

Hazardous and contaminated sites within salt marsh migration corridors in Rhode Island

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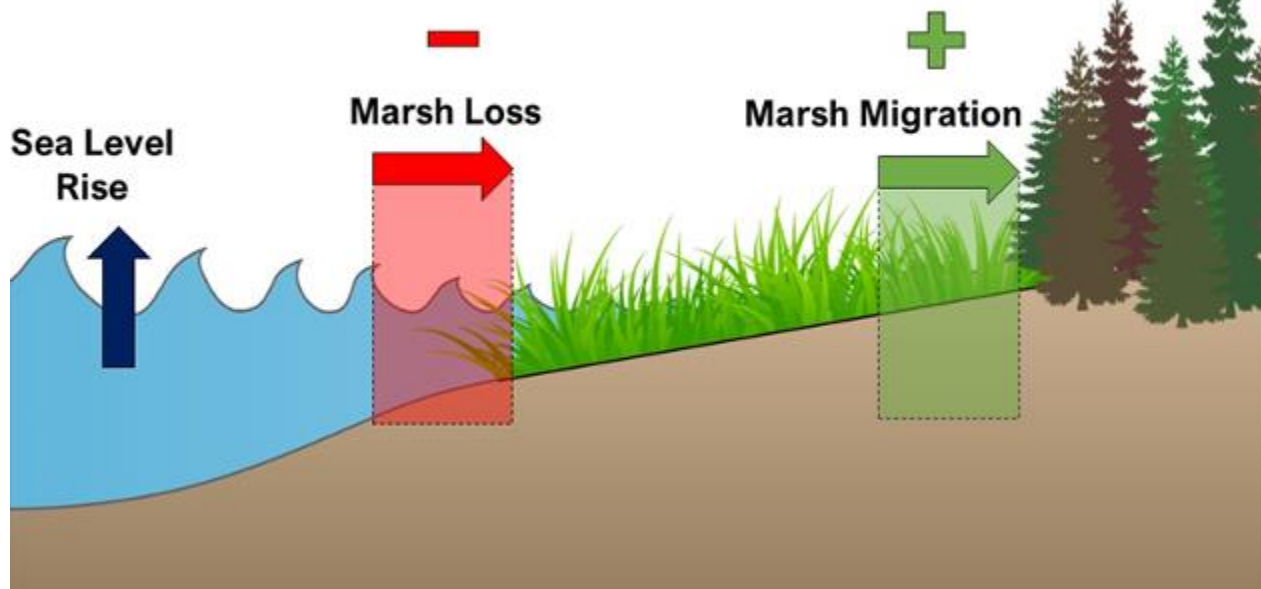
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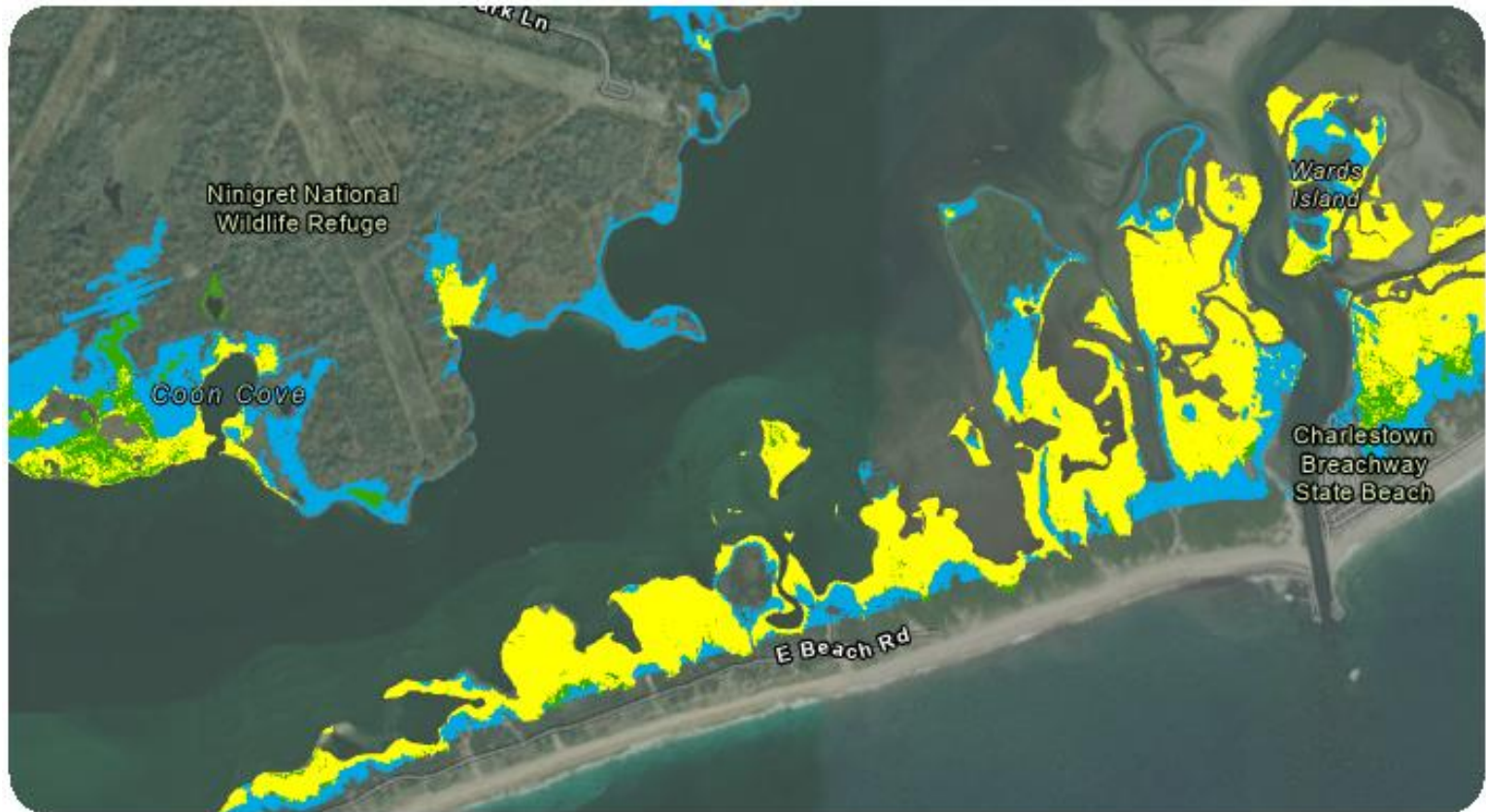
Introduction: salt marsh migration

