COSTEP MA Resilience Symposium for Cultural Institutions

Presentation slide decks

Session 1: Climate Change and Resilience for Cultural Institutions

10:30am - 12:00pm

Presentations in order of appearance:

1. Presentation given by Ben Haavik, Team Leader of Property Care for Historic New England
2. Presentation given by Rodney Rowland, Director of Special Projects and Facilities, Strawbery Banke Museum
3. Presentation given by Matthew Siegal, Chair, Conservation and Collections Management, Museum of Fine Arts, Boston

CLIMATE CHANGE AND RESILIENCE FOR CULTURAL INSTITUTIONS

SEPTEMBER 10, 2019

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WHAT IS RESILIENCE?

Having the capacity to prevent, withstand, respond to, and recover from disruptions.

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Definition from Historic New England

WHAT IS CLIMATE CHANGE?

A change in climate attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

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Definition from the UNFCCC (United Nations Framework Convention on Climate Change)

NEW ENGLAND CLIMATE CHANGE

Temperatures

- Avg temp increasing .5˚ F every decade since 1970
- Avg temp predicted to increase 3-6 degrees by 2050
- Intensify the extremes: Summer hotter; winter colder

Precipitation

- Precipitation avg up five inches between 1895 and 2011
- Projected 1-6 inches more rain by 2050
- Intensify the already intense rainstorms

Sea level

- Risen 1 foot since 1990
- Projected additional 2.5 feet in Boston by 2050
  - 7.6 feet by 2090

Most statistics are from the ***Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP),*** *September 17, 2018*

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IMPACTS TO CULTURAL INSTITUTIONS

Temperatures

- Requires emphasis on climate control for collections and visitors
- Changes in landscape maintenance and species
- Accelerated deterioration of building materials

Precipitation

- Localized and regional flooding
- Accelerated building and landscape damage
- Increased mold
- Increased habitat for pests
- Increased risk to collections

Sea level

- Loss of land/property
- Localized and regional flooding from storm surge
- Potential for damage to lower floors or loss of building
- Moisture and mold issues intensified

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SPEAKERS

Benjamin Haavik

- Team Leader Property Care, Historic New England

Rodney Rowland

- Director of Facilities and Special Projects,
  Strawbery Banke Museum

Matthew Siegal

- Chair, Conservation and Collections Management,
  Museum of Fine Arts

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AGENDA

- **Historic Property Resiliency**
- **Sea Level Rise and Strawbery Banke**
- **Collections-Based Resiliency and Energy Conservation**
- **Discussion**

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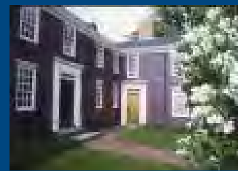
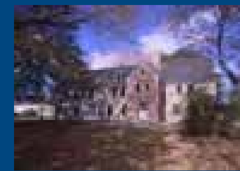
Historic Property Resiliency

Historic New England's approach to climate change and resilience







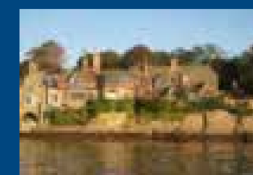
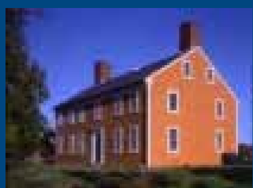




Homes, Farms and Landscapes

- 37 historic sites
- 160 buildings
- 1,284 acres of farmland, fields, forests, and gardens

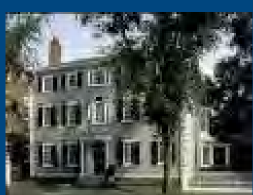
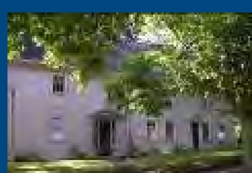


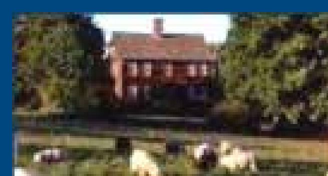
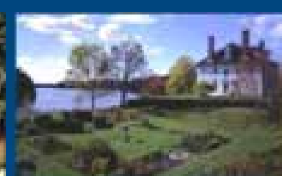
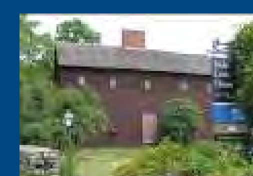




