

# Sea Level Affecting Marshes Model (SLAMM) Maps

## Warwick

Warwick Map Panels			
9	25	31	41
13	26	32	42
17	27	35	47
21	30	36	

The Rhode Island Coastal Resources Management Council (CRMC) and its partners have developed Sea Level Affecting Marshes Model (SLAMM) Maps for the coastal wetlands of all 21 Rhode Island 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 1, 3 and 5 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.

The SLAMM maps were developed using a digital wetlands coverage derived from the 2010 National Wetlands Inventory for Rhode Island. The elevation data used in the model was developed from the 2011 USGS LIDAR elevation dataset. These maps were developed using the “protection off” mode for the model simulations, thereby depicting the highest potential for marsh migration despite current limitations such as parking lots, roads or other development. In this way the maps illustrate opportunities for conservation and potential land modification to enhance wetland migration and restoration. The SLAMM data do not consider natural processes such as coastal erosion or the impacts of coastal storms that can have significant influence on shoreline location and sediment dynamics. Despite these limitations the data still provide a valuable tool to identify those places that provide the best opportunity for future saltmarsh habitat and conservation priorities, and provide valuable information to help plan for new development and infrastructure. Additional map parameters, data sources and caveats can also be found at

[www.crmc.ri.gov](http://www.crmc.ri.gov)

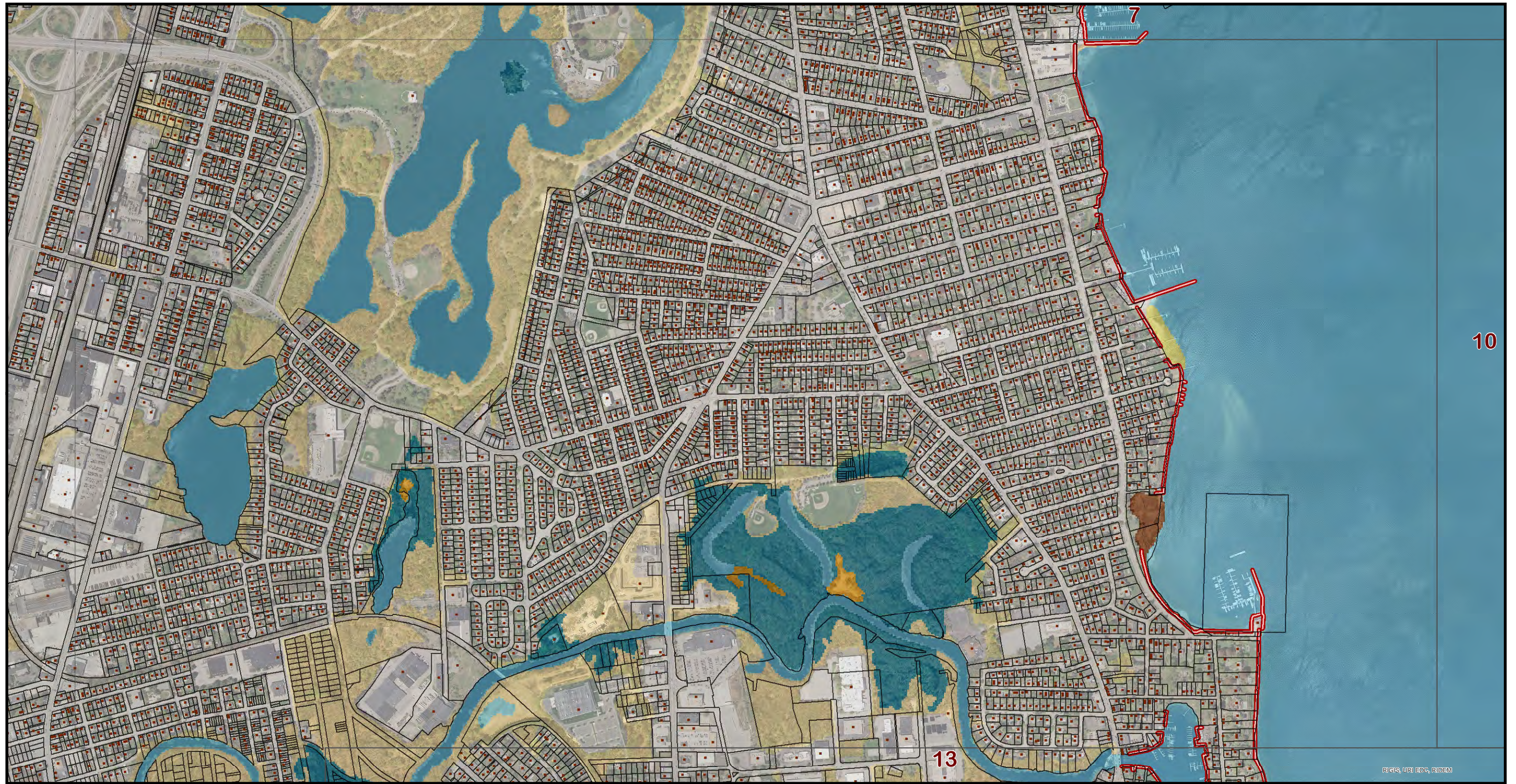
These SLAMM maps are Geographic Information System (GIS)-based map images exported as PDF files to reduce file size and ease of access. In total there are 149 map panels that cover the entire Rhode Island shoreline and each panel has four maps showing the initial (current) wetland condition followed by 1, 3, and 5-feet of sea level rise scenarios.

No warranty is expressed or implied by the CRMC and its SLAMM project partners related to the spatial accuracy of these maps and promote no other use of these maps and data other than as a planning tool. These maps should not be used for, and are not intended for, survey and engineering purposes. The data do not take the place of a legal survey or other primary source documentation. They were created for general reference, informational, planning, and guidance use. They are not a legally authoritative source as to the exact location of natural or manmade features.

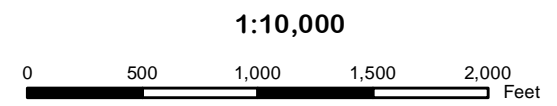
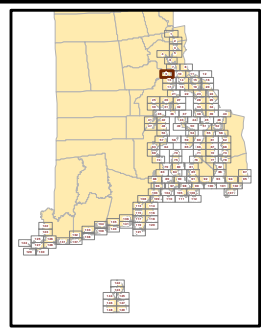
These maps can be examined at the Council’s office in Wakefield, at the Secretary of State’s office, and on-line at the Council’s website: [www.crmc.ri.gov](http://www.crmc.ri.gov).







Map 9



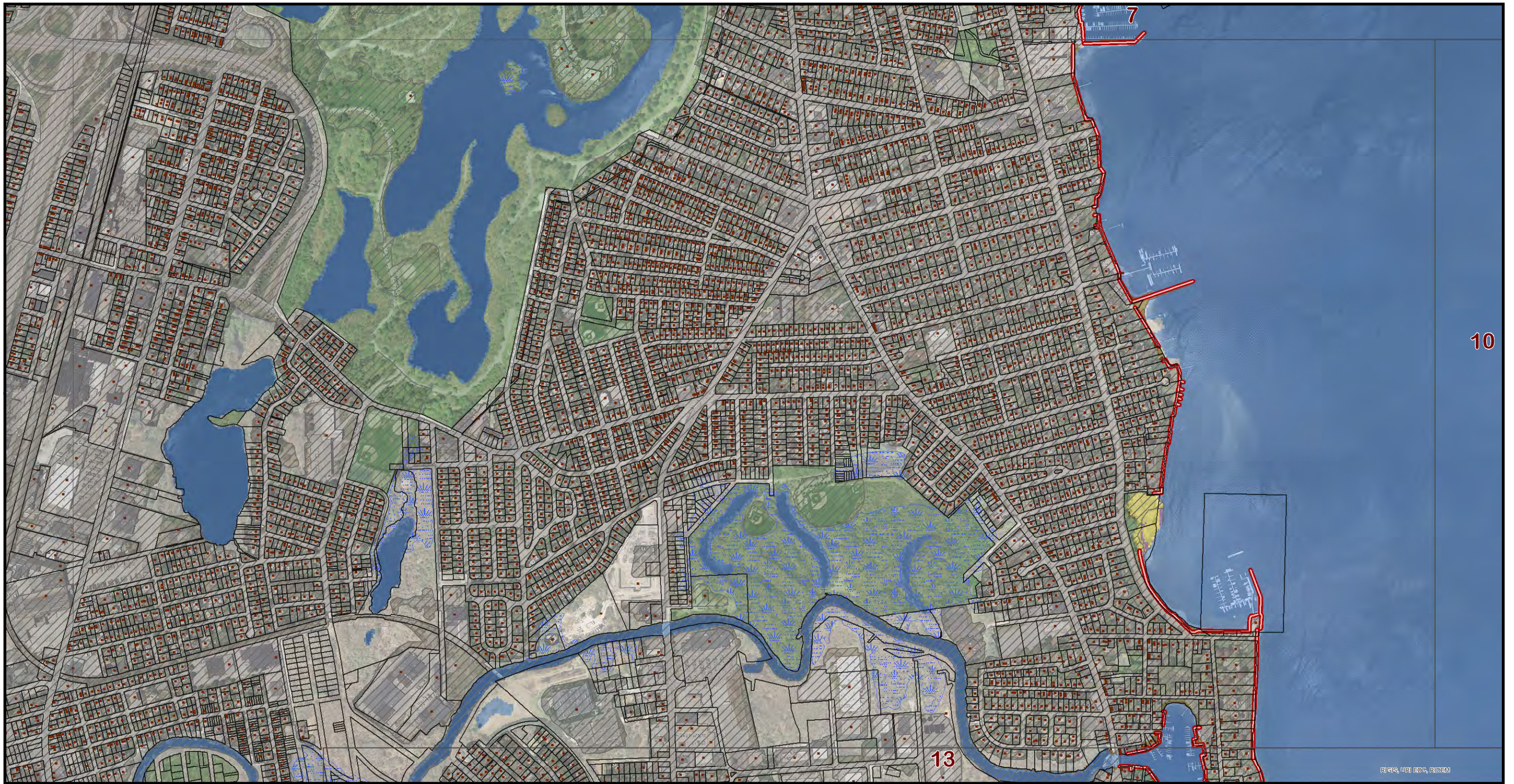
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- |                    |                                |
|--------------------|--------------------------------|
| Developed Upland   | Salt Marsh                     |
| Undeveloped Upland | Brackish Marsh                 |
| Rocky Intertidal   | Scrub/Shrub Transitional Marsh |
| Beach              | Fresh Marsh                    |
| Tidal Flat         | Hardened Shores                |
| Open Water         | Buildings                      |
| Swamp              | Parcel Boundaries              |
| Tidal Creek        |                                |

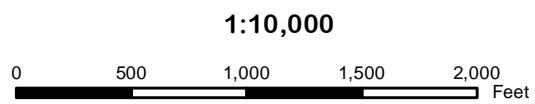
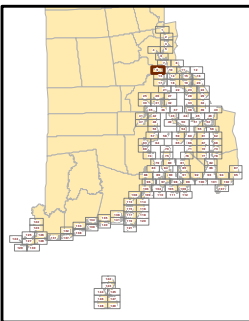
# Tidal Marsh Vulnerability Analysis: Current Condition


















Map 9



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-  Potential Marsh Zone
-  Persistent Marsh Zone
-  Potential Marsh Loss
-  Open Water and Tidal Flat
-  Current Fresh Wetlands
-  Protected Open Space
-  Hardened Shores
-  Buildings
-  Parcel Boundaries
-  Developed Land
-  CRMC Coastal Barriers

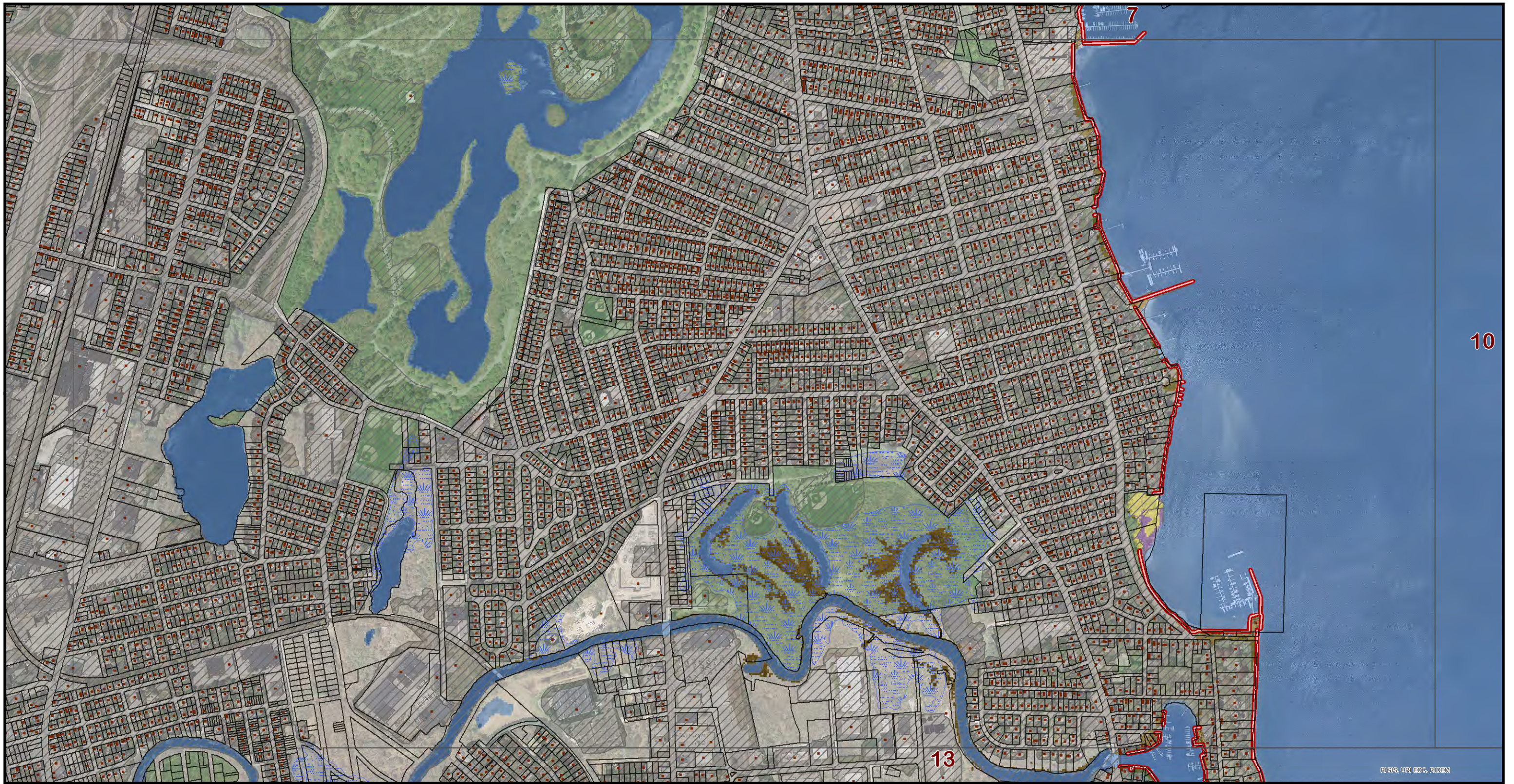
## Tidal Marsh Vulnerability Analysis: One Foot Sea Level Rise Model