- Salt marshes are highly productive and valuable coastal ecosystems
- Marsh migration: movement of marshes upland with sea level rise
- Require permeable land to migrate onto



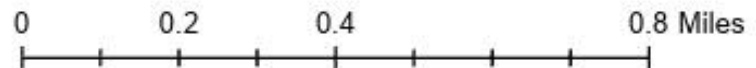
Projected marsh habitat, 2050 (86 cm SLR)

Ninigret Pond, Rhode Island



Marsh potential

- Yellow: Lost
- Green: Persistent
- Blue: New





Hazardous and contaminated sites (HCSs)



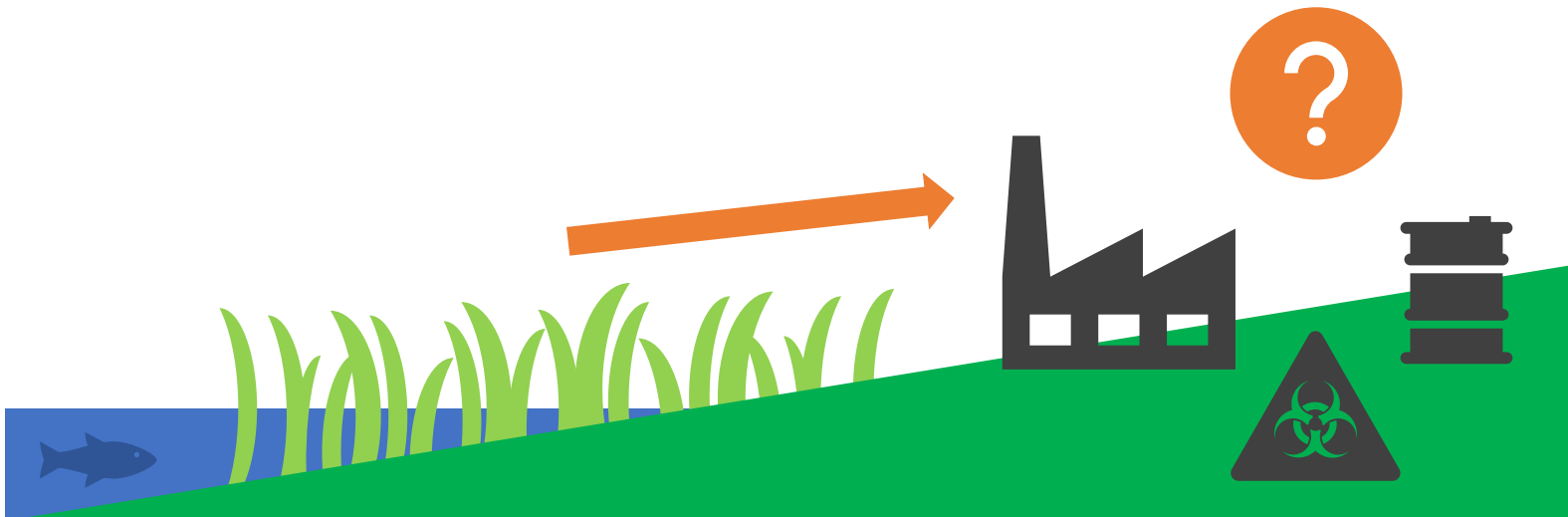
- Hazardous and contaminated sites (HCSs) – facilities, infrastructure, and other sites that store, use, or release toxic substances
- Understanding HCSs' presence within migration pathways could inform both remediation and conservation planning





Research question

What are the types and distribution of hazardous and contaminated sites that may encounter migrating marsh in Rhode Island?