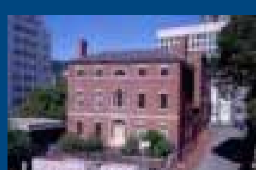




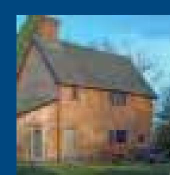


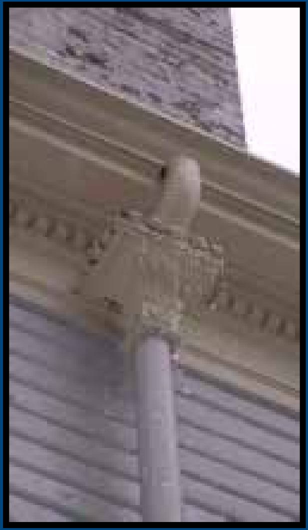







Building and Landscape Preservation and Maintenance

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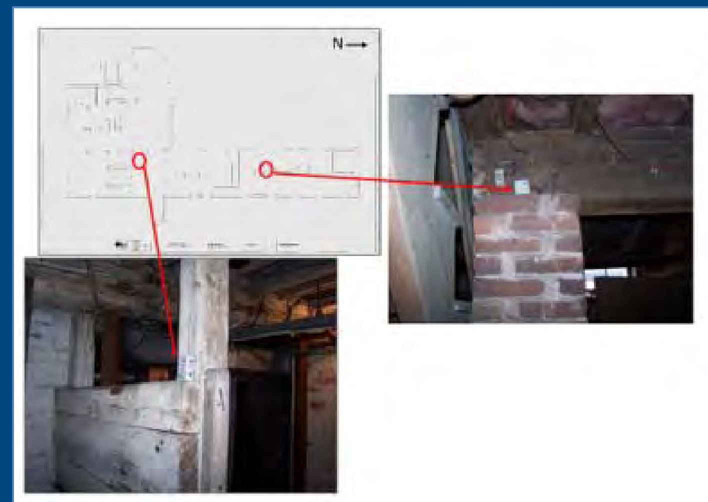
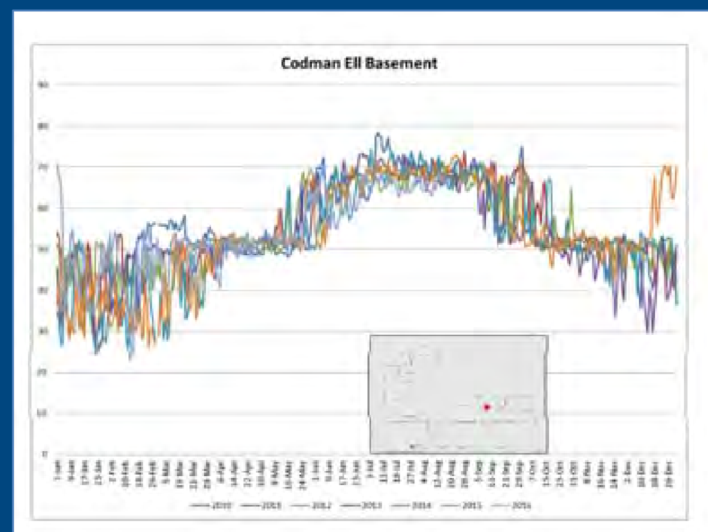
Tree Care

Site Drainage

Environmental Conditions and Energy Efficiency





Integrated Pest Management

Emergency Preparedness

Historic New England Approach

- Emergency Preparedness, Response and Mitigation
- Maintenance
- Tree Care
- Exterior Envelope
  - Roof Replacements
  - Gutter Systems
  - Cladding and Windows
- Site Drainage
- Basement Moisture Mitigation
- Relative Humidity (RH) Mitigation
- Energy Efficiency and Weatherization
- Surge Suppression and Stand by Generators

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Resiliency and Climate Change Framework

- Emergency Preparedness, Response and Mitigation
- Maintenance
- Tree Care
- Exterior Envelope
  - Roof Replacements
  - Gutter Systems
  - Cladding and Windows
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Planning Process

- Determine your focus
- Determine risks and vulnerabilities
- Identify and select options address risks and vulnerabilities
- Formulate an implementation plan
- Implement
- Assess results

Maine Gutter Analysis Project (2018)

- Are our gutters good enough for today's rainstorms?
- Will they be sufficient for future, more intense rainstorms?
- Where are the failure points?