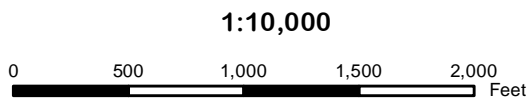
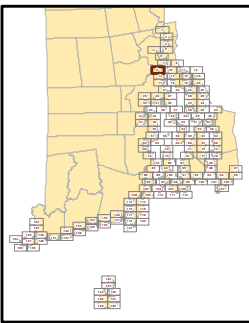
NOAA grant award #: NA120AR4310108


















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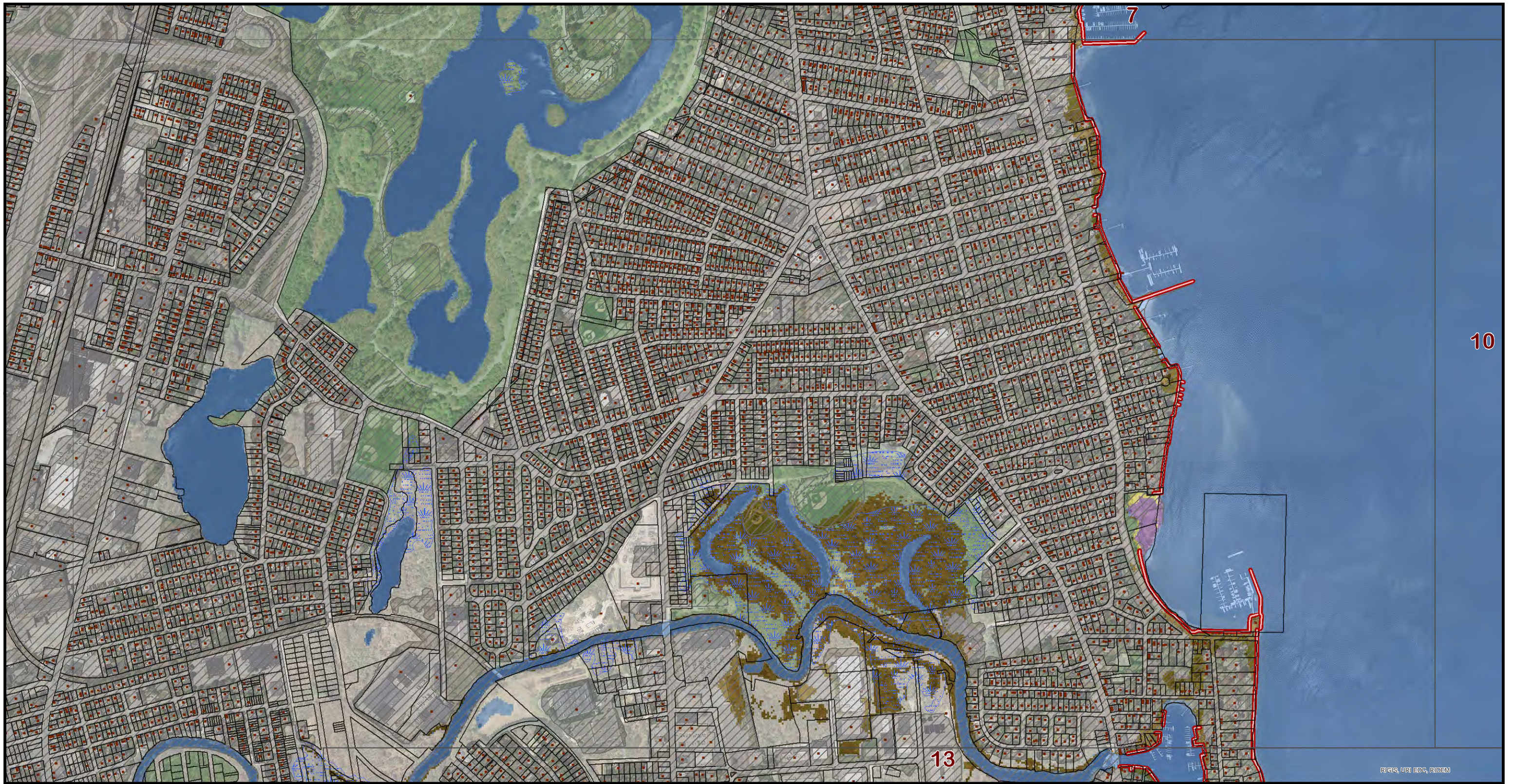
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## Tidal Marsh Vulnerability Analysis: Three Foot Sea Level Rise Model

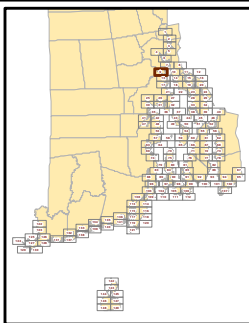


NOAA grant award #: NA120AR4310108





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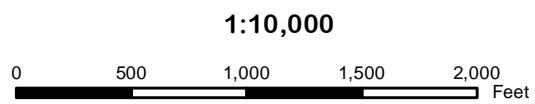
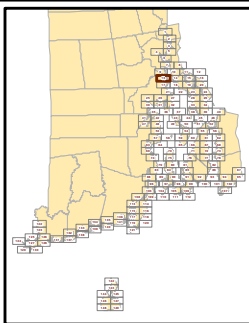
## Tidal Marsh Vulnerability Analysis: Five Foot Sea Level Rise Model







Map 13



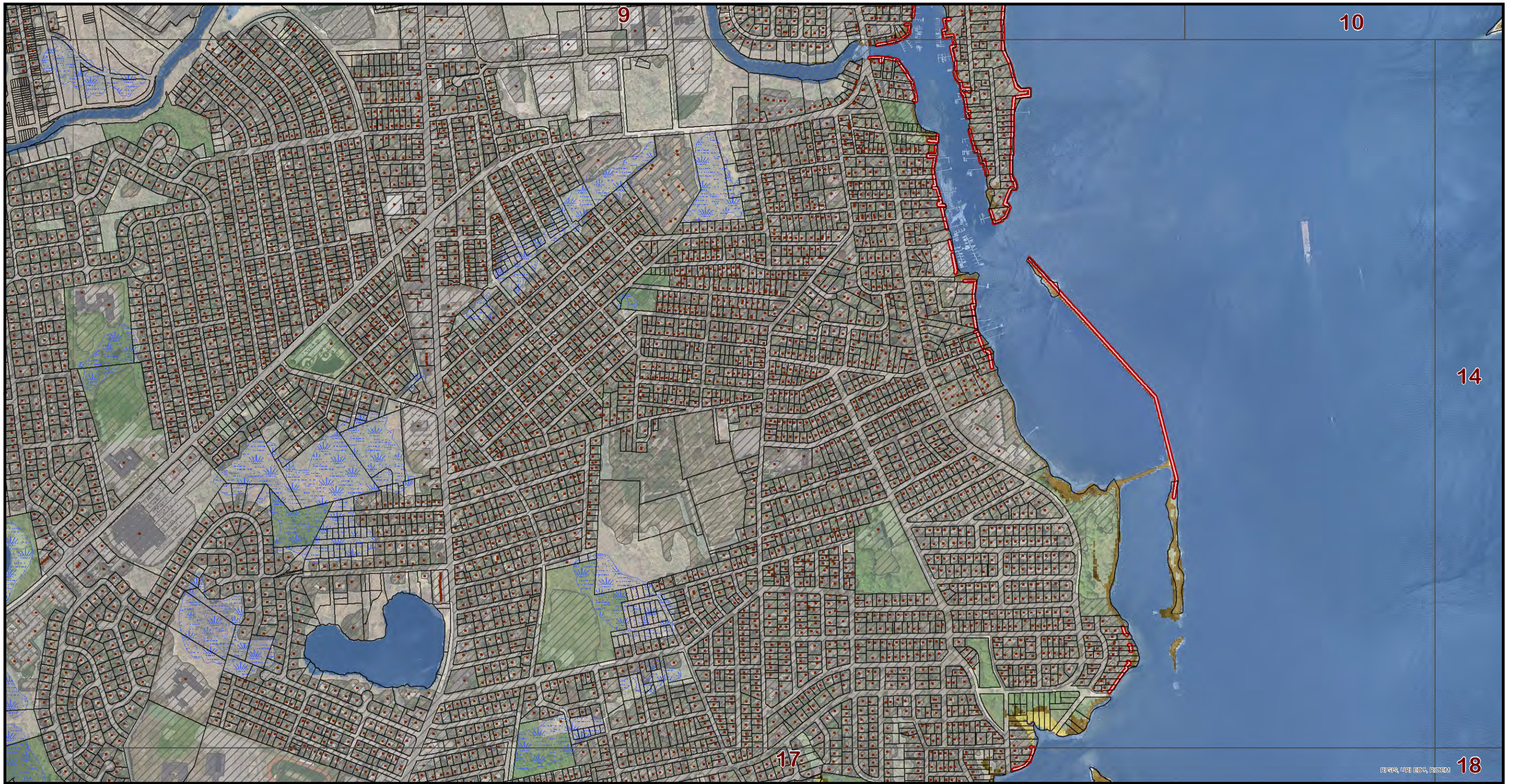
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| Beach              | Fresh Marsh                    |
| Tidal Flat         | Hardened Shores                |
| Open Water         | Buildings                      |
| Swamp              | Parcel Boundaries              |
| Tidal Creek        |                                |

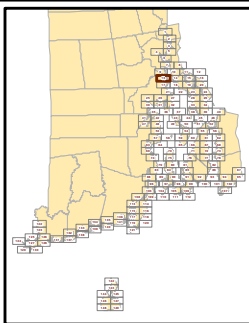
## Tidal Marsh Vulnerability Analysis: Current Condition







Map  
13



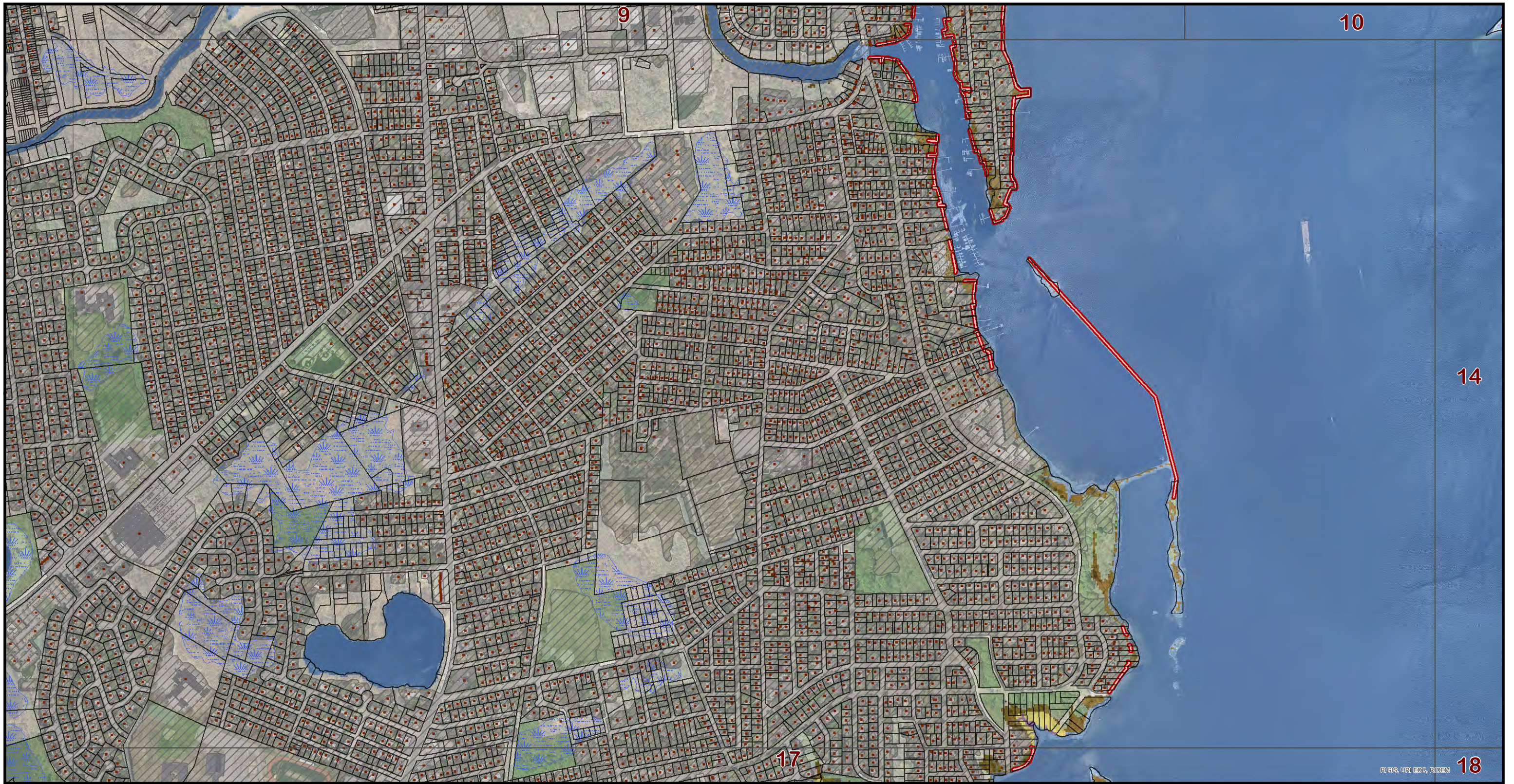
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- |                           |                       |
|---------------------------|-----------------------|
| Potential Marsh Zone      | Hardened Shores       |
| Persistent Marsh Zone     | Buildings             |
| Potential Marsh Loss      | Parcel Boundaries     |
| Open Water and Tidal Flat | Developed Land        |
| Current Fresh Wetlands    | CRMC Coastal Barriers |
| Protected Open Space      |                       |

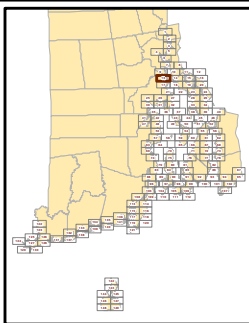
## Tidal Marsh Vulnerability Analysis: One Foot Sea Level Rise Model


