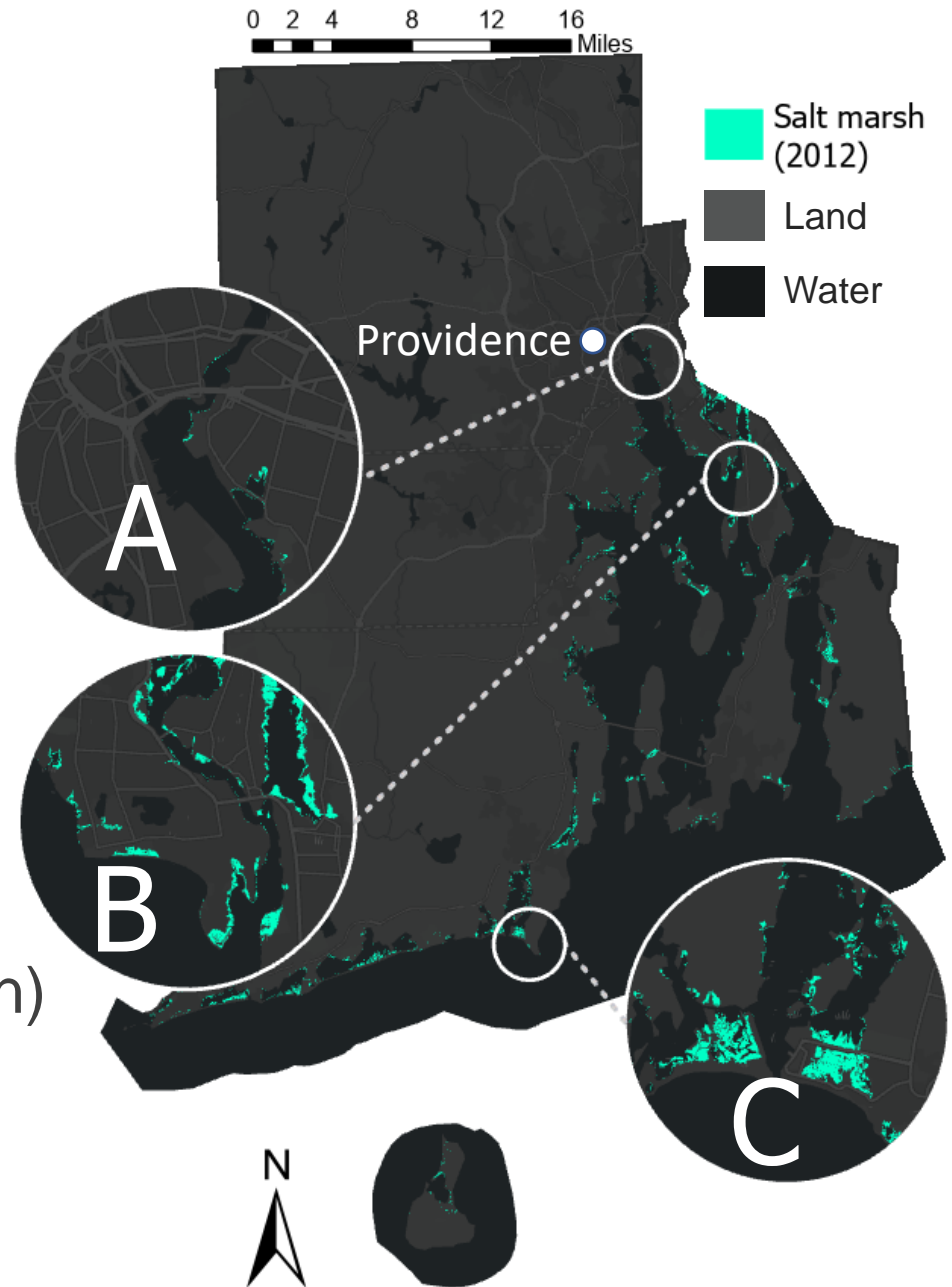


Methods

Site profile: Rhode Island

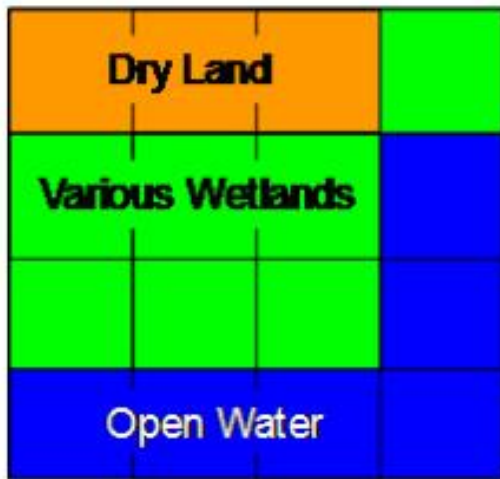
- “Ocean State”
- Narragansett Bay
- ~4000 acres of marsh
- Most of “original” marsh is gone
- Industrial revolution

- A** Urban (Providence)
- B** Suburban (Barrington)
- C** Rural (Galilee)

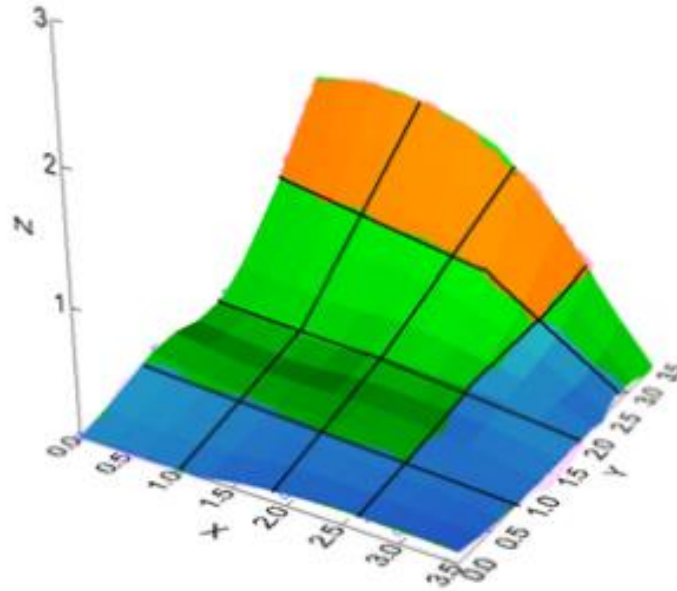


Sea Level Affecting Marsh Model (SLAMM)

- Models marshes migrating upland with sea level rise
- Inputs: Current marsh, elevation, soil accretion, tide, etc.
- Output: map of potential marsh



