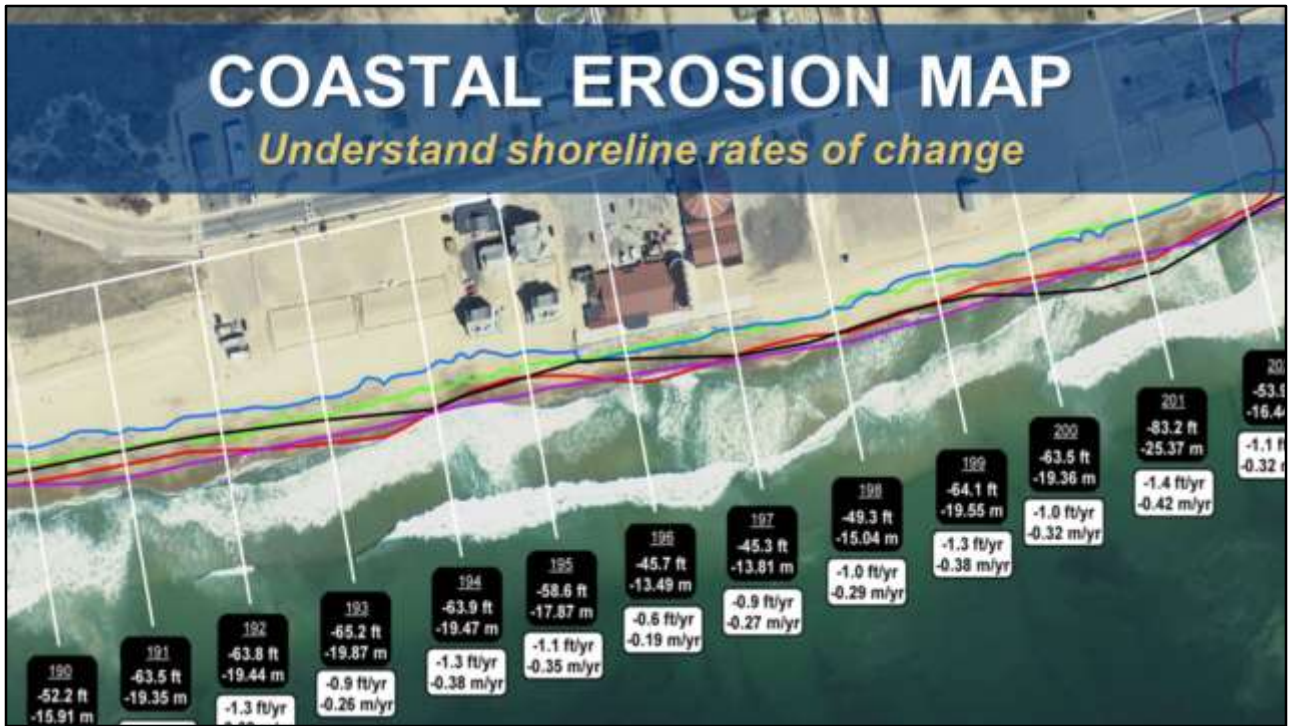
FIRMs are typically used to determine:

- If a structure is in a floodplain
- The flood insurance zone that applies to the structure
- The approximate base flood elevation for the site

Flood Zone Descriptions

| Zone | Risk Type | Description |
|--------------|-----------------|--|
| X (Unshaded) | Low to Moderate | Areas of minimal flood hazard. |
| X (Shaded) | Low to Moderate | Areas subject to inundation by the 0.2% annual-chance flood event. |
| A | High | Areas subject to inundation by the 1% annual-chance flood event generally determined using approximate methodologies. |
| AE | High | Areas subject to inundation by the 1% annual-chance flood event determined by detailed methods. |
| AH | High | Areas subject to inundation by the 1% annual-chance shallow flooding (usually areas of ponding) where average depths are between 1-3 ft. |
| AO | High | Areas subject to inundation by the 1% annual-chance shallow flooding (usually sheet flow) where average depths are between 1-3 ft. |
| VE | High - Coastal | Coastal areas subject to inundation by the 1% annual-chance flood event with additional hazards due to storm-induced velocity wave action. |

Both RIEMA's Floodplain Mapping Tool and FEMA's Map Service Center offer online flood insurance rate maps in an ArcGIS format to allow easy viewing of these maps online. To take a look at your property and the flood zone designation, simply enter your address in the upper right hand corner of the map viewer. You can zoom in and out to activate different layers of information in these online maps.



The Coastal Erosion maps have been hosted by the CRMC for many years now and are available through their website. These maps have helped us understand shoreline rates of change over time and how erosion is affecting our coastal properties

COASTAL EROSION MAP

How will erosion affect a particular area?

What CRMC setbacks can I expect?



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Shorelines may be viewed as stable but the rate of erosion can change dramatically with every storm event that hits Rhode Island. The erosion rates are used by CRMC to determine setbacks for coastal developments: residential structures are evaluated with a 30-year annualized erosion rate, and commercial structures require a 60-year annualized erosion rate to define the distance of the setback for project approval. CRMC is also working with geologists to estimate what future erosion might look like along the Rhode Island coast in the face of storms and sea level rise.



These maps are all in a downloadable PDF format for your area of interest, and the maps are organized by different transects that have been drawn across all 400 miles of RI's coastline. Each transect includes the transect number and also the actual shoreline change distance and the shoreline rate of change between 1939 and 2014. The colored lines on the map correspond with the year that the shoreline was mapped.