Map  
13



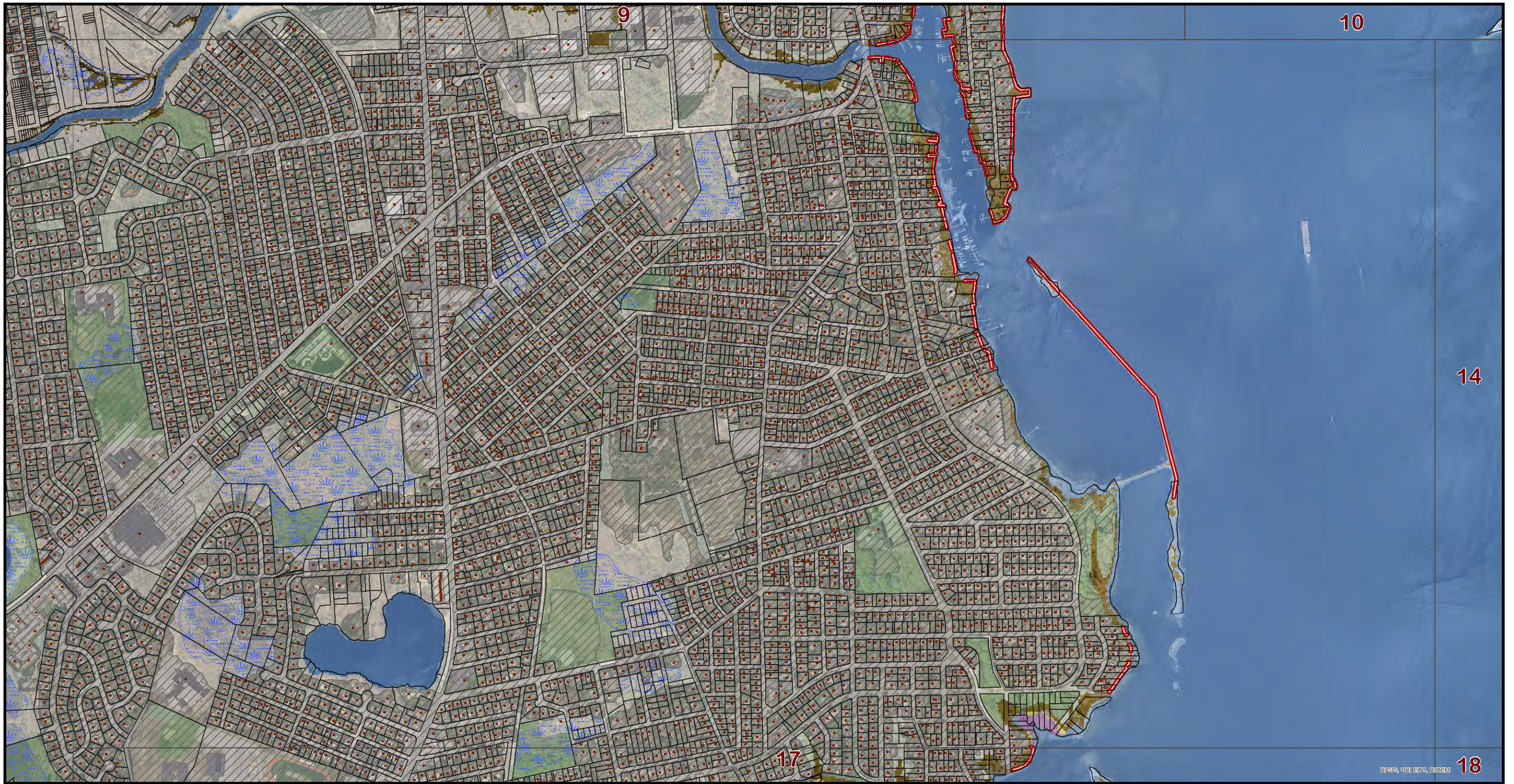
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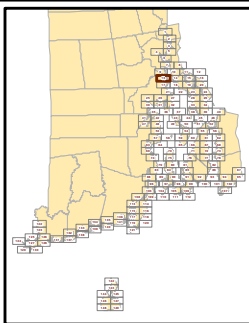
## Tidal Marsh Vulnerability Analysis: Three Foot Sea Level Rise Model







Map  
13



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## Tidal Marsh Vulnerability Analysis: Five Foot Sea Level Rise Model

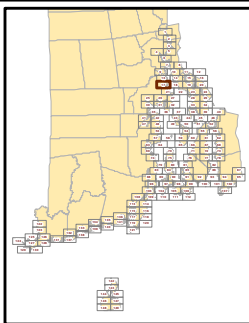






RGIS, URI EDG, RIDEM

Map  
17



1:10,000

0 500 1,000 1,500 2,000 Feet

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| Tidal Flat         | Hardened Shores                |
| Open Water         | Buildings                      |
| Swamp              | Parcel Boundaries              |
| Tidal Creek        |                                |

## Tidal Marsh Vulnerability Analysis: Current Condition



NOAA grant award #: NA12OAR4310108



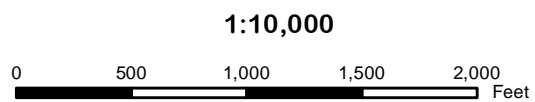
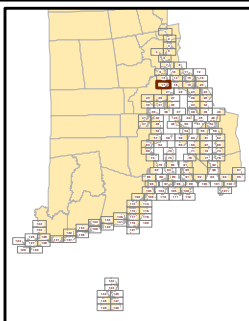
Map produced by Kevin Ruddock. 4/2/2014
















RCES, URI EDG, RIDEM

Map  
17



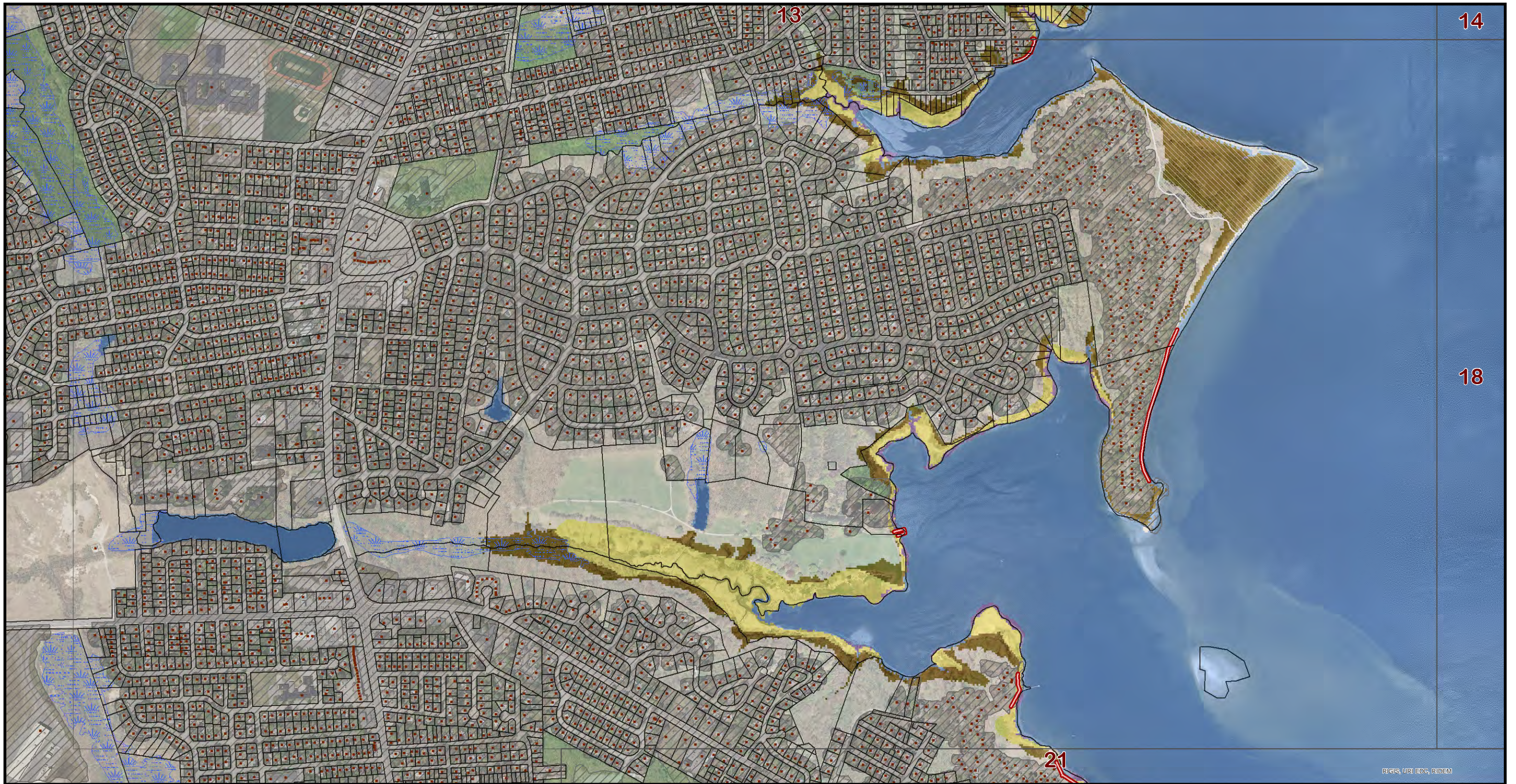
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## Tidal Marsh Vulnerability Analysis: One Foot Sea Level Rise Model

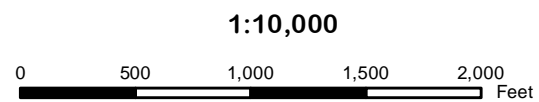
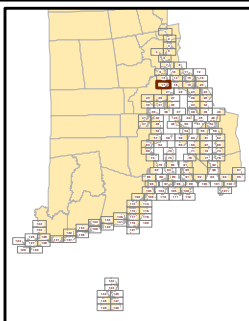

















RCES, URI EDG, RIDEM

Map  
17



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## Tidal Marsh Vulnerability Analysis: Three Foot Sea Level Rise Model

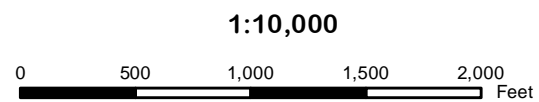
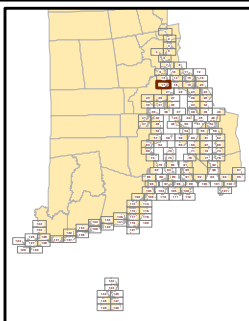

















RCEIS, URI EDG, RIDEM

Map  
17



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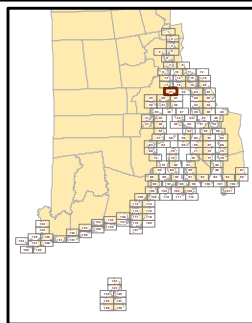
## Tidal Marsh Vulnerability Analysis: Five Foot Sea Level Rise Model







Map  
21



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| Tidal Flat         | Hardened Shores                |
| Open Water         | Buildings                      |
| Swamp              | Parcel Boundaries              |
| Tidal Creek        |                                |

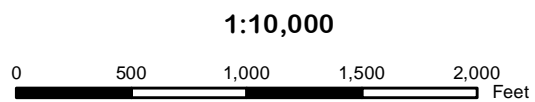
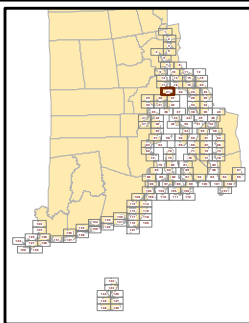
## Tidal Marsh Vulnerability Analysis: Current Condition







Map  
21



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## Tidal Marsh Vulnerability Analysis: One Foot Sea Level Rise Model



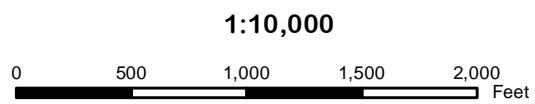
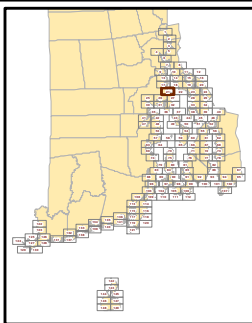
NOAA grant award #:  
NA120AR4310108

Map produced by Kevin Ruddock. 4/1/2014
















Map  
21



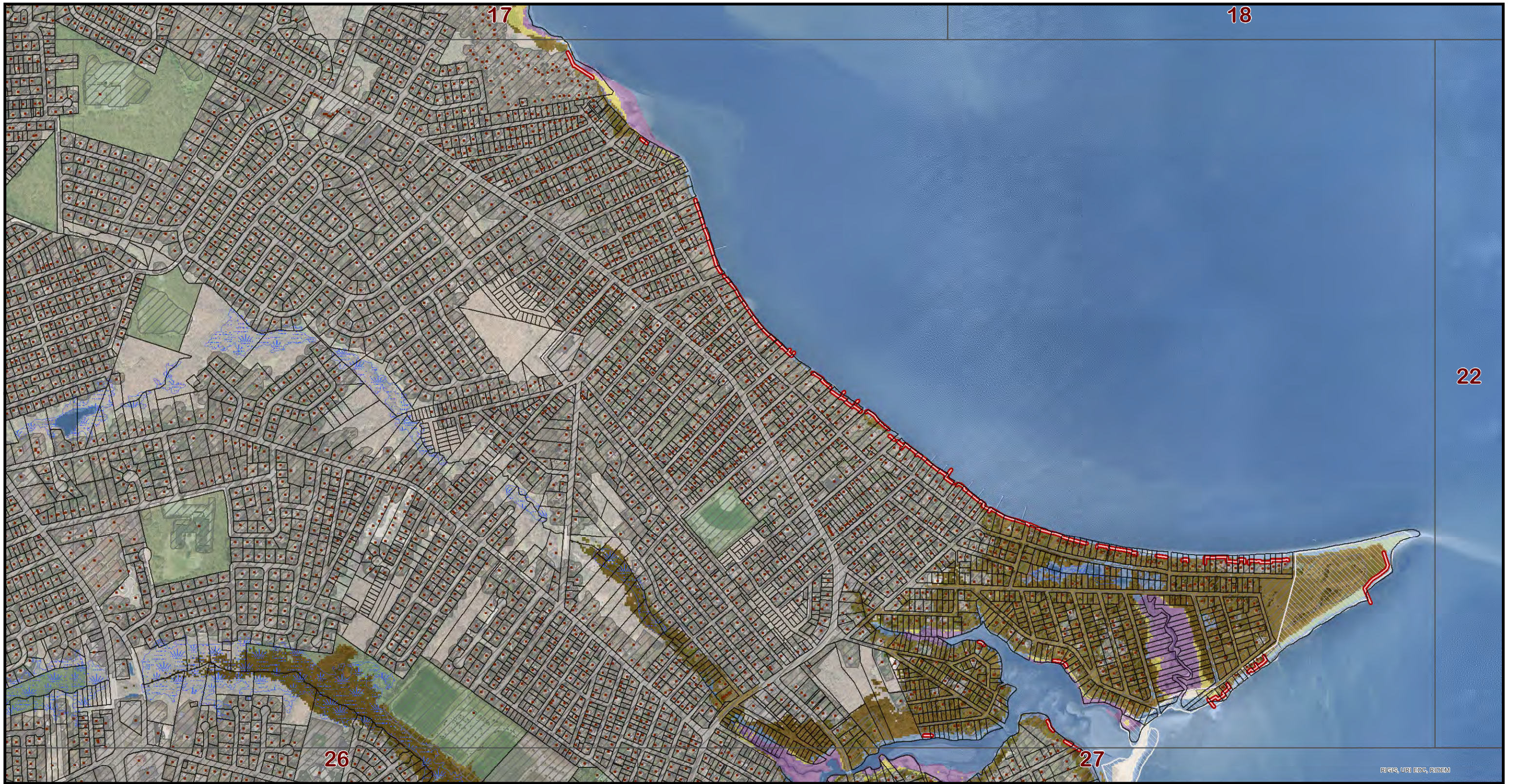
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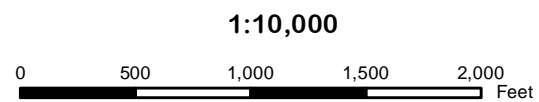
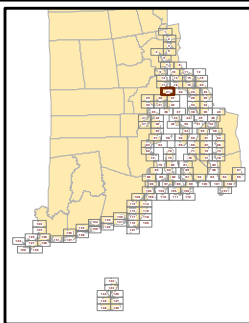
## Tidal Marsh Vulnerability Analysis: Three Foot Sea Level Rise Model







Map  
21



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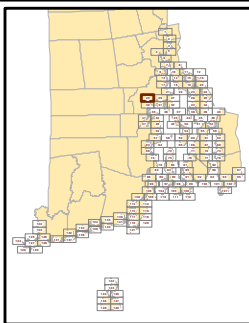
NOAA grant award #:  
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Map  
25