2D Representation

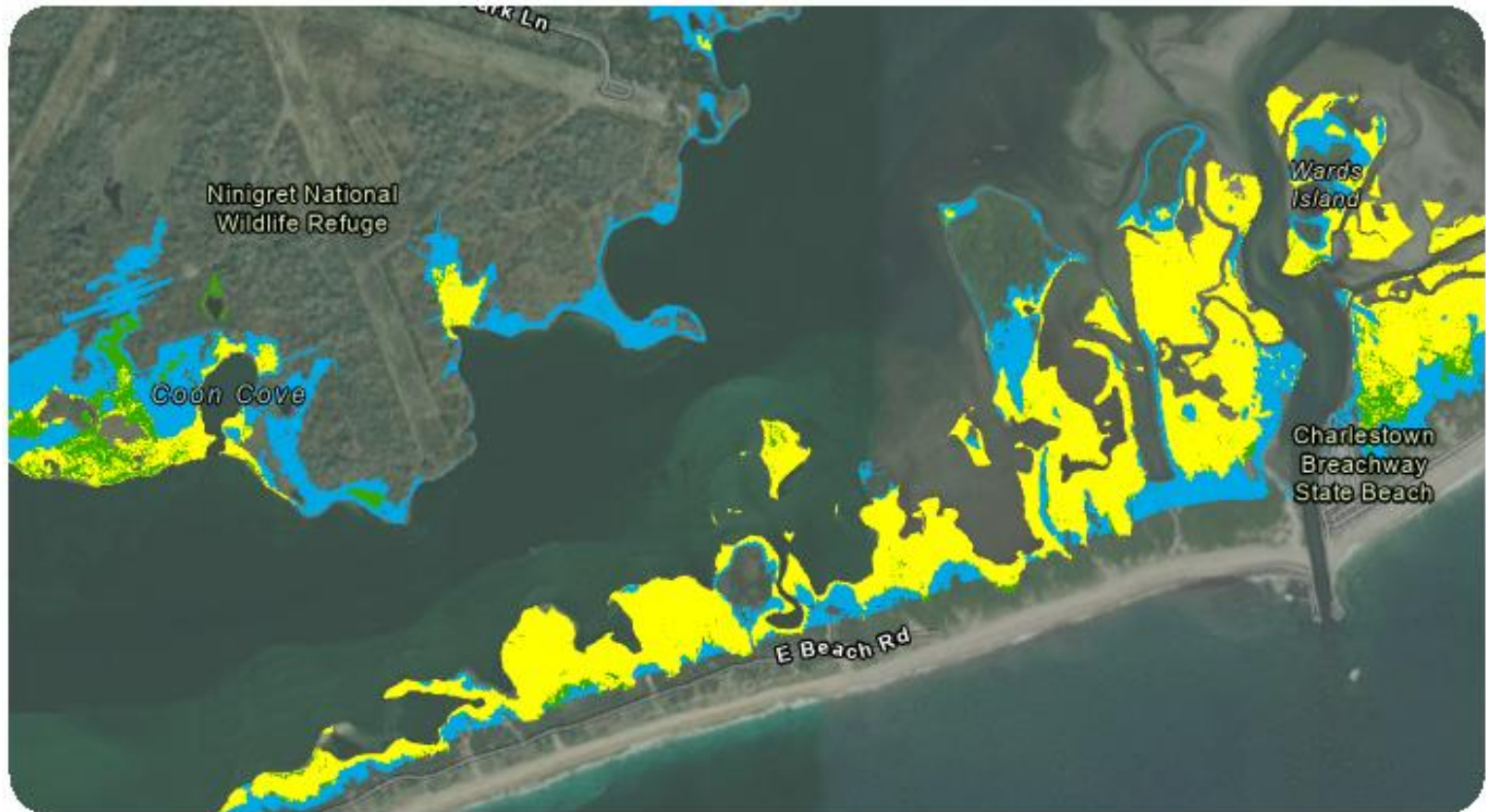


3D Representation

<https://coast.noaa.gov/digitalcoast/tools/slam>
m.html

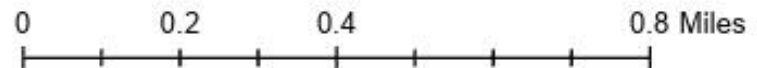
Projected marsh habitat, 2050 (86 cm SLR)

Ninigret Pond, Rhode Island



Marsh potential

- Lost
- Persistent
- New



Hazardous and contaminated sites (HCSs): sources

- US EPA's Facility Registry Service (FRS)
 - <https://www.epa.gov/frs>
- Rhode Island Department of Environmental Management (RIDEM) Permits, Licenses, and Other Vital Environmental Records (PLOVER) database
 - <http://eplover.dem.ri.gov/ploverpublic/search.aspx>
- Rhode Island Department of Environmental Management (RIDEM) Office of Land Revitalization and Sustainable Materials Management (OLRSMM) Stormwater outfall inventory
 - <http://www.dem.ri.gov/programs/wastemanagement/inventories.php>
- EPA Superfund NPL polygons
 - <https://edg.epa.gov/metadata/catalog/search/resource/details.page?uuid=%7BF5C0114B-189D-4E82-B974-4FE8D5131BA2%7D>

SCORR

- Sediment-Bound Contaminant Resiliency and Response (SCoRR) contaminant hazard rankings
 - 4: hazardous effects on human/aquatic life
 - 3: slightly hazardous effects on human/aquatic life
 - 2: mild effects on human/aquatic life
 - 1: little to no hazard risk to human/aquatic life

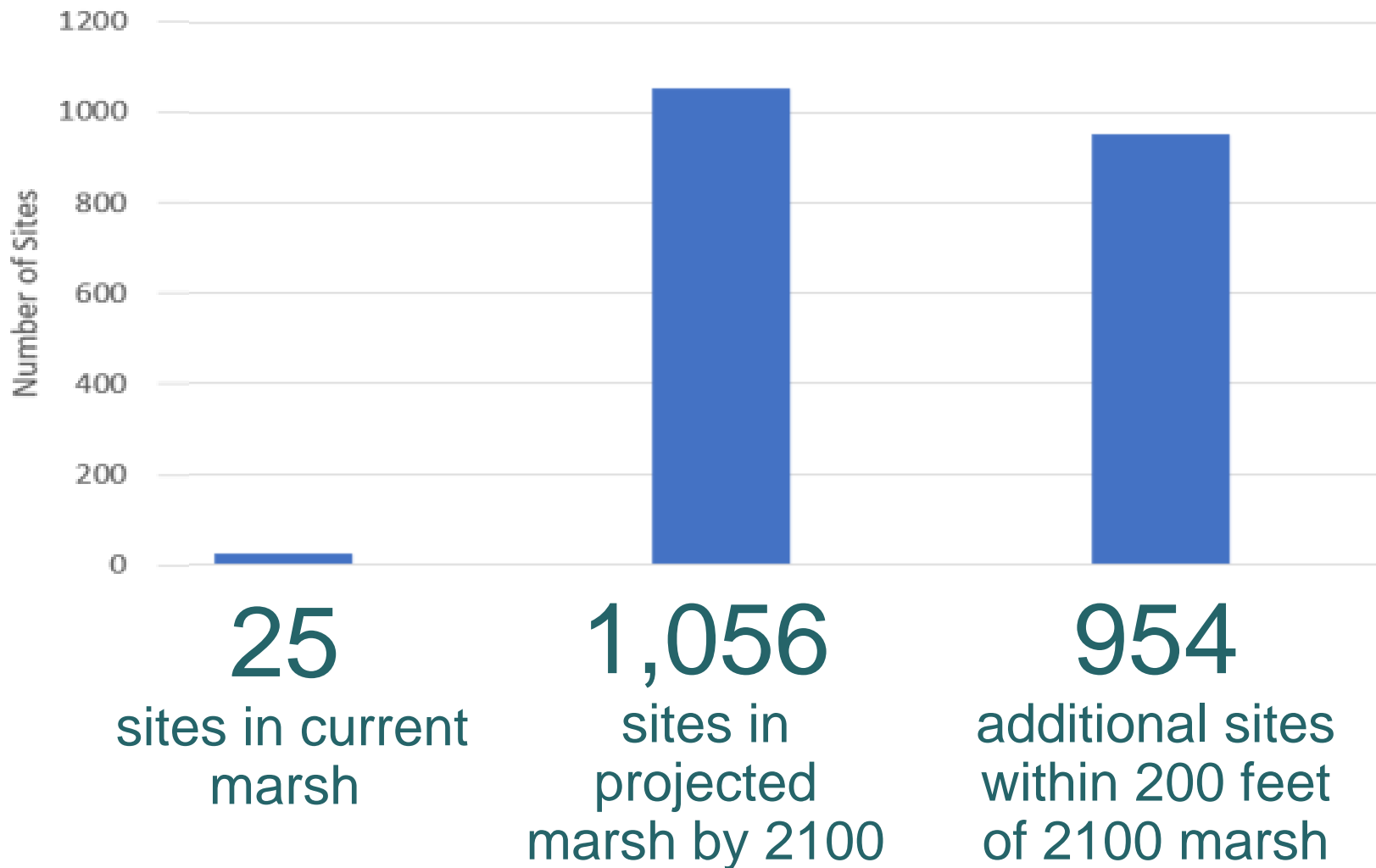
Reilly, T. J., Jones, D. K., Focazio, M. J., Aquino, K. C., Carbo, C. L., Kaufhold, E. E., . . . Schill, W. B. (2015). *Strategy to evaluate persistent contaminant hazards resulting from sea-level rise and storm-derived disturbances—Study design and methodology for station prioritization* (2015-1188A). Retrieved from Reston, VA: <http://pubs.er.usgs.gov/publication/ofr20151188A>