STORMTOOLS

Understand your risk to sea level rise and storm surge



STORMTOOLS

Will the property flood during a coastal storm?

How deep will the water be?

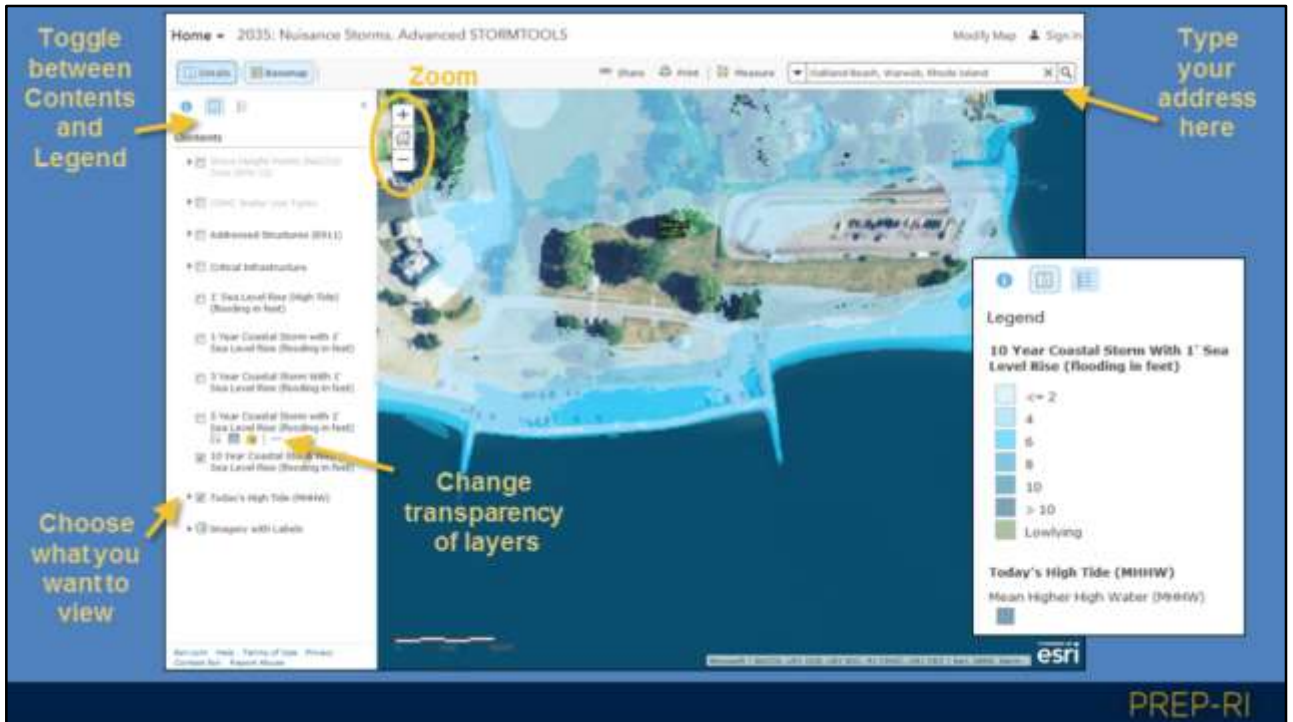
Will the property flood at high tide?

Will emergency services be cut off or limited?

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The next tool we'll cover is STORMTOOLS. STORMTOOLS is an online mapper that shows and illustrates storm inundation with and without sea level rise for varying return-period storms that covers all of Rhode Island's coastal waters. These maps help the end user understand risk to sea level rise and storm surge. Including, if your property will flood during a coastal storm; how deep the water may be during a coastal storm; if the property will be flooded during high tide--including astronomical high tides (also called moon tides or king tides) and will the emergency facilities or utilities be cut off or limited.

Image Source: Wickford, Rhode Island Sea Grant Flickr, 2011



Different formats available in Stormtools allow you to toggle between a legend and the content of any given map. You can see up in the upper left hand corner these icons showing a legend and then also the contents. What we are showing here is the contents page where you can choose what you want to view in this list of layers. Here we are illustrating a ten year coastal storm with one foot of sea level rise and also today's high tide shown as mean high or high water or MHHW. You can enter your address in the upper right corner of the map and zoom in and out using this icon in the upper left corner of the map itself. Once you zoom into your area, we are showing Oakland beach in Warwick right now, you can click on...

Touring Historic Storms in Rhode Island

1954 Hurricane (Carol) - Westerly

Carol caused widespread destruction along our coasts. Towns from Westerly to Narragansett were almost completely destroyed with high winds and an incredibly high storm surge.

1954 Hurricane (Carol) - Westerly

Click on the blue flood areas to get a pop-up of the estimated flood depths in Hurricane Carol.

If you'd like to see how these historical storms affected your town, [click here](#).