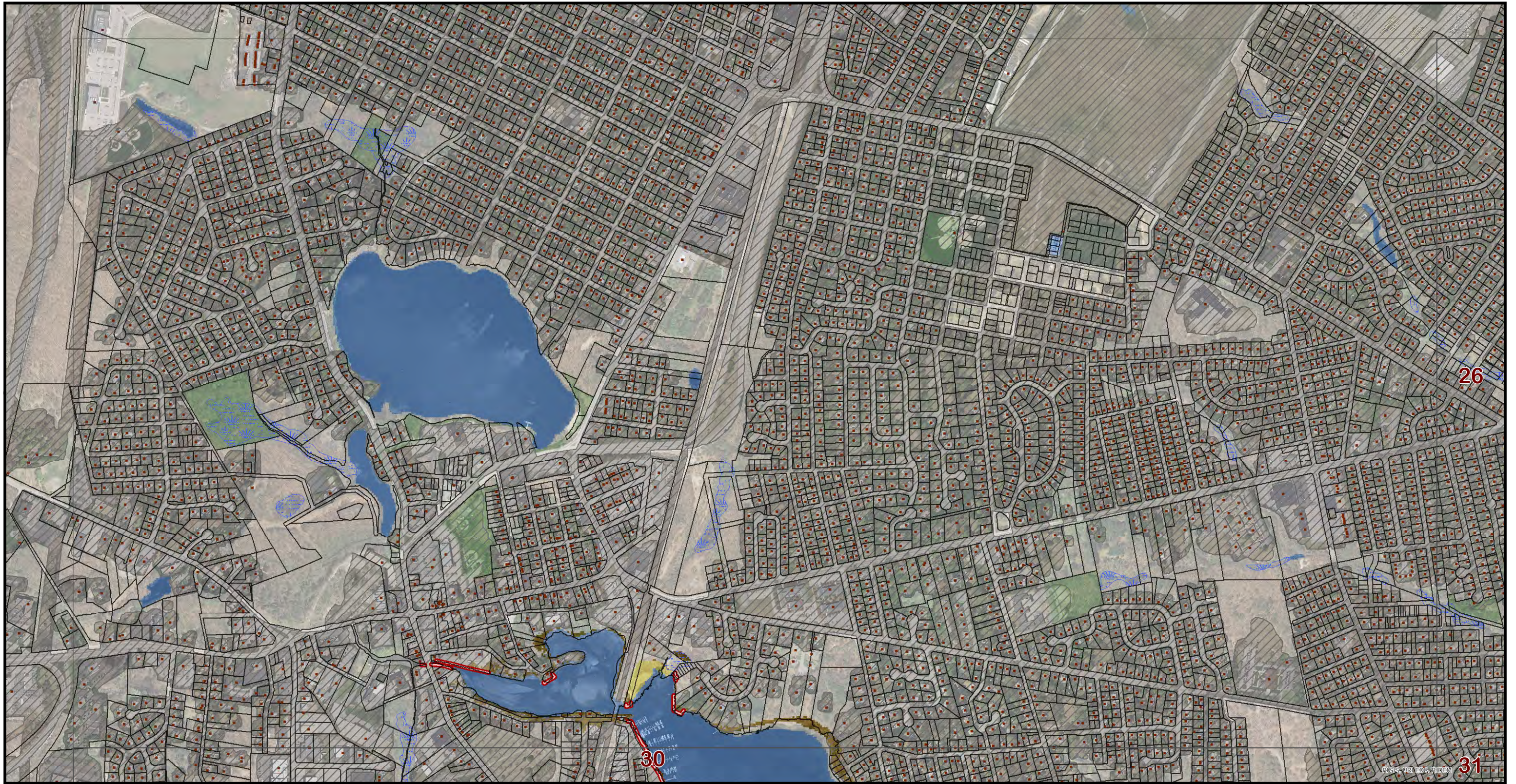
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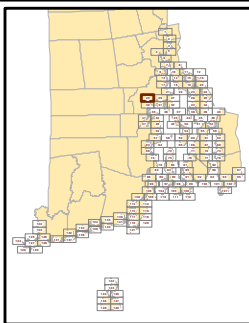
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Map  
25



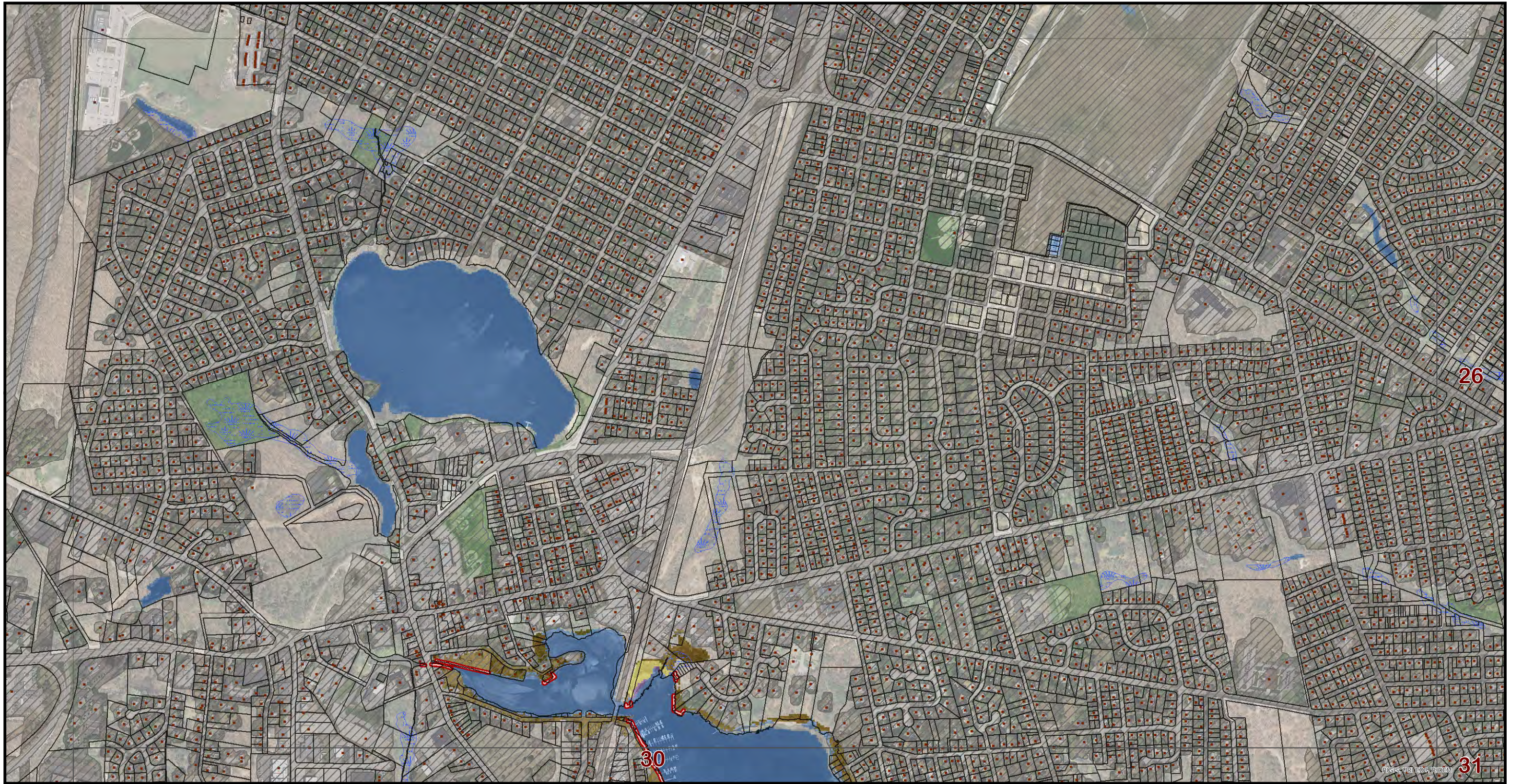
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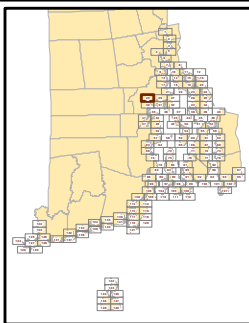
## Tidal Marsh Vulnerability Analysis: One Foot Sea Level Rise Model


















Map  
25



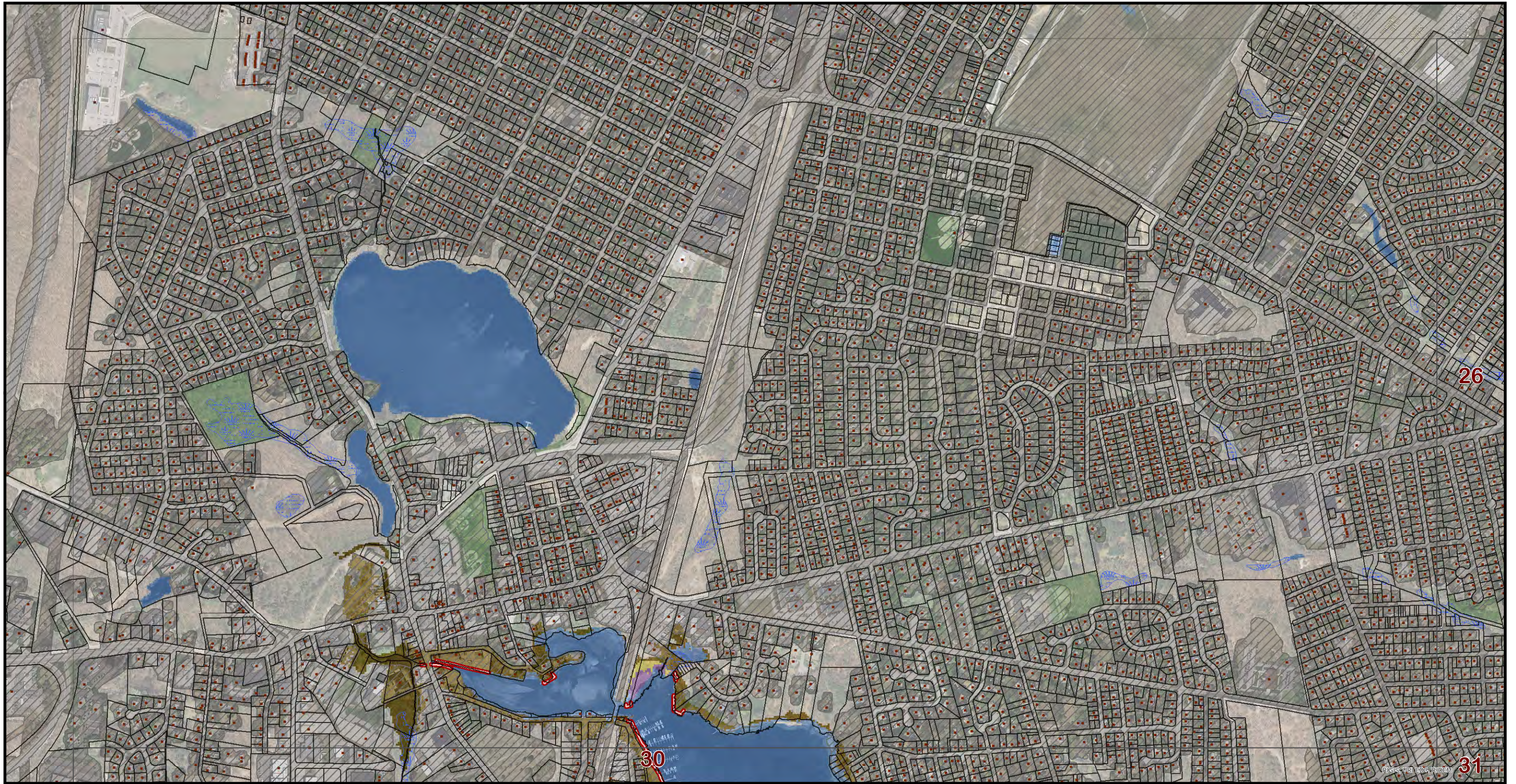
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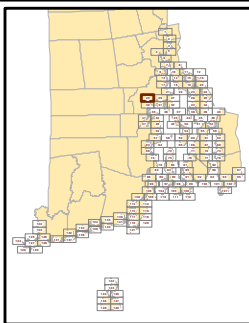
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Map  
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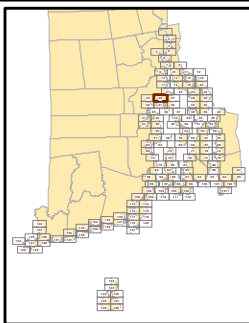
## Tidal Marsh Vulnerability Analysis: Five Foot Sea Level Rise Model



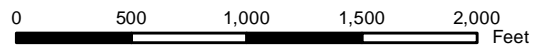




Map  
26



1:10,000



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- |                    |                                |
|--------------------|--------------------------------|
| Developed Upland   | Salt Marsh                     |
| Undeveloped Upland | Brackish Marsh                 |
| Rocky Intertidal   | Scrub/Shrub Transitional Marsh |
| Beach              | Fresh Marsh                    |
| Tidal Flat         | Hardened Shores                |
| Open Water         | Buildings                      |
| Swamp              | Parcel Boundaries              |
| Tidal Creek        |                                |

## Tidal Marsh Vulnerability Analysis: Current Condition

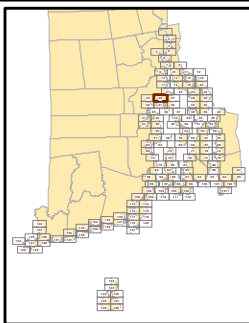


NOAA grant award #: NA12GAR4310108

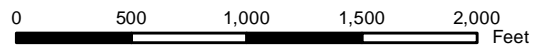















Map  
26



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-  Potential Marsh Zone
-  Persistent Marsh Zone
-  Potential Marsh Loss
-  Open Water and Tidal Flat
-  Current Fresh Wetlands
-  Protected Open Space
-  Hardened Shores
-  Buildings
-  Parcel Boundaries
-  Developed Land
-  CRMC Coastal Barriers

## Tidal Marsh Vulnerability Analysis: One Foot Sea Level Rise Model

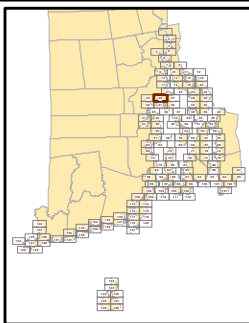


NOAA grant award #: NA120AR4310108
















Map  
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-  Hardened Shores
-  Buildings
-  Parcel Boundaries
-  Developed Land
-  CRMC Coastal Barriers

## Tidal Marsh Vulnerability Analysis: Three Foot Sea Level Rise Model

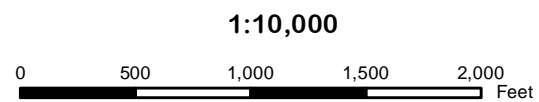
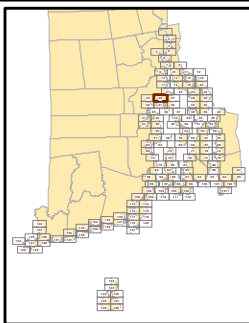