Funding secured from the Maine Historic Preservation Commission and the National Park Service

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Methodology

- Research history of gutters on site
- Review how gutters perform in intense rain storms
- Visit sites and measure gutter components
- Complete mathematical formulas to determine capacity of gutter components

Many thanks to Margaret Gaertner of Historic Building Consultants and Historic New England staff for their work on this project.

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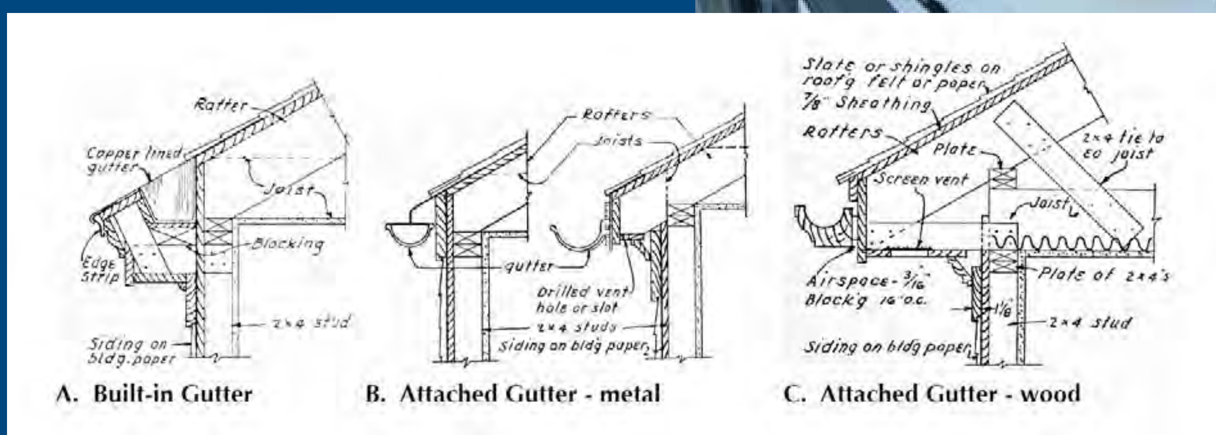
Primary Metric

- Ten-year storm
- Hundred-year storm

Recurrence intervals[4] and probabilities of occurrences[5]		
Recurrence interval, in years	Probability of occurrence in any given year	Percent chance of occurrence in any given year
100	1 in 100	1
50	1 in 50	2
25	1 in 25	4
10	1 in 10	10
5	1 in 5	20
2	1 in 2	50

Primary Data Point

- 9 sites in Maine
- 21 roof drainage systems



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Maine Gutter Analysis Project

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Gutter Performance

- Ten-Year Storm: 48% of the gutters failed
  - Eight of nine wooden gutters failed

- Hundred-Year Storm: 76% gutters failed
  - Nine of nine wooden gutters failed.

Maine Gutter Analysis Project

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Downspout Performance

- All of the downspouts in the study carried the water regardless of storm intensity.

Maine Gutter Analysis Project

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Outlet Performance

- Basically 50% failed both calculations
  - Outlets under two inches of diameter failed every time

What did we learn?