GIS methods

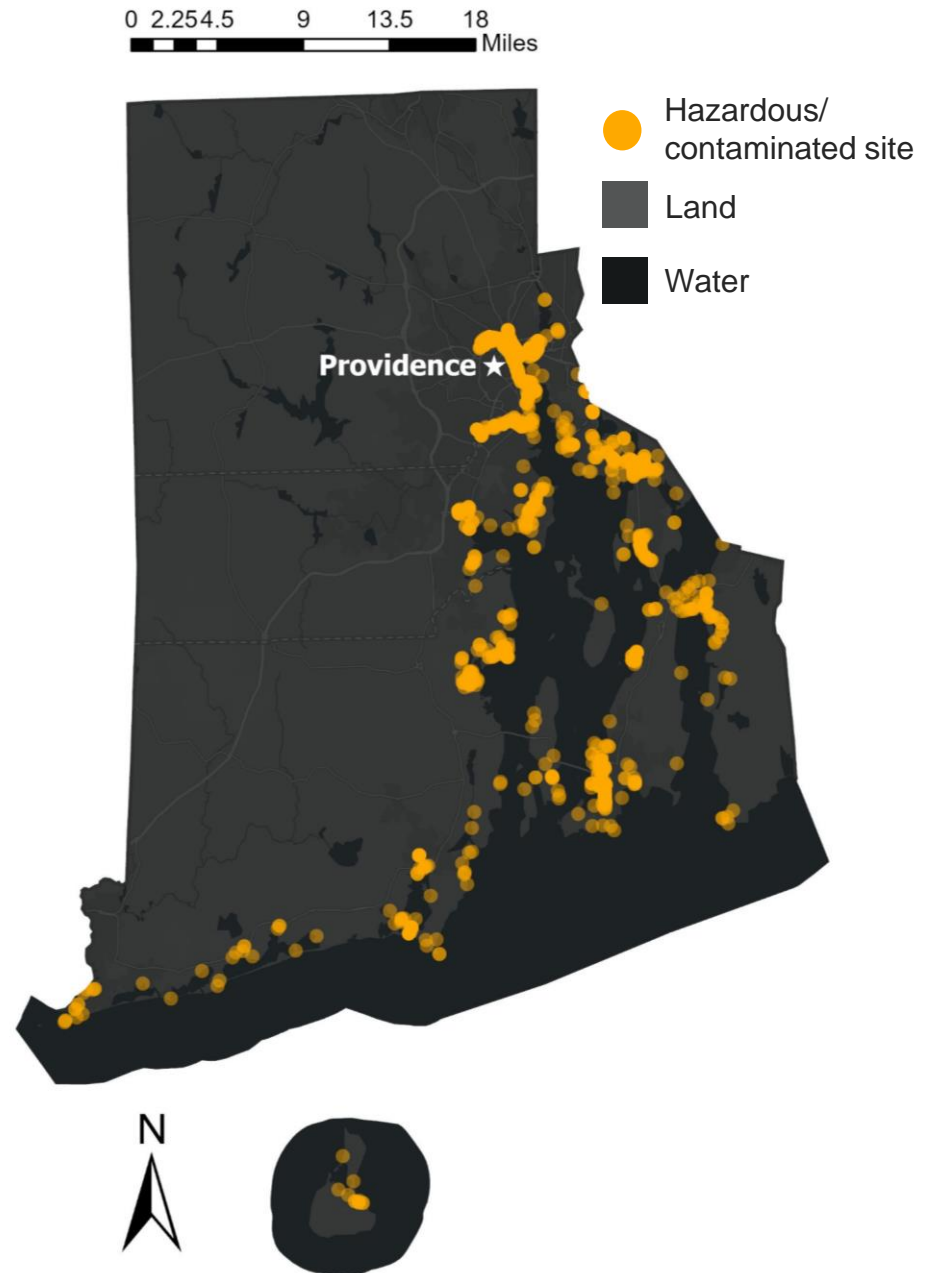
- Overlay SLAMM (2100, 268 cm SLR) with HCS points
- 200 foot buffer
 - Reflects RI's Coastal Resource Management Council (CRMC)'s jurisdiction around coastal features