NOAA grant award #: NA120AR4310108





Map  
26



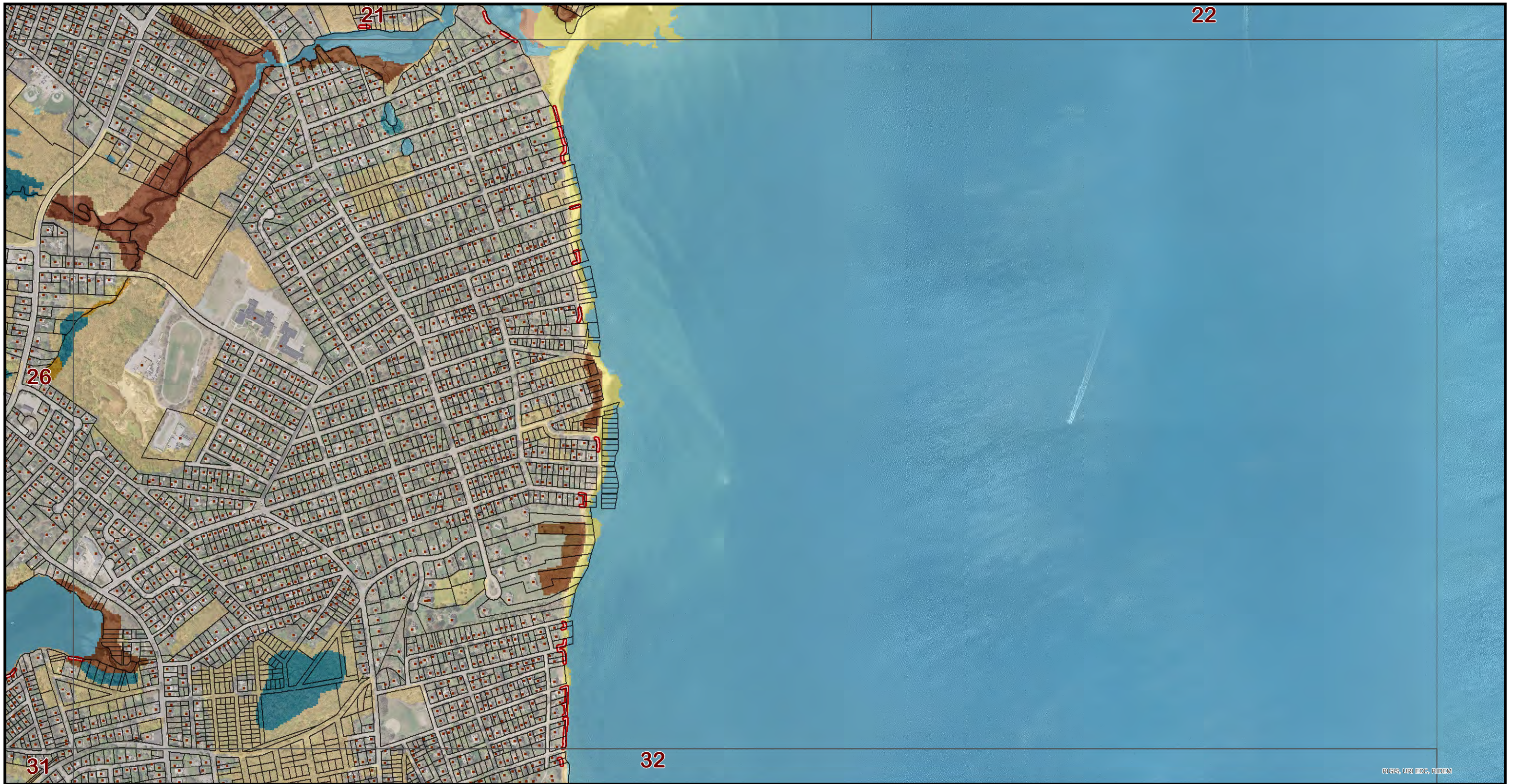
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-  Current Fresh Wetlands
-  Protected Open Space
-  Hardened Shores
-  Buildings
-  Parcel Boundaries
-  Developed Land
-  CRMC Coastal Barriers

## Tidal Marsh Vulnerability Analysis: Five Foot Sea Level Rise Model

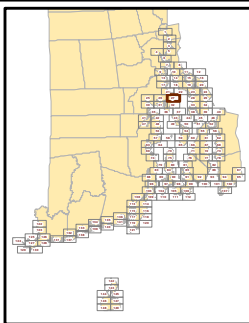




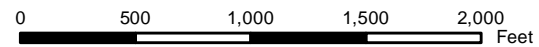


RGIS, URI EDG, RDEM

Map  
27



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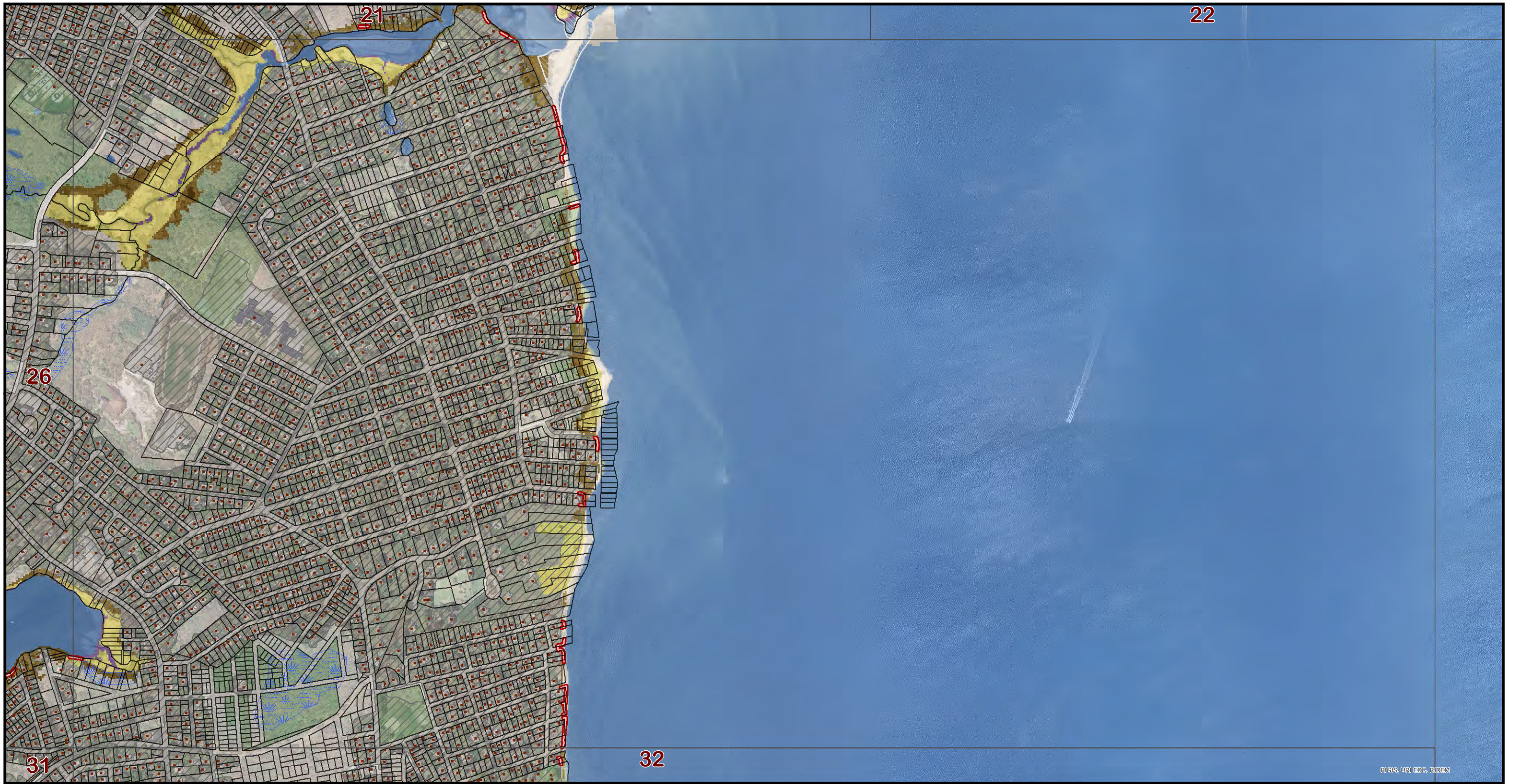
- |                    |                                |
|--------------------|--------------------------------|
| Developed Upland   | Salt Marsh                     |
| Undeveloped Upland | Brackish Marsh                 |
| Rocky Intertidal   | Scrub/Shrub Transitional Marsh |
| Beach              | Fresh Marsh                    |
| Tidal Flat         | Hardened Shores                |
| Open Water         | Buildings                      |
| Swamp              | Parcel Boundaries              |
| Tidal Creek        |                                |

## Tidal Marsh Vulnerability Analysis: Current Condition



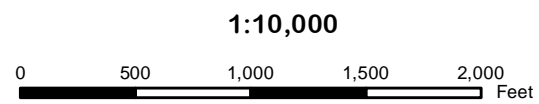
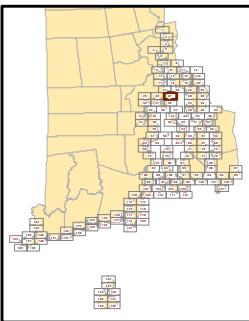
Map produced by Kevin Ruddock. 4/2/2014





RTS, URI EDG, RDEM

Map  
27



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- Potential Marsh Zone
- Persistent Marsh Zone
- Potential Marsh Loss
- Open Water and Tidal Flat
- Current Fresh Wetlands
- Protected Open Space
- Hardened Shores
- Buildings
- Parcel Boundaries
- Developed Land
- CRMC Coastal Barriers

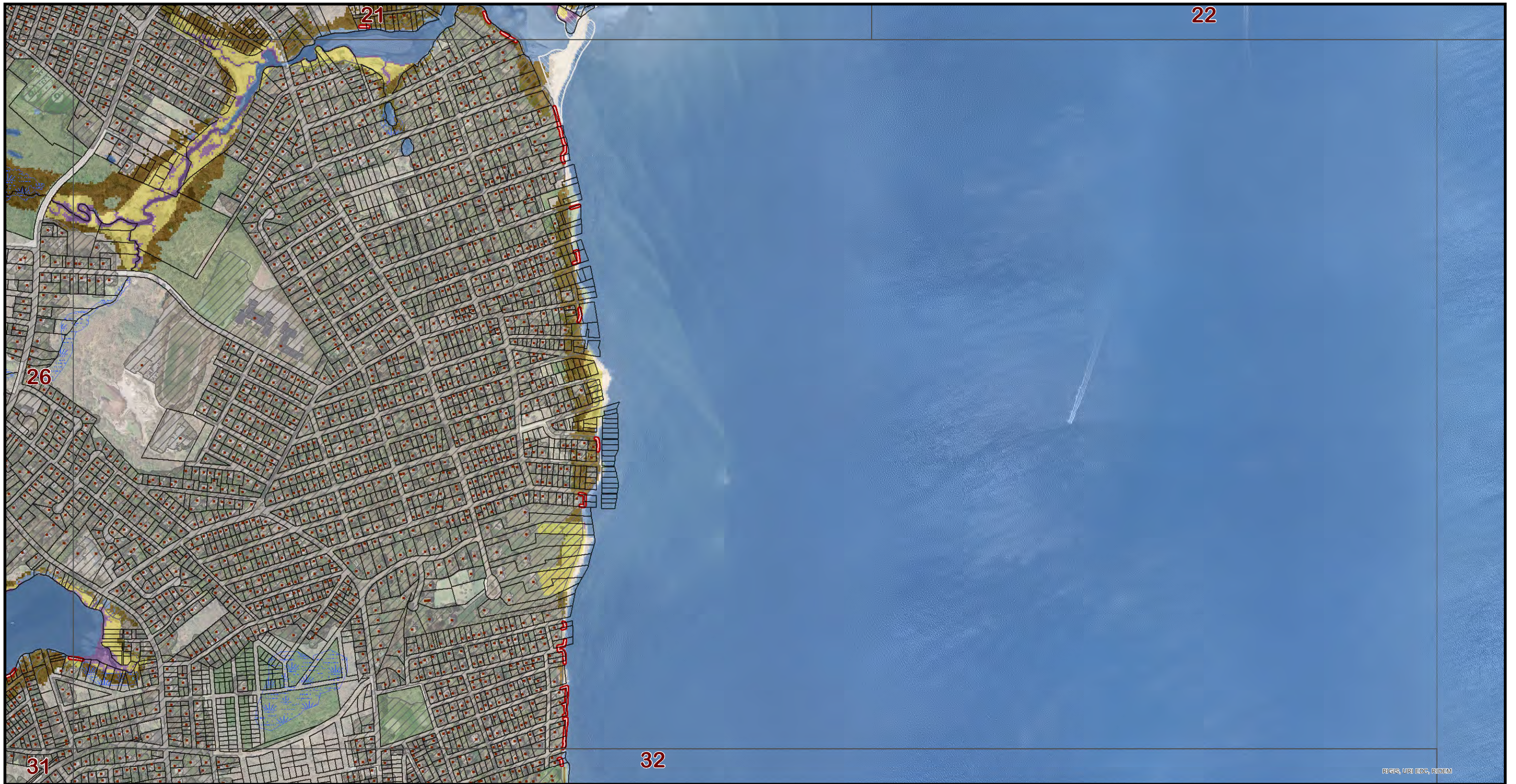
## Tidal Marsh Vulnerability Analysis: One Foot Sea Level Rise Model



NOAA grant award #:  
NA120AR4310108

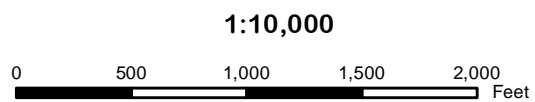
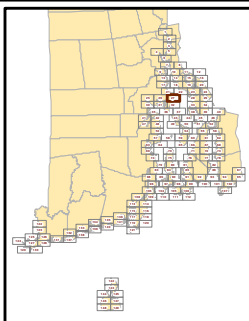
Map produced by Kevin Ruddock. 4/1/2014
















RTS, URI EDG, RDEM

Map  
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-  Current Fresh Wetlands
-  Protected Open Space
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-  Buildings
-  Parcel Boundaries
-  Developed Land
-  CRMC Coastal Barriers