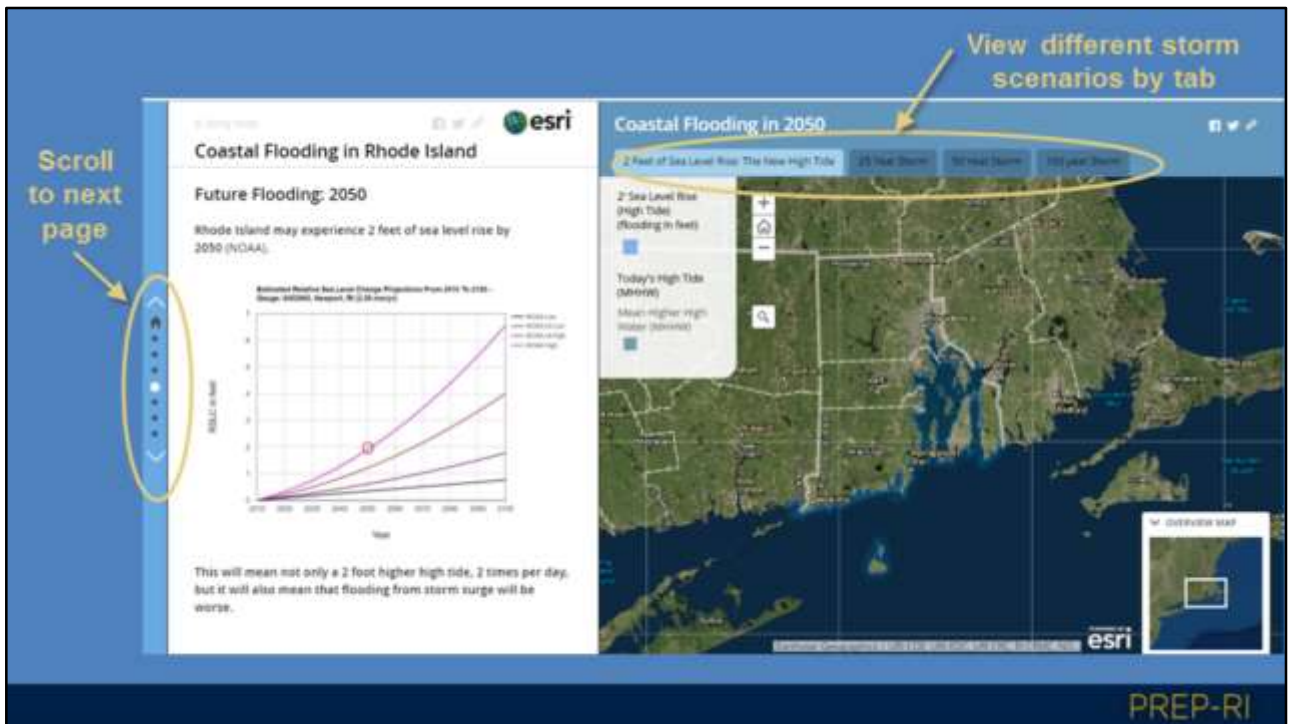
1954 Hurricane (Carol) - Westerly

STORMTOOLS "Map Journals" combine interactive maps with narrative & historic photos

esri

PREP-RI

...Areas of the map to get water depth. In addition to the interactive maps we just showed you, we also have a format called a map journal, which is shown here on the right. Map journals provide more information and photos to guide you through the tool while still allowing you to interact with the map by searching for addresses or zooming around the site.



Touring historic storms in RI is one example of a map journal that brings you through historical hurricanes including the 1938 Hurricane, 1954 Hurricane or Hurricane Carol, 1991- Hurricane Bob, and 2012- Superstorm Sandy. You can use the buttons on this side of the map journal to scroll through the different pages and maps contained in the journal and also, when you see a map there may also be an opportunity to scroll through other maps within this view. Here we are showing the 1938 Hurricane and then next if you click this arrow on the right hand side it will take you to the 1954 Hurricane, and then to 1991 Hurricane, and then to Superstorm Sandy of 2012 for this same location.

SLAMM

Understand potential impacts that sea level rise could have on coastal wetlands



SLAMM

Where will coastal wetlands and marshes likely shift?



PREP-RI

The Sea Level Affecting Marshes Model maps are available online through the RI Coastal Resources Management Council's website. These maps have been created for the coastal wetlands. These maps illustrate the coastal wetlands of all 21 RI coastal communities. The purpose of these SLAMM maps is to show how coastal wetlands will likely transition and migrate onto adjacent upland areas under projected sea level rise scenarios of one, three, and five feet in the coming decades. These maps are intended to support state and local community planning efforts and to help decision makers prepare for and adapt to future coastal wetland conditions despite the inherent uncertainties associated with future rates of sea level rise.

Image Source: Narrow River, Rhode Island Sea Grant Flickr, 2014



This map shows five feet of sea level rise and what the impacts to future wetland migration might look like in Warwick in the Oakland Beach area. The brown areas show where there might be, in the future, potential new marsh inland from five feet of sea level rise, twice, daily, everyday. The purple areas show potential marsh loss. The yellow marsh areas are persistent marsh.

MyCoast

Photo bank showing past, present, and future flooding



MyCoast

What locations in Rhode Island experience flooding during high tides and King Tides?