Results

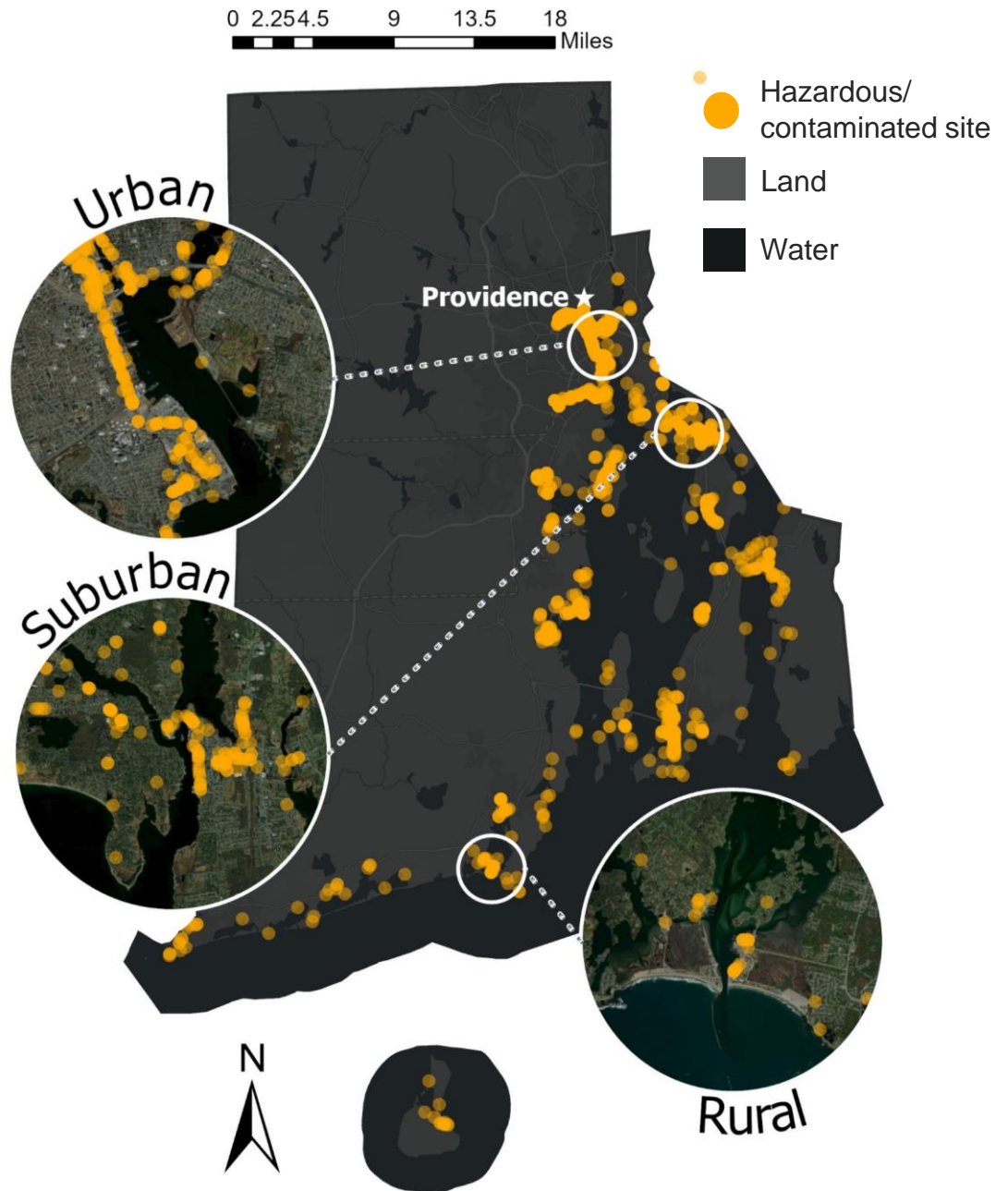
In Rhode Island, HCSs are widespread in and near marsh migration corridors



Density of HCSs varies across Rhode Island



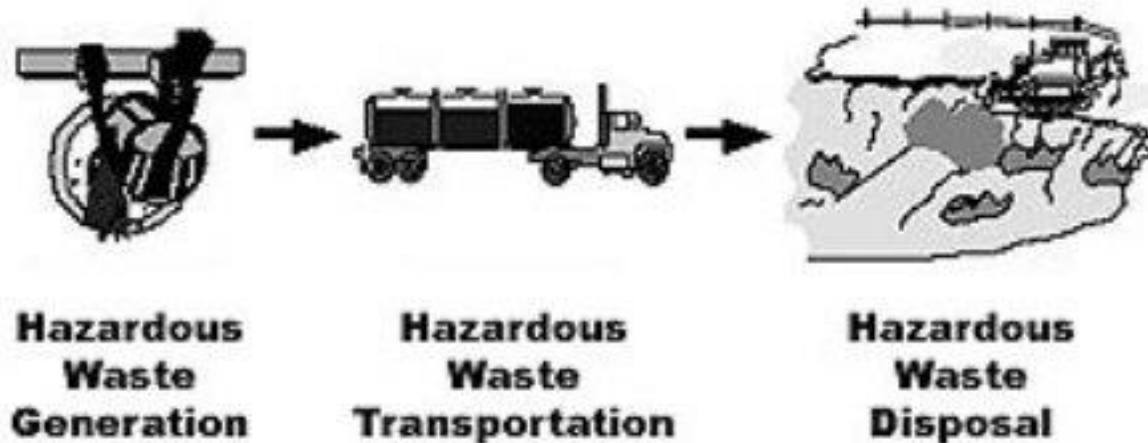
Density of HCSs varies across Rhode Island