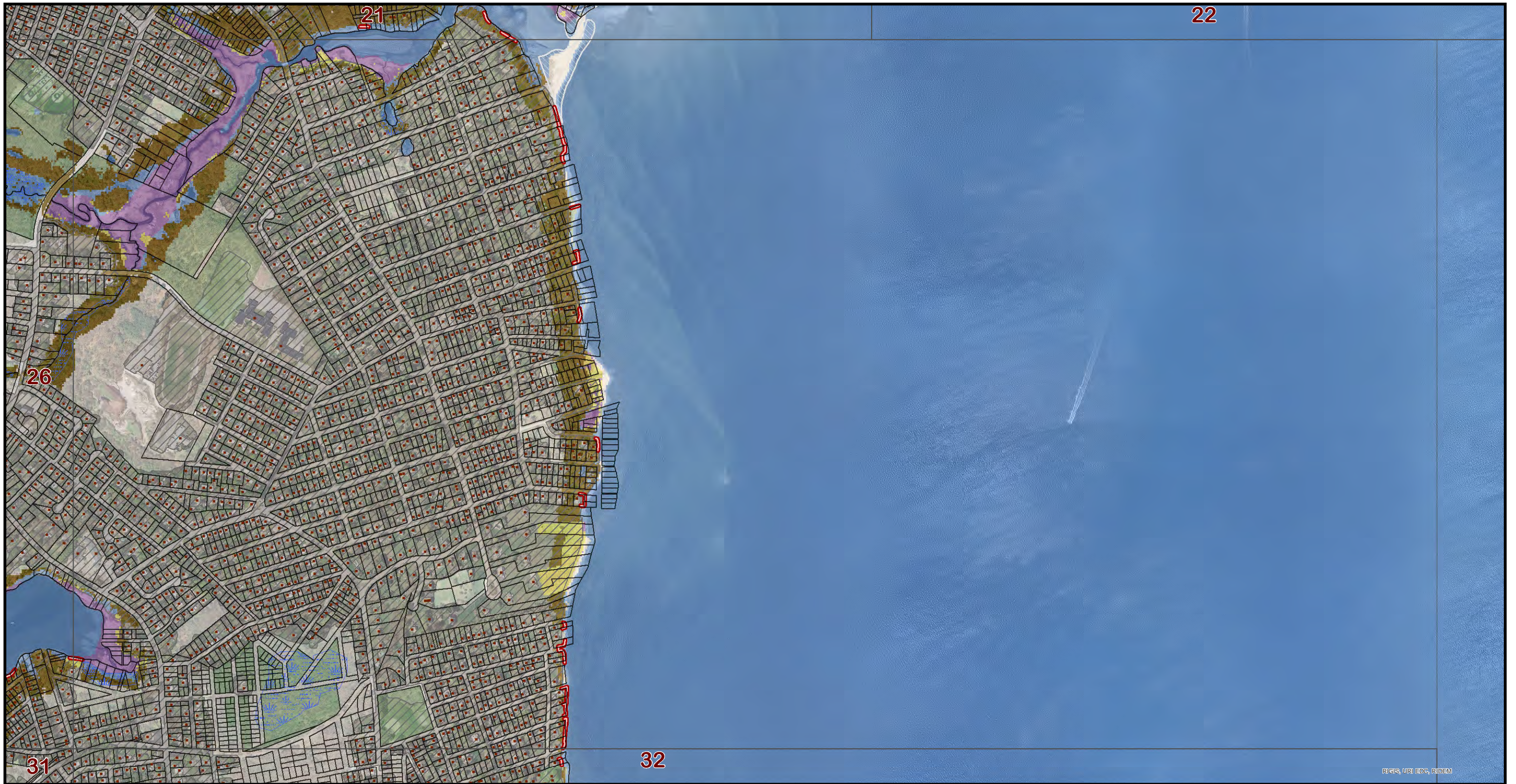
## Tidal Marsh Vulnerability Analysis: Three Foot Sea Level Rise Model



NOAA grant award #:  
NA120AR4310108

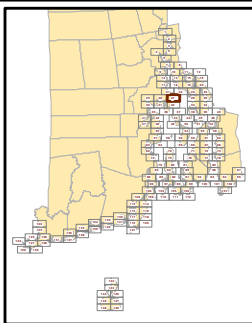
Map produced by Kevin Ruddock. 4/1/2014



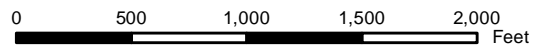


RTS, URI EDG, RDEM












Map  
27



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-  Potential Marsh Zone
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-  Potential Marsh Loss
-  Open Water and Tidal Flat
-  Current Fresh Wetlands
-  Protected Open Space
-  Hardened Shores
-  Buildings
-  Parcel Boundaries
-  Developed Land
-  CRMC Coastal Barriers

## Tidal Marsh Vulnerability Analysis: Five Foot Sea Level Rise Model



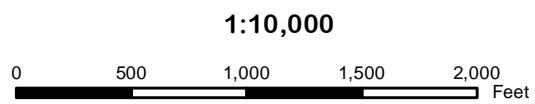
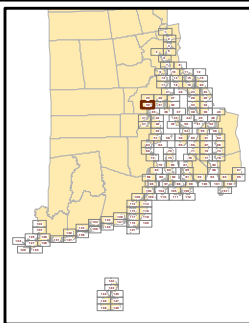
NOAA grant award #:  
NA120AR4310108

Map produced by Kevin Ruddock. 4/1/2014





Map  
30



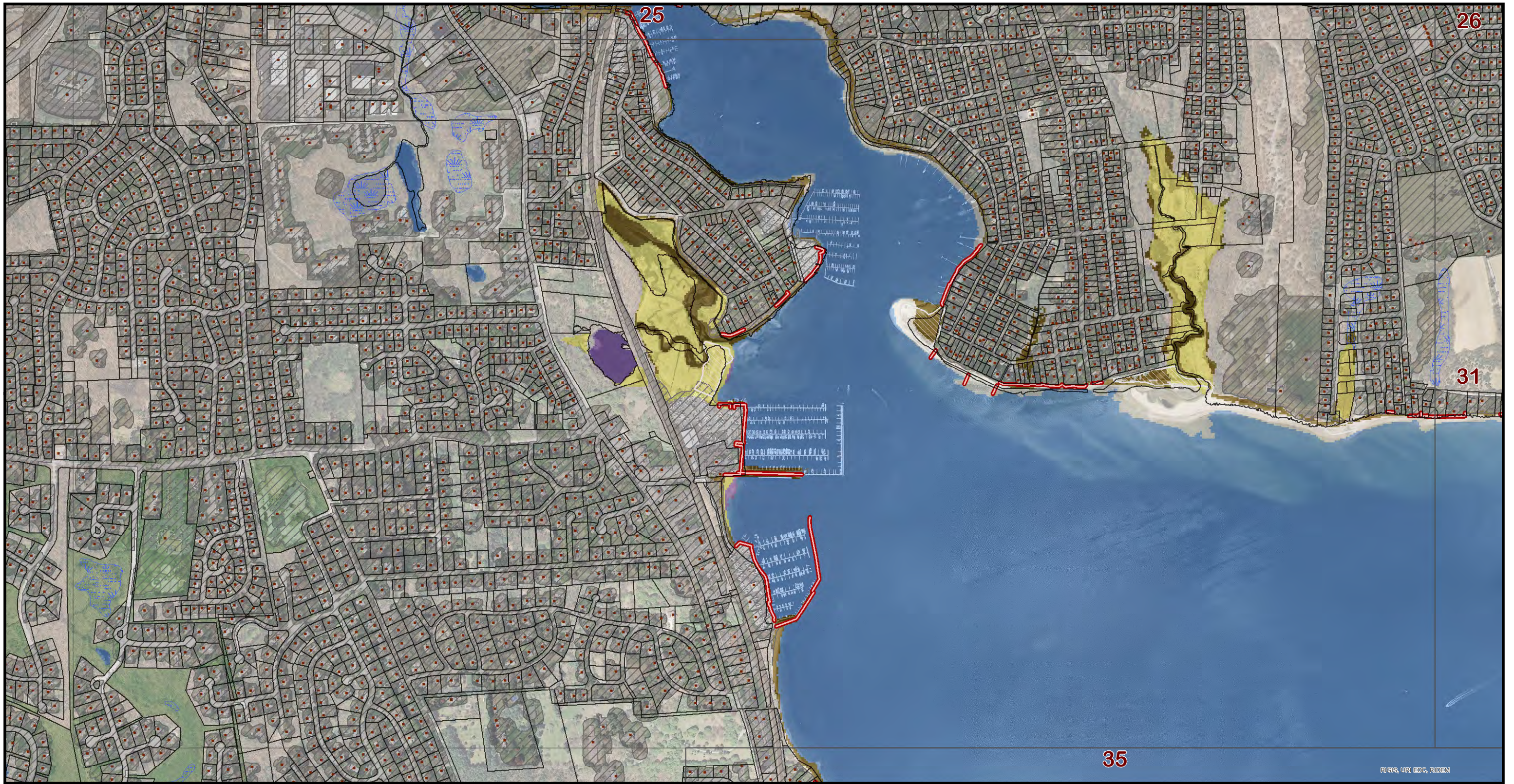
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- |                    |                                |
|--------------------|--------------------------------|
| Developed Upland   | Salt Marsh                     |
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| Rocky Intertidal   | Scrub/Shrub Transitional Marsh |
| Beach              | Fresh Marsh                    |
| Tidal Flat         | Hardened Shores                |
| Open Water         | Buildings                      |
| Swamp              | Parcel Boundaries              |
| Tidal Creek        |                                |

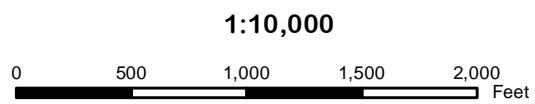
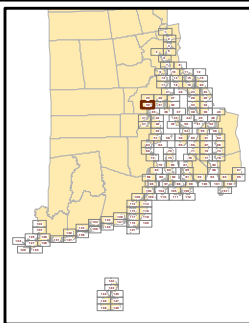
## Tidal Marsh Vulnerability Analysis: Current Condition







Map  
30



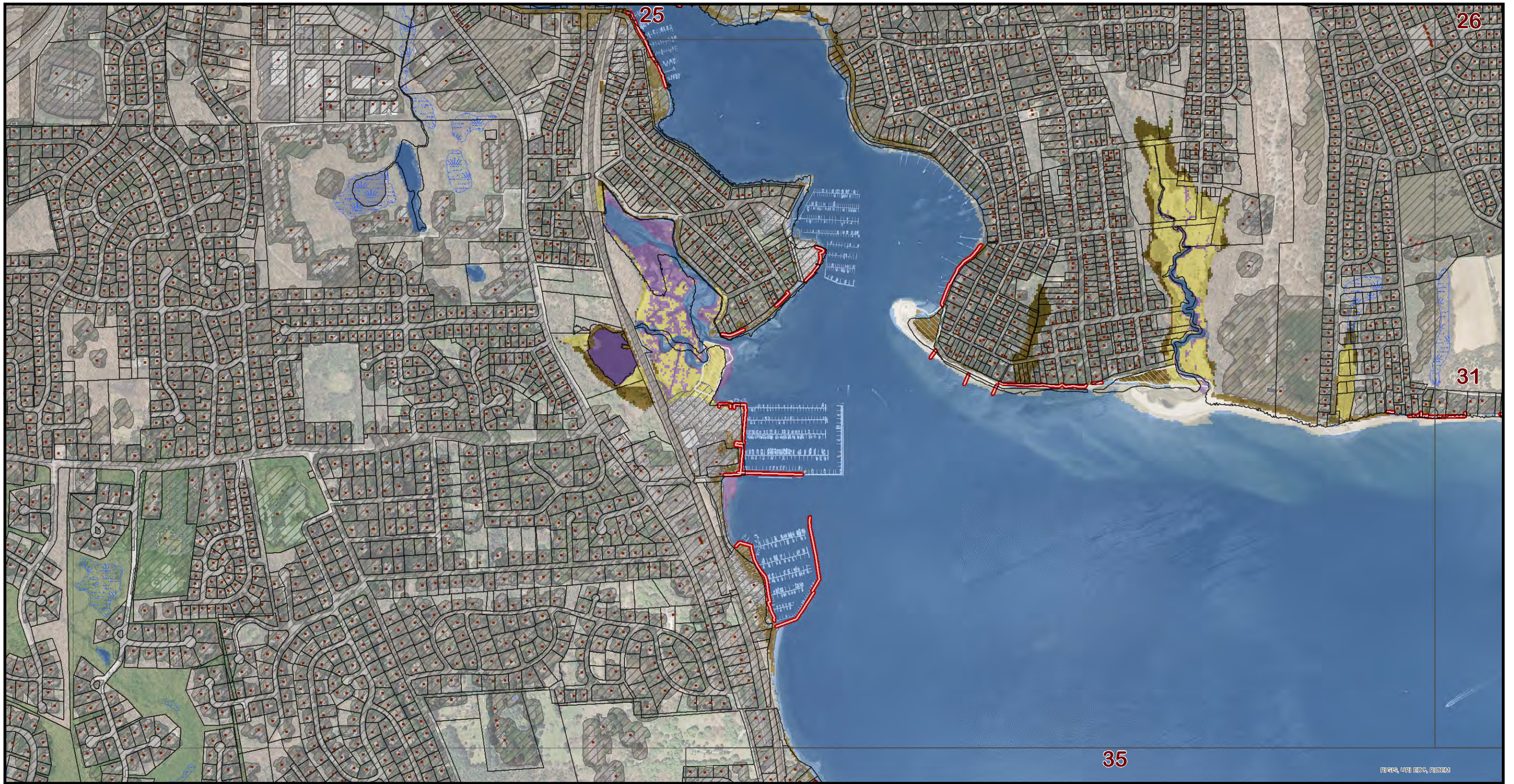
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-  Potential Marsh Zone
-  Persistent Marsh Zone
-  Potential Marsh Loss
-  Open Water and Tidal Flat
-  Current Fresh Wetlands
-  Protected Open Space
-  Hardened Shores
-  Buildings
-  Parcel Boundaries
-  Developed Land
-  CRMC Coastal Barriers

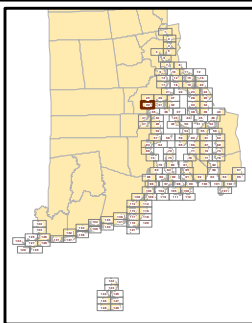
## Tidal Marsh Vulnerability Analysis: One Foot Sea Level Rise Model


















Map  
30



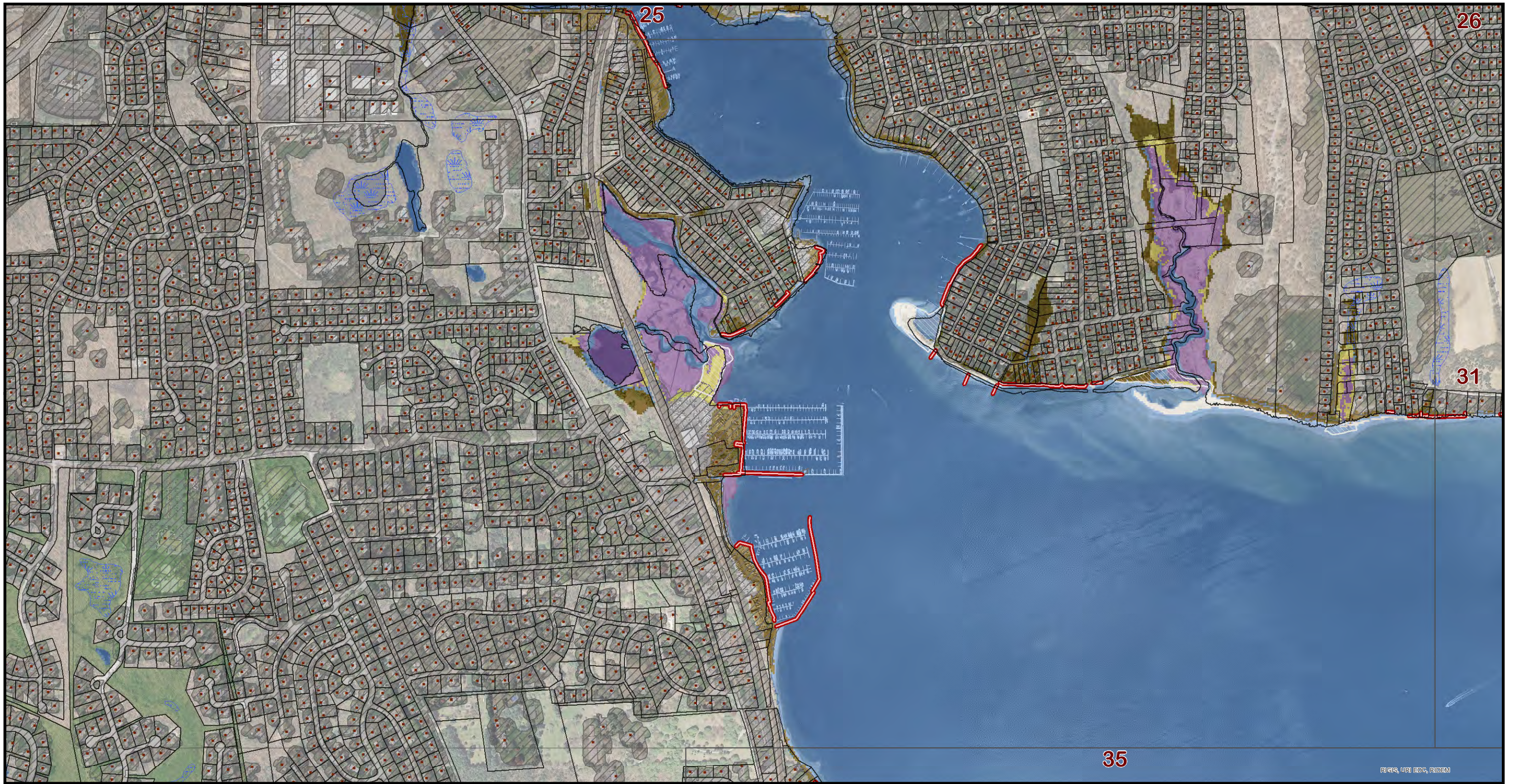
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-  Buildings
-  Parcel Boundaries
-  Developed Land
-  CRMC Coastal Barriers