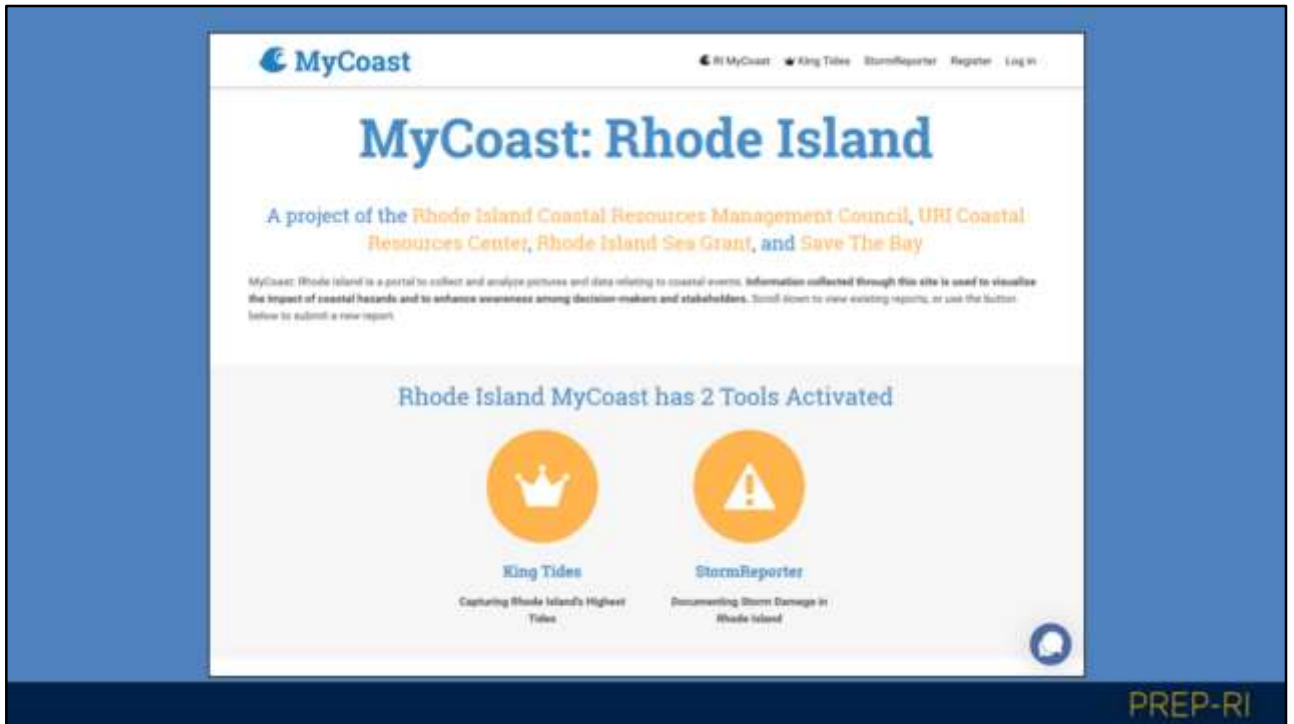
What will future sea level rise look like on a particular property?

PREP-RI

Janet Freedman photos: S Shore Ave, Warwick, RI:

<https://mycoast.org/reports/27510>

The next tool is MyCoast. MyCoast is an online photo bank in a crowdsourcing tool that allows us to show and collect past, present, and future flooding photographs from Rhode Islanders taken in the field. This helps us understand what locations in RI experience flooding during high tides and king tides and it also helps us illustrate what future sea level rise might look like on the property when we can translate these periodic flood events today into twice daily tides are likely to look like in the future on our coastal lands.



MyCoast allows users to upload king tides and also photos during storm events.

MyCoast Hi MyCoast King Tides StormReporter Register Log In

S Shore Ave | Kent County [view all content »](#)

King Tide Report by Janet Freedman

10/17/2016 | 9:38 am
(0 hours 20 minutes after high tide)

Weather Overview

Wind Speed: 2.0 MPH
Wind Direction: 230°
Temperature: 5.7°F
Rainfall (Calendar Day): 0"
Rainfall (Past 24 Hours): 0.01"

Tidal Overview

Data from [Cumberland Light](#) (3.1 miles away)

Water Level: 5.1' (observed MLLW)
Closest High Tide: 9:18 am, 4.2' (observed)

View this location on **STORMTOOLS**

Weather and tide conditions

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Also, shows a tidal overview from the closest tide gauge and the water level and closest high tide observed that day.

King Tide Reports



↑ KING TIDE PHOTO

VIEW PHOTOS

↓ LEARN MORE

PREP-RI

The main page of the king tides allow you to zoom in and click on any of these king tide icons to go to the king tide report for that area. You can zoom into your community and see who has been uploading photographs and also download the app onto your phone and go out and add some of your own photographs to the photobank.

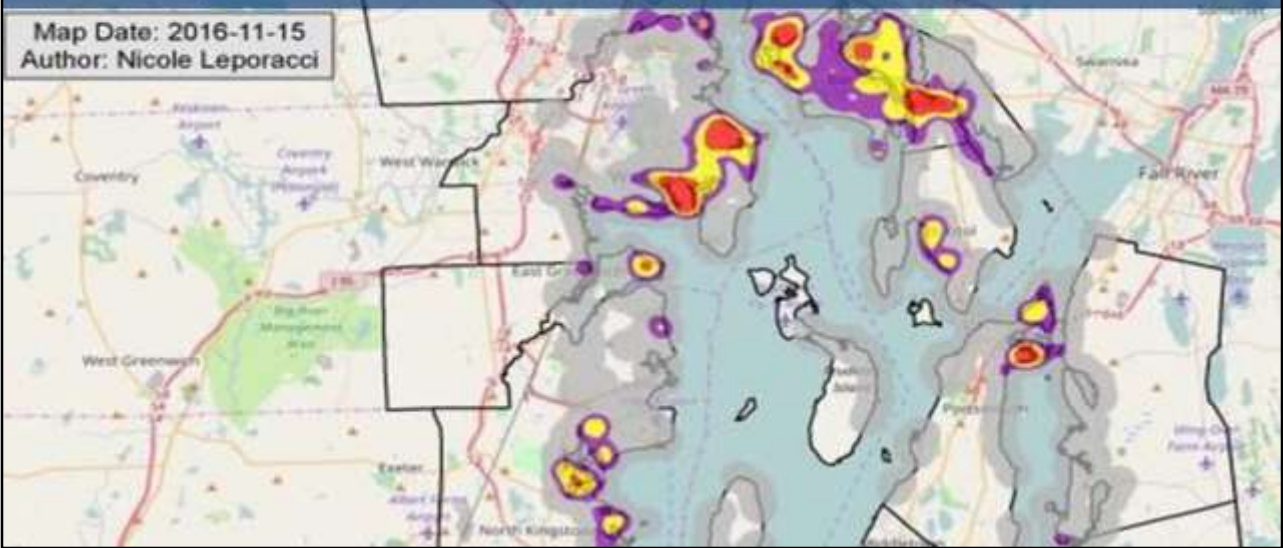
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E911 Exposure Assessment