Top 5 most common types of hazardous and contaminated sites

1. Resource Conservation and Recovery Act (RCRA)

RCRA's Cradle-to-Grave Hazardous Waste Management System



Top 5 most common types of hazardous and contaminated sites

2. Stormwater outfalls



Top 5 most common types of hazardous and contaminated sites

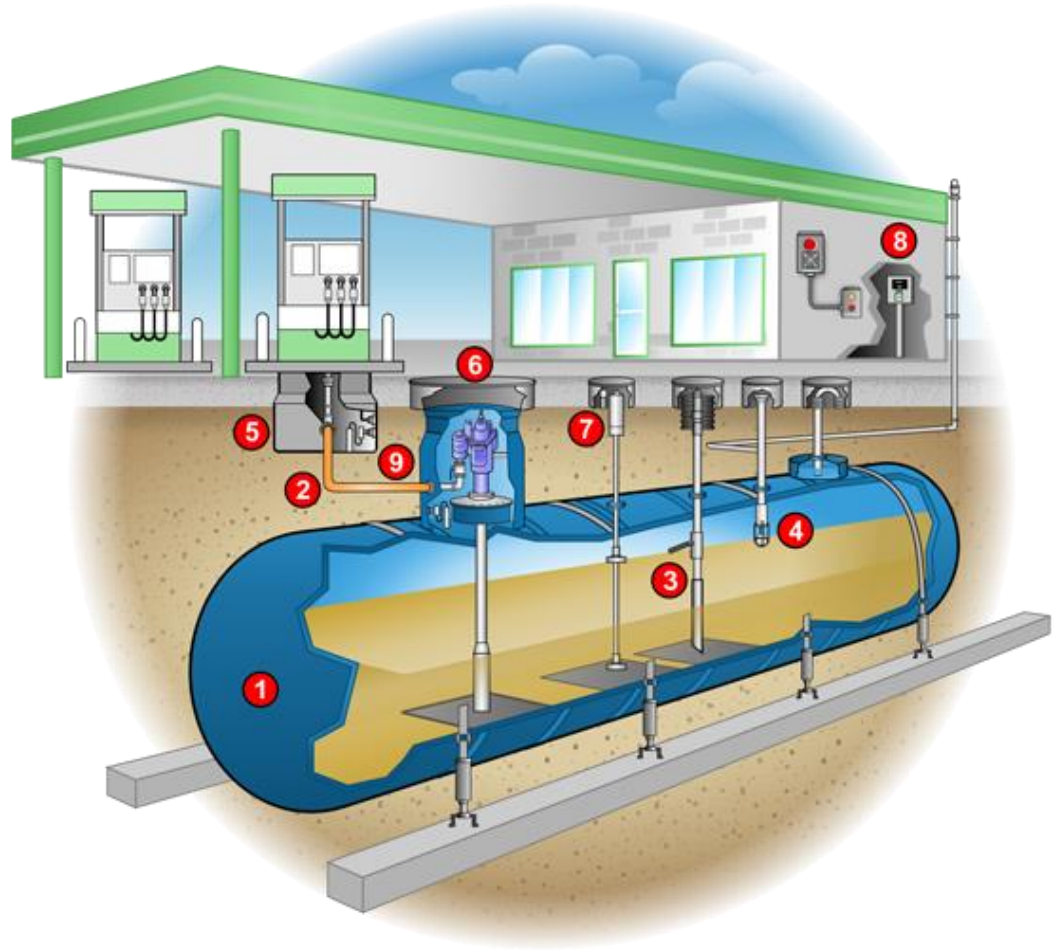
3. National Pollutant Discharge Elimination System (NPDES)



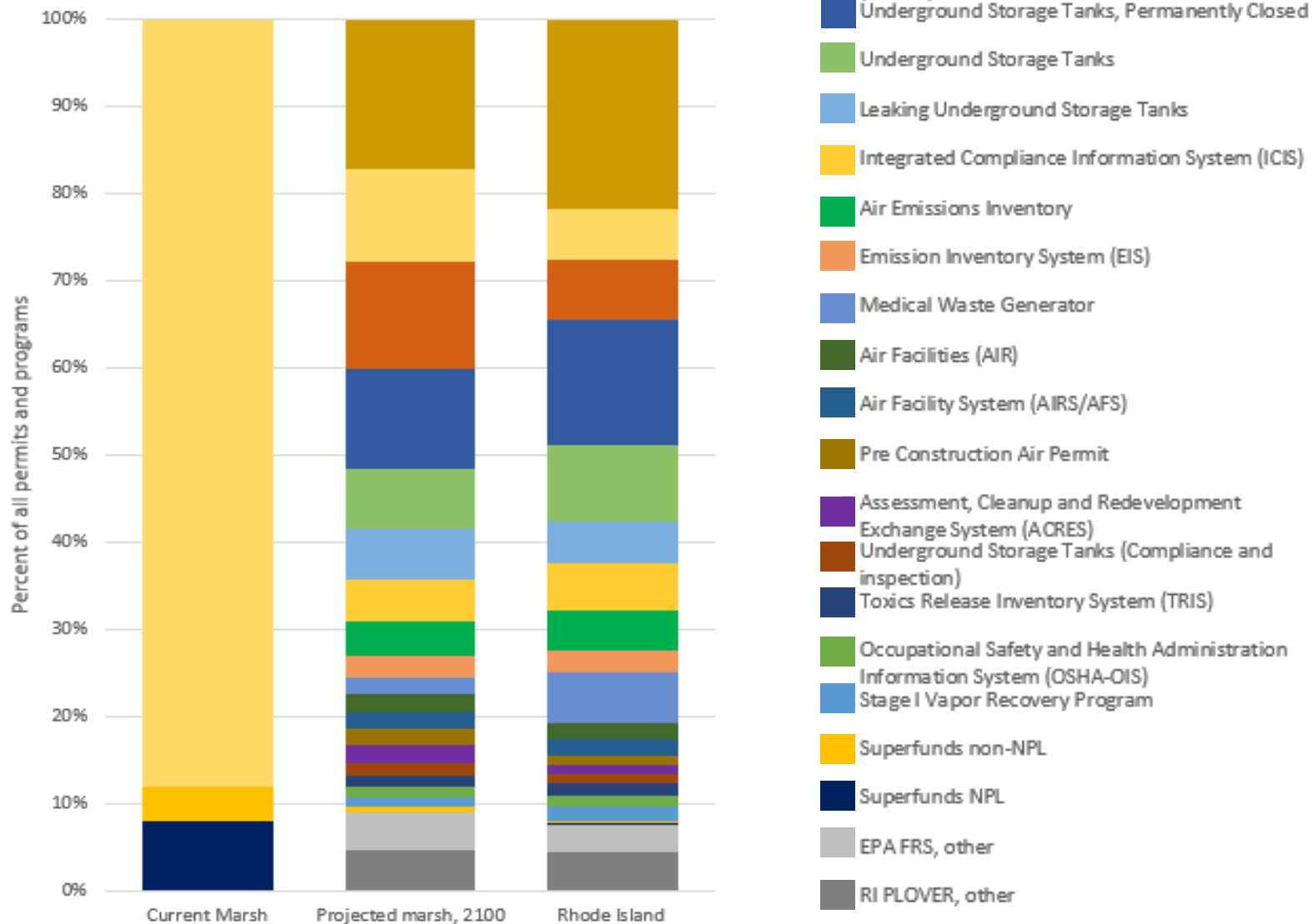
Top 5 most common types of hazardous and contaminated sites