- “Historic” gutter systems will fail in intense rain storms
  - “Modern” systems aren’t that great either
- Design guidelines have outdated weather data
- “Replace in kind” is problematic for climate change mitigation
- New design standards need to be considered

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Next Steps with Gutters

- Pay attention to gutters!!!!
- Think about sizing when planning a project
- Consider changes in preservation approach
  - in kind replacement may not be effective
- It’s not all or nothing

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Middlebury College Partnership

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Middlebury College Partnership

- Year I: Define the climate change issues facing historic sites
- Year II: Focus on four Newbury, MA properties
  - Gutter analysis
  - Sea level rise
  - Vegetation Management

Newbury Gutters

- Findings from Maine study repeated themselves

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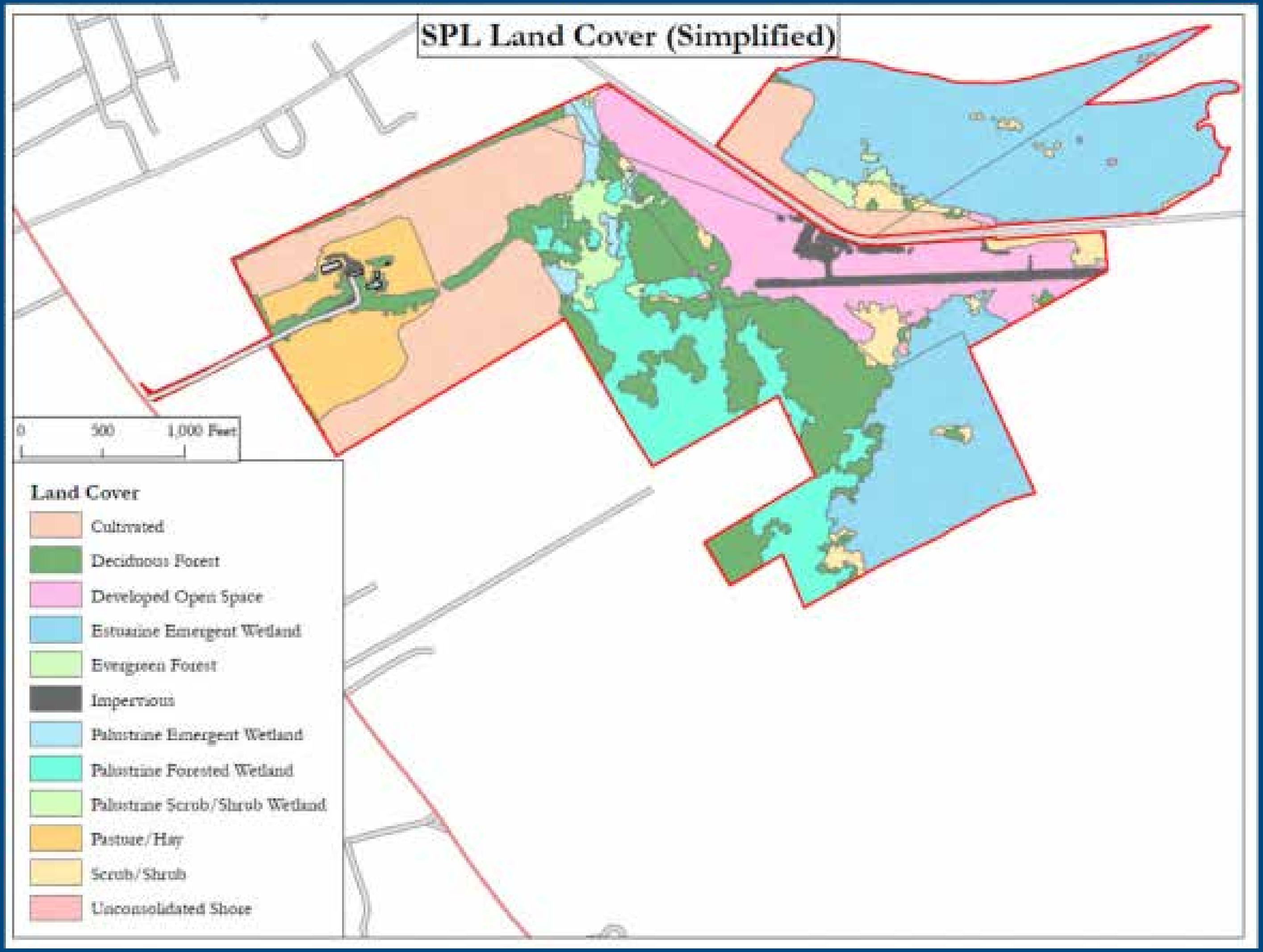
Sea Level Rise