Snapshot of structures at risk in RI cities and towns

the existence of the Fox P...
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Map Date: 2016-11-15
Author: Nicole Leporacci

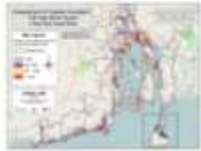


RI Shoreline Change Special Area Management Plan



Home | News | Events | Related Projects | STOREFRONTS | Coastal Erosion Maps | Management Plan | Get Involved

Rhode Island e911 Exposure Assessment



This page offers a summary of all exposed structures in each of the 21 coastal municipalities in Rhode Island within a variety of coastal flooding scenarios: (1) from twice-daily tide-based on sea level rise projections to the year 2100; and (2) from coastal storm events with and without sea level rise scenarios. The data contained in the spreadsheets below present the e911 structure base data sorted by coastal flooding scenario.

PLEASE SCROLL DOWN THE PAGE TO VIEW AND/OR DOWNLOAD THE SPREADSHEETS.

About the e911 Data:

The "e911" dataset represents the locations of all structures mapped using their primary usage at the time when the Uniform Emergency Telephone System contractor

Uniform Emergency Telephone System contractor

The map shown here illustrates one way to analyze these data. This map identifies coastal "hot spots" areas to be exposed by flooding from a 100-year return period storm with 7 feet of sea level rise. Section 148 of R.I.C.G. sets sea level rise scenarios as a planning target for the year 2100 based on the US Army Corps of Engineers' "Sea Level Rise Planner" for projecting sea level rise in the future.

Excel Spreadsheet Table Information

Description: Verbal description of what each site type code represents.

Exposed Structures: Number of structures exposed by greater than 0 feet of water.

Total Structures (Municipality): Number of structures total in the town.

Total Structures (SLR_100YR): Total number of structures exposed in the worst case scenario (mean sea level rise of 10 feet).

Percent (Municipality): Percent of structures exposed out of total structures in town.

| Municipality | Site Type | Description | Exposed Structures | Total Structures (Municipality) | Total Structures (SLR_100YR) | Percent (Municipality) |
|--------------|-----------|-------------|--------------------|---------------------------------|------------------------------|------------------------|
| Narragansett | 1 | Residential | 1 | 1 | 1 | 100% |
| | 2 | Commercial | 1 | 1 | 1 | 100% |
| | 3 | Industrial | 1 | 1 | 1 | 100% |
| Providence | 1 | Residential | 1 | 1 | 1 | 100% |
| | 2 | Commercial | 1 | 1 | 1 | 100% |
| | 3 | Industrial | 1 | 1 | 1 | 100% |
| Warwick | 1 | Residential | 1 | 1 | 1 | 100% |
| | 2 | Commercial | 1 | 1 | 1 | 100% |
| | 3 | Industrial | 1 | 1 | 1 | 100% |