4. Underground storage tanks (closed)

5. Underground storage tanks (open)

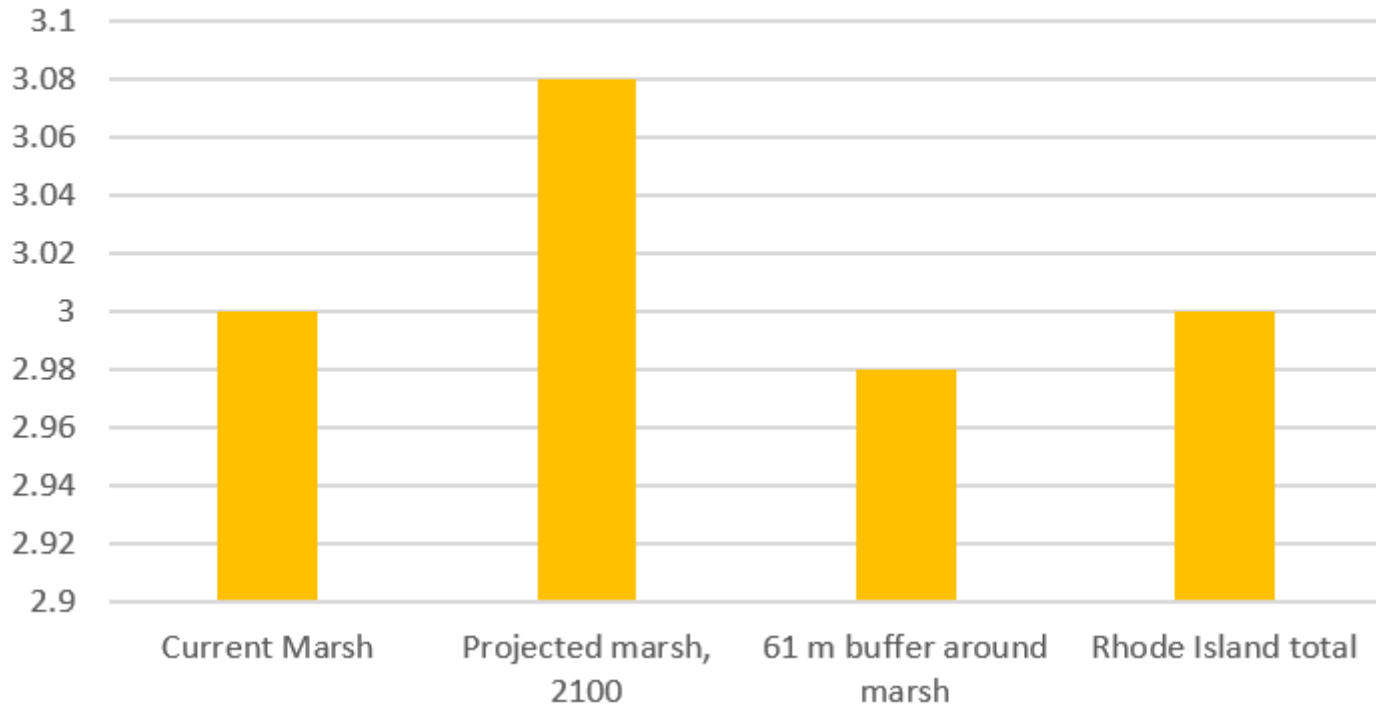


HCS types vary depending on marsh proximity



SCORR

Average SCORR ranking of FRS sites



Consequences of marsh and HCS overlap

- Stormwater outfalls in or near marsh may cause eutrophication, lowered salinity, changes in plant composition, spread of invasive species



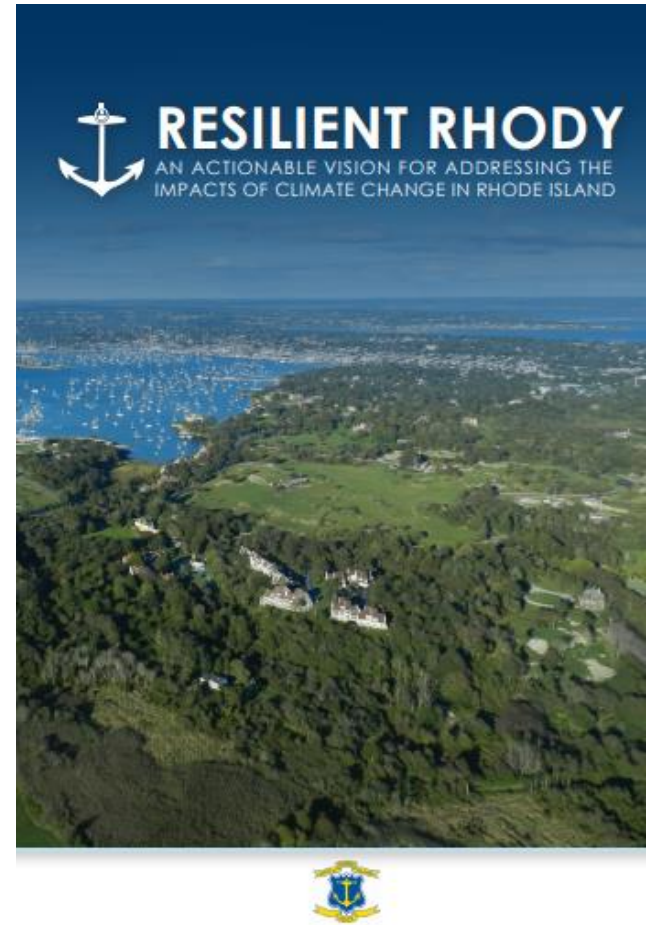
Consequences of marsh and HCS overlap

- Heavily polluted marshes unlikely to be candidates for restoration because contaminated sediment could be re-suspended
- Restoring urban marsh has benefits because of the higher number of recreational use beneficiaries, and may address historic environmental injustices



Resilience Planning & Governance

- Opportunity for collaboration between marsh conservationists and coastal resiliency planners
- Regional coastal resiliency planning considers marsh migration, but could include more about HCSs
- Better publicizing inventories like FRS & ensuring that they are easily used will benefit stakeholders



Next steps

- Identify priority marshes for conservation and/or restoration
- Expand research outside of RI
- Characterize hazards posed by HCSs if inundated by marsh

Thank you!

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Salt marsh against the Providence skyline

The views expressed in this presentation are those of the authors and do not necessarily represent the views or policies of the U.S. Environmental Protection Agency.