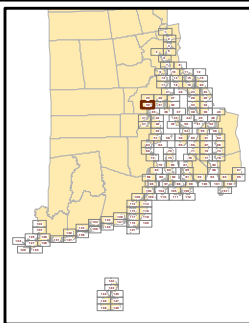
## Tidal Marsh Vulnerability Analysis: Three Foot Sea Level Rise Model







Map  
30



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-  Potential Marsh Zone
-  Persistent Marsh Zone
-  Potential Marsh Loss
-  Open Water and Tidal Flat
-  Current Fresh Wetlands
-  Protected Open Space
-  Hardened Shores
-  Buildings
-  Parcel Boundaries
-  Developed Land
-  CRMC Coastal Barriers

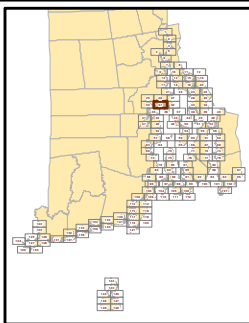
## Tidal Marsh Vulnerability Analysis: Five Foot Sea Level Rise Model







Map  
31



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- |                    |                                |
|--------------------|--------------------------------|
| Developed Upland   | Salt Marsh                     |
| Undeveloped Upland | Brackish Marsh                 |
| Rocky Intertidal   | Scrub/Shrub Transitional Marsh |
| Beach              | Fresh Marsh                    |
| Tidal Flat         | Hardened Shores                |
| Open Water         | Buildings                      |
| Swamp              | Parcel Boundaries              |
| Tidal Creek        |                                |

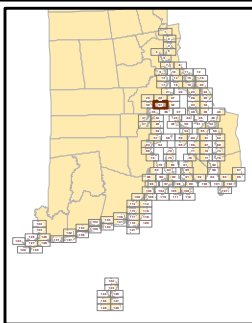
## Tidal Marsh Vulnerability Analysis: Current Condition







Map  
31



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- |  |                           |  |                       |
|--|---------------------------|--|-----------------------|
|  | Potential Marsh Zone      |  | Hardened Shores       |
|  | Persistent Marsh Zone     |  | Buildings             |
|  | Potential Marsh Loss      |  | Parcel Boundaries     |
|  | Open Water and Tidal Flat |  | Developed Land        |
|  | Current Fresh Wetlands    |  | CRMC Coastal Barriers |
|  | Protected Open Space      |  |                       |

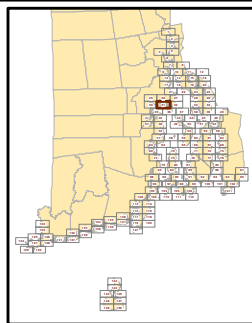
## Tidal Marsh Vulnerability Analysis: One Foot Sea Level Rise Model


















Map  
31



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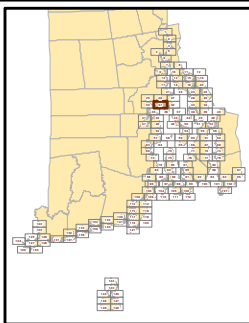
## Tidal Marsh Vulnerability Analysis: Three Foot Sea Level Rise Model







Map  
31



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## Tidal Marsh Vulnerability Analysis: Five Foot Sea Level Rise Model

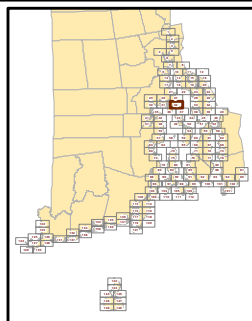




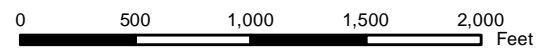


RGIS, URI EDG, RIDEM

Map  
32



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| Tidal Flat         | Hardened Shores                |
| Open Water         | Buildings                      |
| Swamp              | Parcel Boundaries              |
| Tidal Creek        |                                |

## Tidal Marsh Vulnerability Analysis: Current Condition

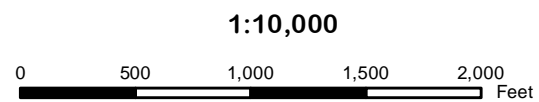
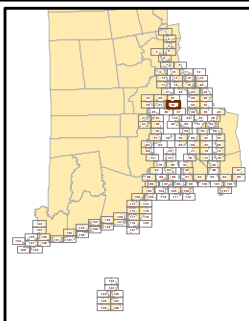

















REIS, URI EDG, RIDEM

Map  
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-  Hardened Shores
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-  Parcel Boundaries
-  Developed Land
-  CRMC Coastal Barriers

## Tidal Marsh Vulnerability Analysis: One Foot Sea Level Rise Model



NOAA grant award #:  
NA120AR4310108

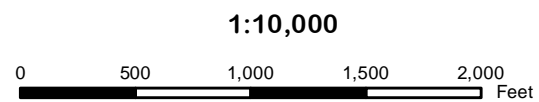
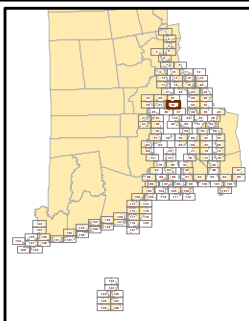
Map produced by Kevin Ruddock. 4/1/2014
















RTS, URI EDG, RIDEM

Map  
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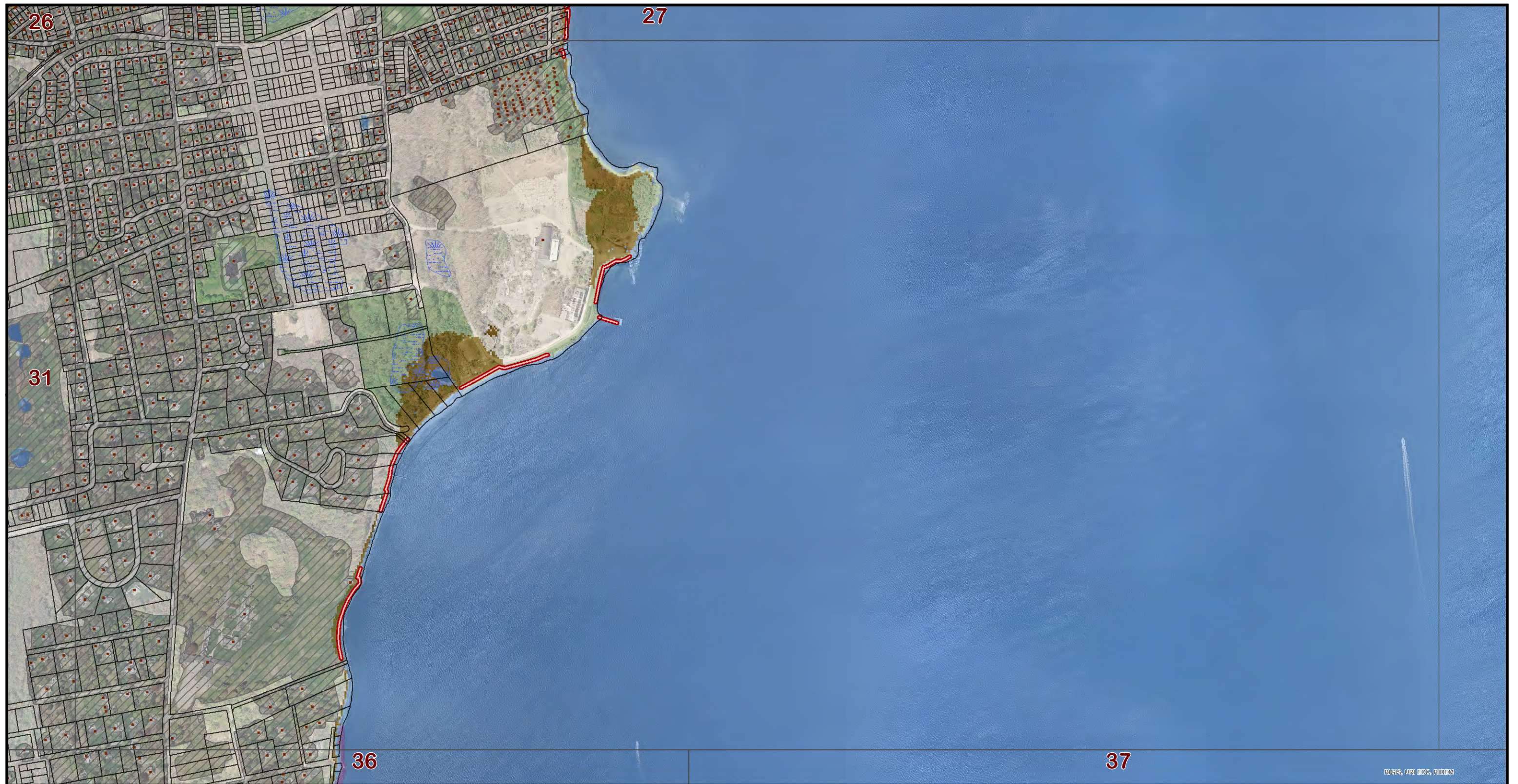
## Tidal Marsh Vulnerability Analysis: Three Foot Sea Level Rise Model



NOAA grant award #:  
NA120AR4310108

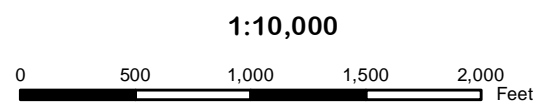
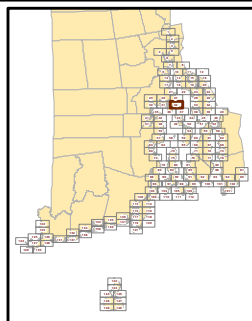
Map produced by Kevin Ruddock. 4/1/2014
















RTS, URI EDG, RIDEM

Map  
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## Tidal Marsh Vulnerability Analysis: Five Foot Sea Level Rise Model



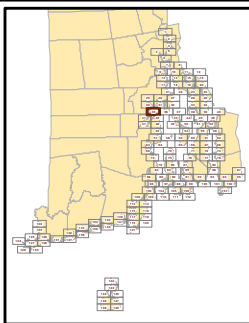
NOAA grant award #:  
NA120AR4310108

Map produced by Kevin Ruddock. 4/1/2014

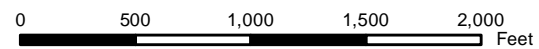




Map  
35



1:10,000



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- |                    |                                |
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| Open Water         | Buildings                      |
| Swamp              | Parcel Boundaries              |
| Tidal Creek        |                                |

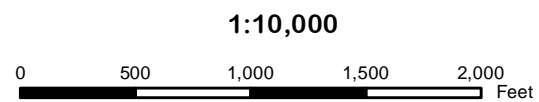
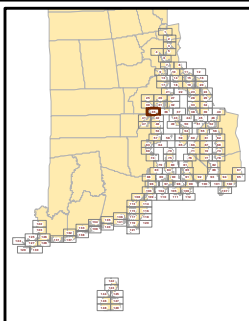
## Tidal Marsh Vulnerability Analysis: Current Condition


















Map  
35



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-  Potential Marsh Zone
-  Persistent Marsh Zone
-  Potential Marsh Loss
-  Open Water and Tidal Flat
-  Current Fresh Wetlands
-  Protected Open Space
-  Hardened Shores
-  Buildings
-  Parcel Boundaries
-  Developed Land
-  CRMC Coastal Barriers

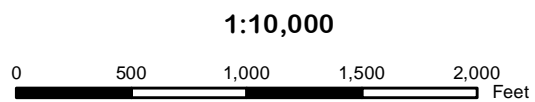
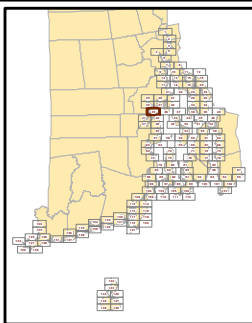
## Tidal Marsh Vulnerability Analysis: One Foot Sea Level Rise Model


















Map  
35



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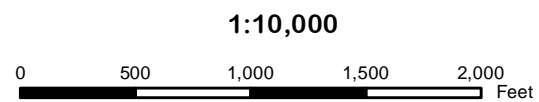
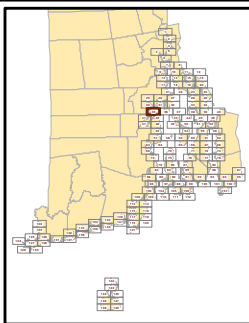
## Tidal Marsh Vulnerability Analysis: Three Foot Sea Level Rise Model







Map  
35



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-  Hardened Shores
-  Buildings
-  Parcel Boundaries
-  Developed Land
-  CRMC Coastal Barriers

## Tidal Marsh Vulnerability Analysis: Five Foot Sea Level Rise Model

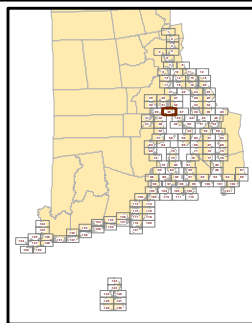


NOAA grant award #:  
NA120AR4310108





Map  
36



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- |                    |                                |
|--------------------|--------------------------------|
| Developed Upland   | Salt Marsh                     |
| Undeveloped Upland | Brackish Marsh                 |
| Rocky Intertidal   | Scrub/Shrub Transitional Marsh |
| Beach              | Fresh Marsh                    |
| Tidal Flat         | Hardened Shores                |
| Open Water         | Buildings                      |
| Swamp              | Parcel Boundaries              |
| Tidal Creek        |                                |

## Tidal Marsh Vulnerability Analysis: Current Condition



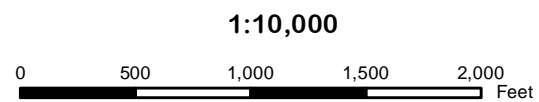
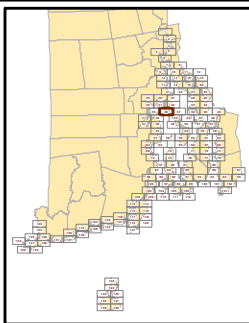
NOAA grant award #: NA12GAR4310108