| | A | B | C | D | E | F | G | H | I |
|-----|------------------|-------------------|--------------------------|-------------------------------|-------------------------------------|-----------------------|-----------------------------|----------------------------|------------|
| 1 | Site | Descrip. | Exposed Buildings | Total Buildings (Town) | Total Buildings (SLR7_100YR) | Percent (Town) | Percent (SLR7_100YR) | 0-5ft | 5-10 |
| 30 | P9 | Ambulance House | 0 | 0 | 0 | 0.0% | 0.0% | 0 | 0 |
| 31 | R1 | Single Family | 3625 | 27338 | 5011 | 15.3% | 72.3% | 1914 | 125 |
| 32 | R2 | Multifamily | 208 | 2731 | 286 | 7.6% | 72.7% | 83 | 85 |
| 33 | R3 | Mobile Home | 0 | 117 | 0 | 0.0% | 0.0% | 0 | 0 |
| 34 | R4 | Other Residential | 19 | 180 | 20 | 10.6% | 95.0% | 6 | 6 |
| 35 | R5 | Camp | 0 | 1 | 0 | 0.0% | 0.0% | 0 | 0 |
| 36 | R6 | Seasonal Home | 43 | 131 | 105 | 32.8% | 41.0% | 38 | 2 |
| 37 | R8 | N/A | 0 | 0 | 0 | 0.0% | 0.0% | 0 | 0 |
| 38 | U1 | Utility | 10 | 35 | 13 | 28.6% | 76.9% | 8 | 1 |
| 39 | XX | N/A | 0 | 1 | 0 | 0.0% | 0.0% | 0 | 0 |
| 40 | TOTALS: | | 4381 | 34479 | 6076 | 12.7% | 72.1% | 2263 | 151 |
| 41 | | | | | | | | | |
| 42 | Groupings | Descrip. | Exposed Buildings | Total Buildings (Town) | Total Buildings (SLR7_100YR) | Percent (Town) | Percent (SLR7_100YR) | Mean Elevation (ft) | |
| 43 | Commercial | C1-CL | 143 | 1987 | 200 | 7.20% | 71.50% | 6.889 | |
| 44 | Industrial | I1 | 2 | 22 | 4 | 9.09% | 50.00% | 4.39 | |
| 45 | Public Service | PO-P9 | 30 | 326 | 46 | 9.20% | 85.22% | 3.727 | |
| 46 | Residential | R1-R6 | 3895 | 30496 | 5422 | 12.77% | 71.64% | 5.297 | |
| 47 | Utility | U1 | 10 | 35 | 13 | 28.57% | 76.92% | 4.498 | |
| 48 | TOTALS: | | 4080 | 32868 | 5685 | 12.41% | 71.77% | | |
| 49 | | | | | | | | | |
| 50 | Groupings | Site | Exposed Buildings | Total Buildings (Town) | Total Buildings (SLR7_100YR) | Percent (Town) | Percent (SLR7_100YR) | Mean Elevation (ft) | |
| 51 | Ambulance House | P9 | 0 | 0 | 0 | 0.00% | 0.00% | 0 | |
| 52 | Fire Stations | P7 | 2 | 15 | 2 | 13.33% | 100.00% | 1.77 | |
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Assessment of Coastal Inundation 100 Year Storm Event 7 foot Sea Level Rise

Surge inundation used in this analysis excludes the existence of the Fox Point Hurricane Barrier located in the Providence area upstream, and was considered non-certified (in FEMA parlance). SLR scenarios are still valid as the barrier will not be closed except during these storm events.

Map Legend

Density of Inundated Structures
(number per square mile)

- Coastal Towns
- < 200
- 200 - 500
- 501 - 1,000
- > 1,000

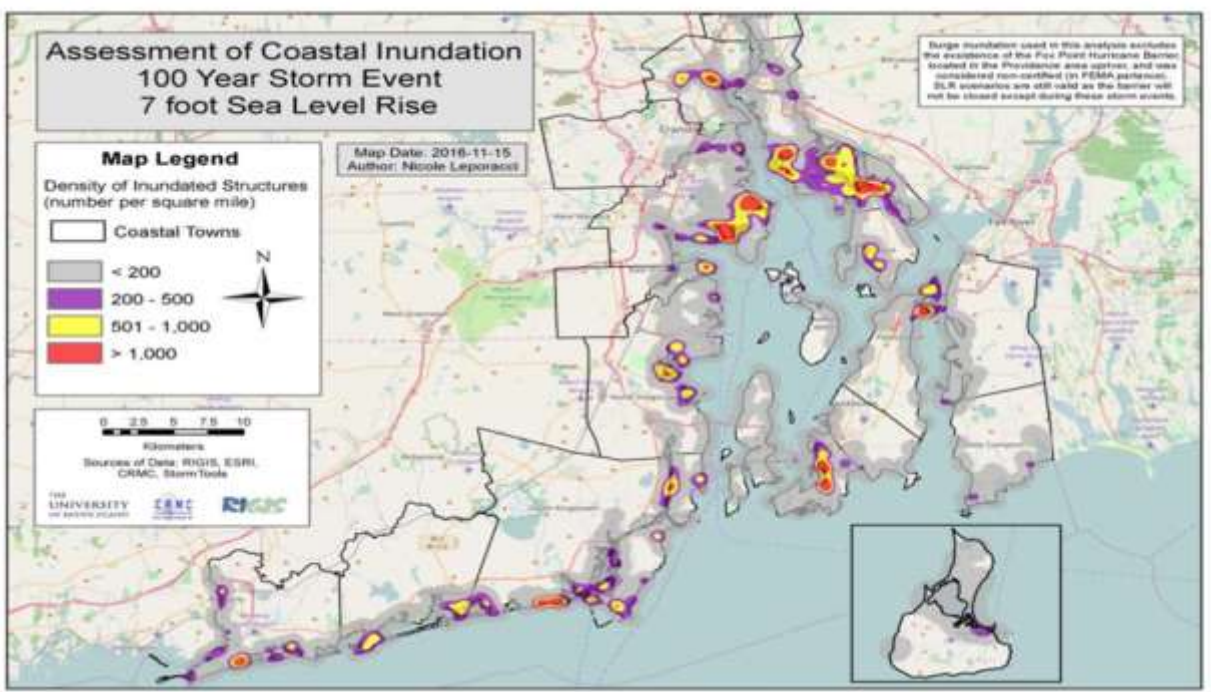


Map Date: 2016-11-15
Author: Nicole Leporeasi

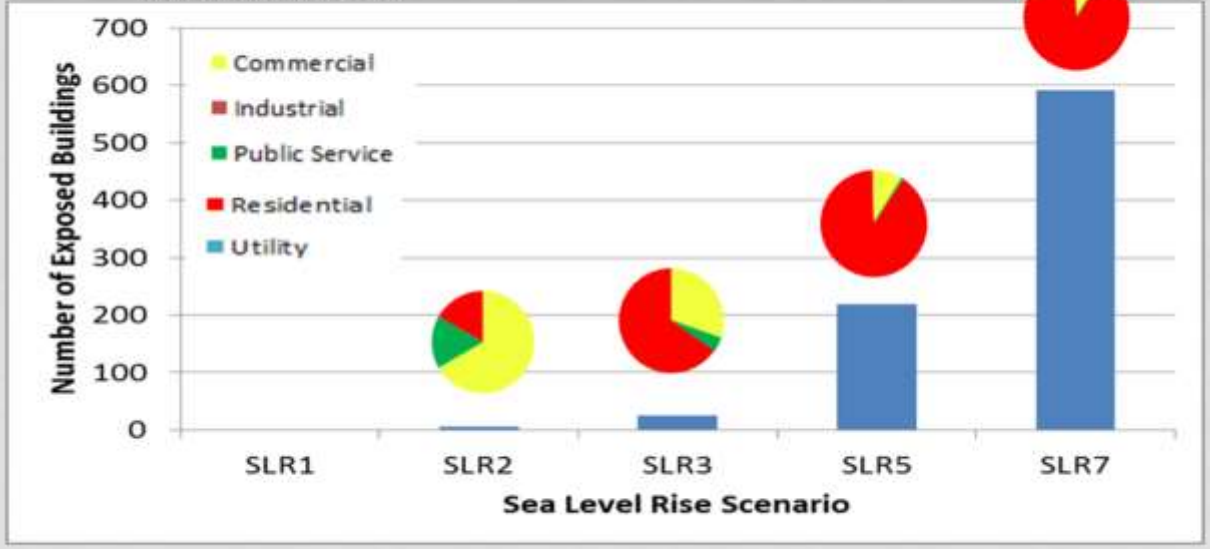
0 2.5 5 7.5 10

Kilometers

Sources of Data: RDIG, ESRI,
CRMC, StormTools

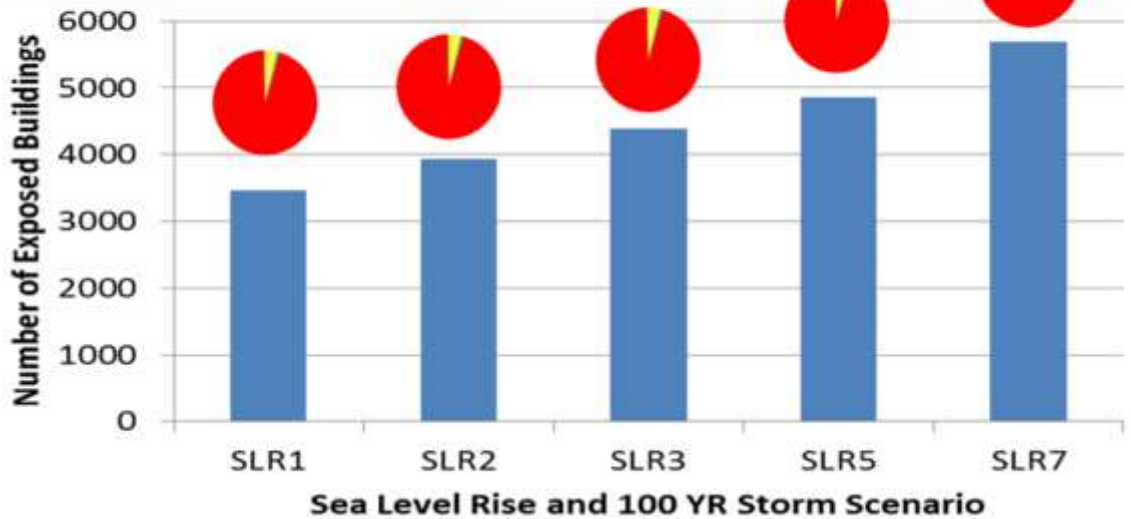


WARWICK



Each of these scenarios is also broken down and summarized into categories which represent critical assets of each town. This includes commercial, industrial, public service, residential, and utility.

WARWICK



In progress...

Municipal Parcel Assessment Data

Centralized Database of Parcel Data & Assessment Values



Wickford Sea Level Rise Scenarios: 1 foot, 3 feet, and 5 feet



The three maps on the right show the projected boundaries of two high tides for the Wickford Historic area of North Kingstown. It uses a digital elevation model and an aerial photograph with a "bathtub model" approach to show the projected boundaries of two high tides for the area. The maps are intended for illustrative purposes only.

The green map below shows the FEMA flood zones for the Wickford Historic area.

These draft maps are intended for illustrative purposes only.