Map  
36



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- Potential Marsh Zone
- Persistent Marsh Zone
- Potential Marsh Loss
- Open Water and Tidal Flat
- Current Fresh Wetlands
- Protected Open Space
- Hardened Shores
- Buildings
- Parcel Boundaries
- Developed Land
- CRMC Coastal Barriers

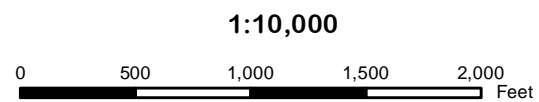
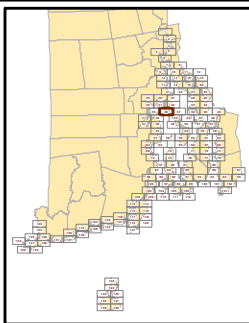
## Tidal Marsh Vulnerability Analysis: One Foot Sea Level Rise Model







Map  
36



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- CRMC Coastal Barriers

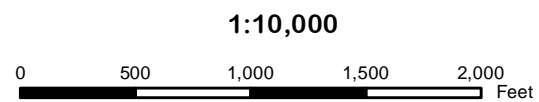
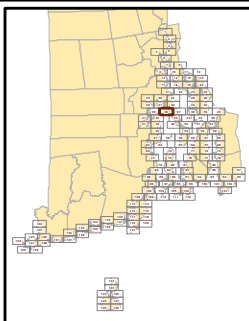
## Tidal Marsh Vulnerability Analysis: Three Foot Sea Level Rise Model







Map  
36



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-  Persistent Marsh Zone
-  Potential Marsh Loss
-  Open Water and Tidal Flat
-  Current Fresh Wetlands
-  Protected Open Space
-  Hardened Shores
-  Buildings
-  Parcel Boundaries
-  Developed Land
-  CRMC Coastal Barriers

## Tidal Marsh Vulnerability Analysis: Five Foot Sea Level Rise Model

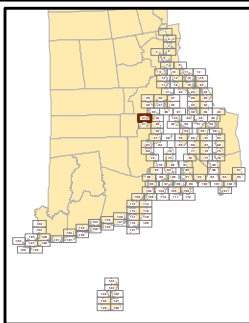


NOAA grant award #:  
NA120AR4310108





Map  
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- |                    |                                |
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| Beach              | Fresh Marsh                    |
| Tidal Flat         | Hardened Shores                |
| Open Water         | Buildings                      |
| Swamp              | Parcel Boundaries              |
| Tidal Creek        |                                |

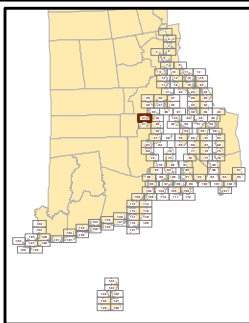
## Tidal Marsh Vulnerability Analysis: Current Condition







Map  
41



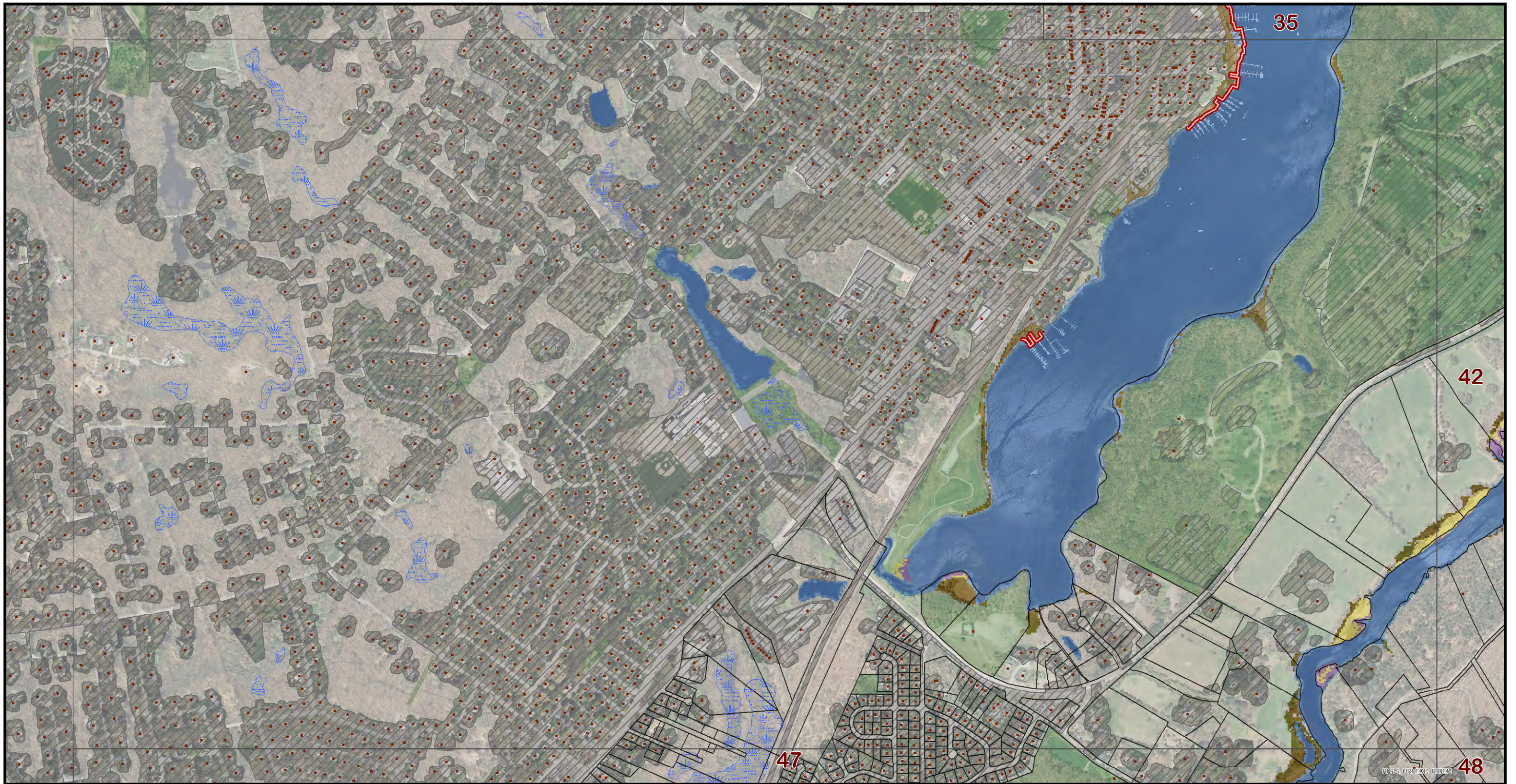
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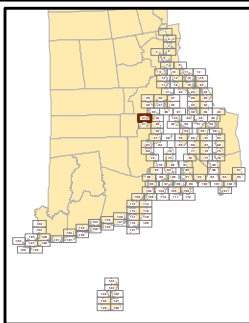
## Tidal Marsh Vulnerability Analysis: One Foot Sea Level Rise Model


















Map  
41



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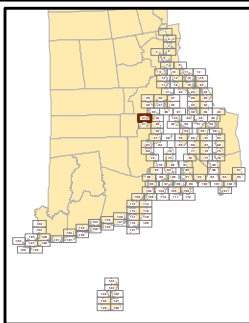
## Tidal Marsh Vulnerability Analysis: Three Foot Sea Level Rise Model







Map  
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## Tidal Marsh Vulnerability Analysis: Five Foot Sea Level Rise Model

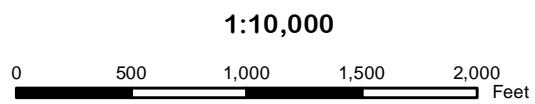
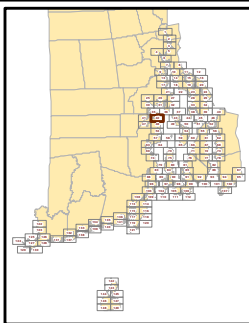






RIGIS, URI EDG, RDEM

Map 42



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| Open Water         | Buildings                      |
| Swamp              | Parcel Boundaries              |
| Tidal Creek        |                                |

# Tidal Marsh Vulnerability Analysis: Current Condition

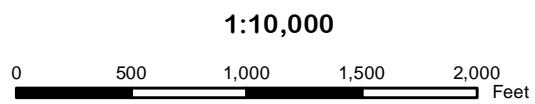
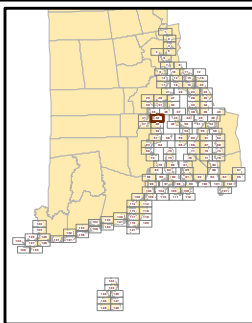

















RIGIS, URI EDG, RDEM

Map 42



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## Tidal Marsh Vulnerability Analysis: One Foot Sea Level Rise Model



NOAA grant award #: NA120AR4310108

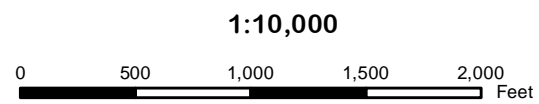
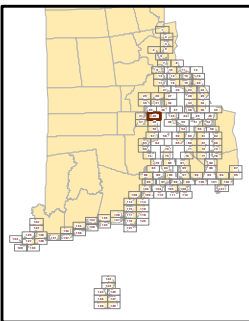
Map produced by Kevin Ruddock. 4/1/2014
















RIGIS, URI EDG, RDEM

Map 42



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## Tidal Marsh Vulnerability Analysis: Three Foot Sea Level Rise Model



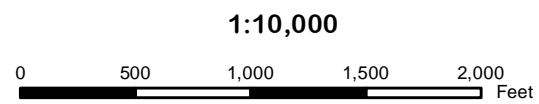
NOAA grant award #: NA120AR4310108

Map produced by Kevin Ruddock. 4/1/2014
















Map  
42



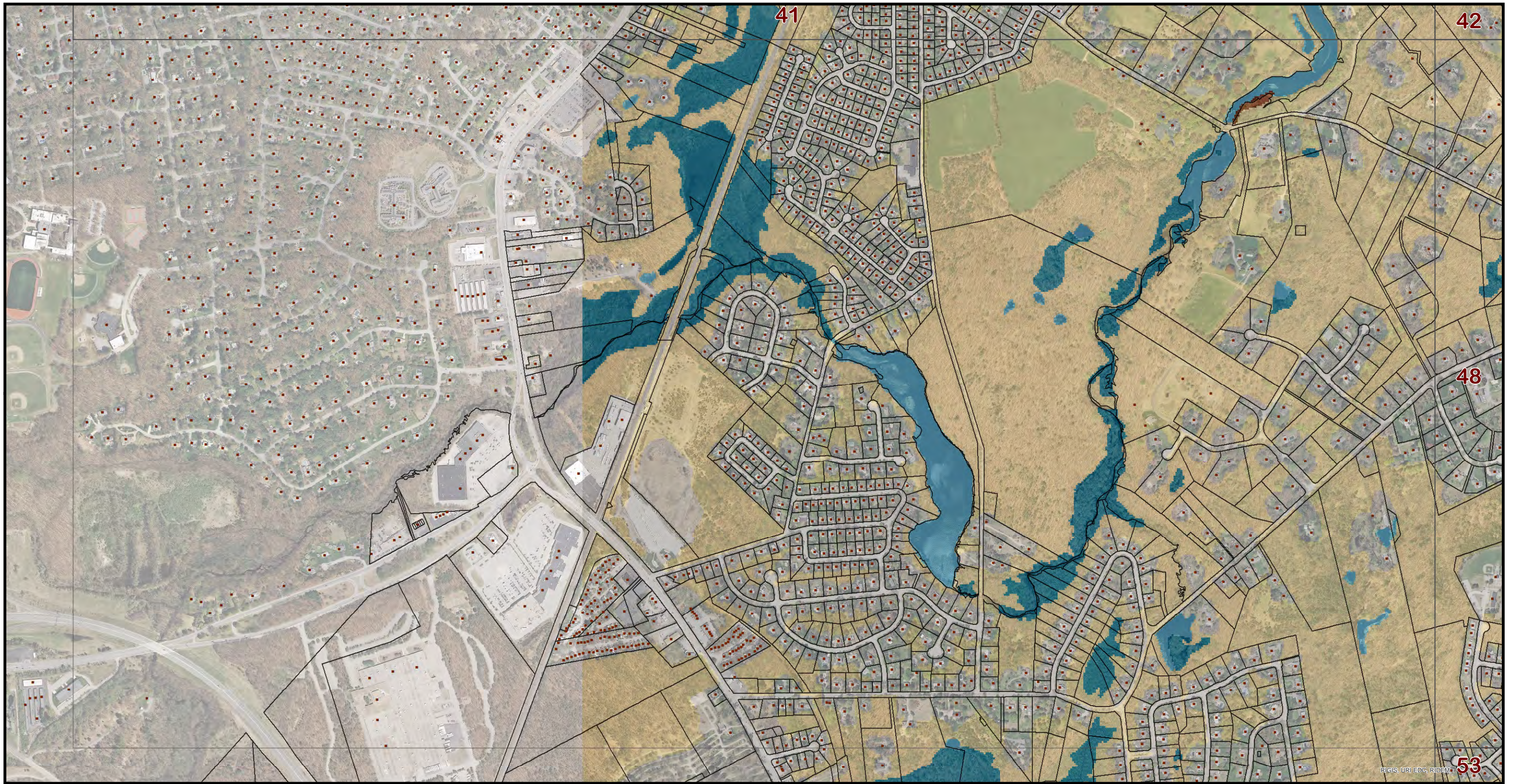
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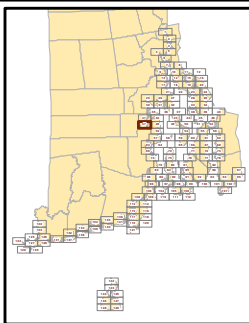
## Tidal Marsh Vulnerability Analysis: Five Foot Sea Level Rise Model







Map  
47



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| Open Water         | Buildings                      |
| Swamp              | Parcel Boundaries              |
| Tidal Creek        |                                |

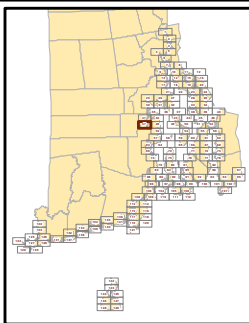
## Tidal Marsh Vulnerability Analysis: Current Condition







Map  
47



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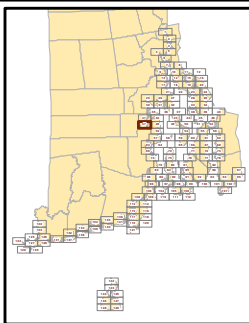
## Tidal Marsh Vulnerability Analysis: One Foot Sea Level Rise Model







Map  
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- |                           |                       |
|---------------------------|-----------------------|
| Potential Marsh Zone      | Hardened Shores       |
| Persistent Marsh Zone     | Buildings             |
| Potential Marsh Loss      | Parcel Boundaries     |
| Open Water and Tidal Flat | Developed Land        |
| Current Fresh Wetlands    | CRMC Coastal Barriers |
| Protected Open Space      |                       |

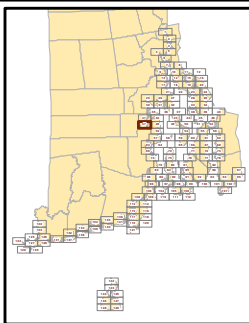
## Tidal Marsh Vulnerability Analysis: Three Foot Sea Level Rise Model







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## Tidal Marsh Vulnerability Analysis: Five Foot Sea Level Rise Model