North Kingstown, RI Pilot Project

Adaptation to
Natural Hazards
& Climate Change



Table 13. Assessed property value of parcels exposed to sea level rise.

| Assessed property value of parcels exposed to projected sea level rise scenarios by Study Area | | | | | | | |
|--|--------------------------------|---|--------------------------|--|--------------------------|--|--------------------------|
| Source: 2009 North Kingstown Property Tax Assessment data from GIS Parcel Database | | | | | | | |
| Study Area # | Study Area Name | Sea level rise (SLR) at 1 foot above MHHW (linear feet) | | SLR at 3 feet above MHHW (linear feet) | | SLR at 5 feet above MHHW (linear feet) | |
| | | QTY | Assess Value (\$) | QTY | Assess Value (\$) | QTY | Assess Value (\$) |
| 1 | Pojac Point / Mount View | 48 | \$ 82,658,725.00 | 54 | \$ 86,258,625.00 | 68 | \$ 91,474,625.00 |
| 2 | Quonset / Davisville | 32 | \$ 124,344,720.00 | 39 | \$ 142,725,920.00 | 57 | \$ 177,176,620.00 |
| 3 | Mill Cove / Shore Acres | 84 | \$ 64,846,660.00 | 138 | \$ 101,268,280.00 | 181 | \$ 127,382,480.00 |
| 4 | Intrajid Drive | 1 | \$ 3,420,900.00 | 2 | \$ 3,442,100.00 | 4 | \$ 3,696,200.00 |
| 5 | Wickford Historic | 58 | \$ 40,331,000.00 | 95 | \$ 61,017,400.00 | 129 | \$ 76,383,000.00 |
| 6 | Wickford Commercial | 47 | \$ 27,375,900.00 | 63 | \$ 34,335,500.00 | 107 | \$ 34,474,000.00 |
| 7 | Phillips / Loop | 39 | \$ 13,117,100.00 | 49 | \$ 16,713,100.00 | 54 | \$ 17,949,800.00 |
| 8 | Poplar Point | 39 | \$ 44,462,700.00 | 67 | \$ 69,556,200.00 | 103 | \$ 87,454,200.00 |
| 9 | Duck Cove / Earle Drive | 46 | \$ 25,814,800.00 | 98 | \$ 34,106,800.00 | 150 | \$ 74,003,000.00 |
| 10 | Hamilton / Bissell Cove | 46 | \$ 15,998,670.00 | 69 | \$ 28,547,370.00 | 79 | \$ 32,686,270.00 |
| 11 | Plum Point / Plum Beach | 24 | \$ 40,862,870.00 | 56 | \$ 69,327,470.00 | 14 | \$ 81,525,270.00 |
| 12 | Gilbert Stuart / Walmsley Lane | 32 | \$ 15,052,790.00 | 38 | \$ 22,747,990.00 | 65 | \$ 23,428,490.00 |
| TOTAL | | 496 | \$ 806,287,125.00 | 768 | \$ 891,652,705.00 | 1011 | \$ 849,613,955.00 |

Centralized Parcel Dataset with Assessed Values of Parcels

CAMA Data “Wish List” for all 21 Coastal RI Municipalities

- Assessed land values
- Assessed improvement / property values
- Total assessment value
- Number of stories
- Building sub-area information
- Outbuilding information
 - Description, value, number of buildings
- Basement presence/absence
- Basement type
 - Full / crawlspace
- First Floor Elevation
- Elevation Certificate
- Piling information
- Piling type
 - Open / enclosed

In progress...

Coastal Environmental Risk Index (CERI)

Structure-specific risk assessment



Hurricane Carol, August 30, 1954, 4:30 PM | Current Buildout | Stempel 2017

STORMTOOLS: Coastal Environmental Risk Index (CERI)

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One of the challenges facing coastal zone managers and municipal planners is the development of an objective, quantitative assessment of the risk to structures, infrastructure, and public safety that coastal communities face from storm surge in the presence of changing climatic conditions, particularly sea level rise and coastal erosion. Here we use state of the art modeling tool (ADDIRC and STWAVE) to predict storm surge and wave, combined with shoreline change maps (erosion), and damage functions to construct a Coastal Environmental Risk Index (CERI). Access to the state emergency data base (E-911) provides information on structure characteristics and the ability to perform analyses for individual structures. CERI has been designed as an on line Geographic Information System (GIS) based tool, and hence is fully compatible with current flooding maps, including those from FEMA. The basic framework and associated GIS methods can be readily applied to any coastal area. The approach can be used by local and state planners to objectively evaluate different policy options for effectiveness and

cost/benefit. In this study, CERI is applied to fit two communities, Charlestown representing a typical coastal barrier system directly exposed to ocean waves and high erosion rates, with predominantly low density single family residences and Warwick located within Narragansett Bay, with more limited wave exposure, lower erosion rates, and higher residential housing density. Results of these applications are highlighted herein.

Technical Papers:

Application of State of Art Modeling Techniques to Predict Flooding and Waves for an Exposed Coastal Area (2017)

<http://www.mdpi.com/2077-1312/5/1/10>

Application of State of the Art Modeling Techniques to Predict Flooding and Waves for a Coastal Area within a Protected Bay (2017)

<http://www.mdpi.com/2077-1312/5/1/14>

Effect of Coastal Erosion on Storm Surge: A Case Study in the Southern Coast of Rhode Island (2016)

<http://www.mdpi.com/2077-1312/4/4/85>

Assessment of Damage and Adaptation Strategies for Structures and Infrastructure from Storm Surge and Sea Level Rise for a Coastal Community in Rhode Island, United States (2016)

<http://www.mdpi.com/2077-1312/4/4/67>

STORMTOOLS: Coastal Environmental Risk Index (CERI) (2016)

<http://www.mdpi.com/2077-1312/4/3/54>



1. Welcome to Know Your Risk. This module is focused on using mapping tools to make informed decisions that reduce impacts from hazards in our coastal cities and towns. This is part of the online series called, Providing Resilience Education for Planning in Rhode Island (or PREP- RI). Rhode Island offers several user-friendly mapping tools for use at the local level to inform decision-making in support of coastal resilience.