Spencer-Peirce-Little Farm

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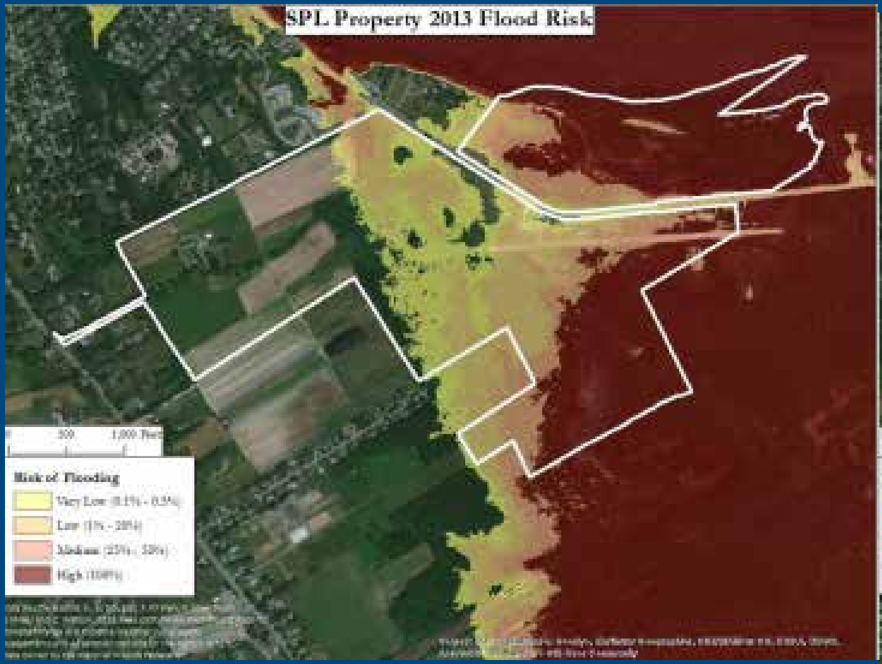
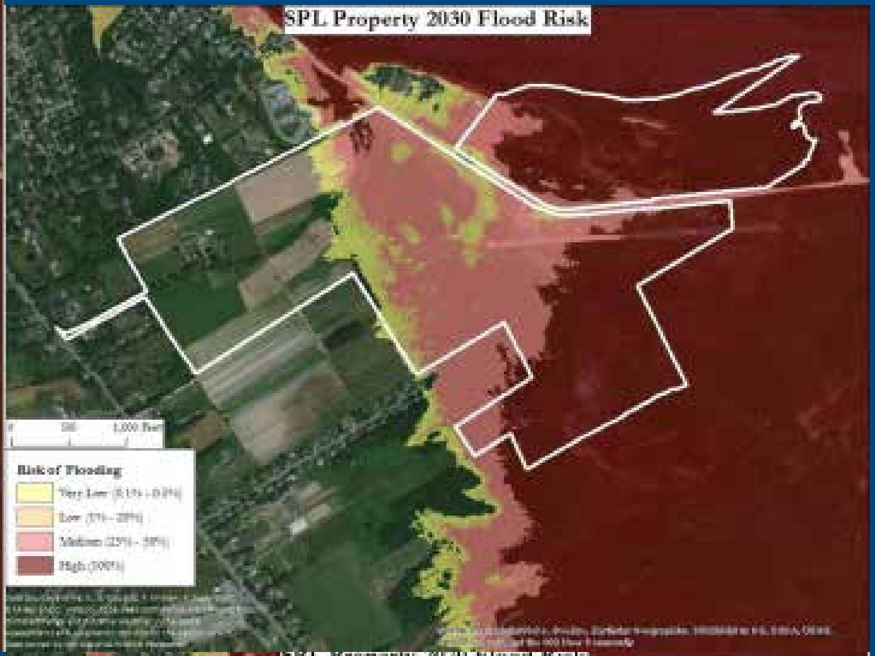
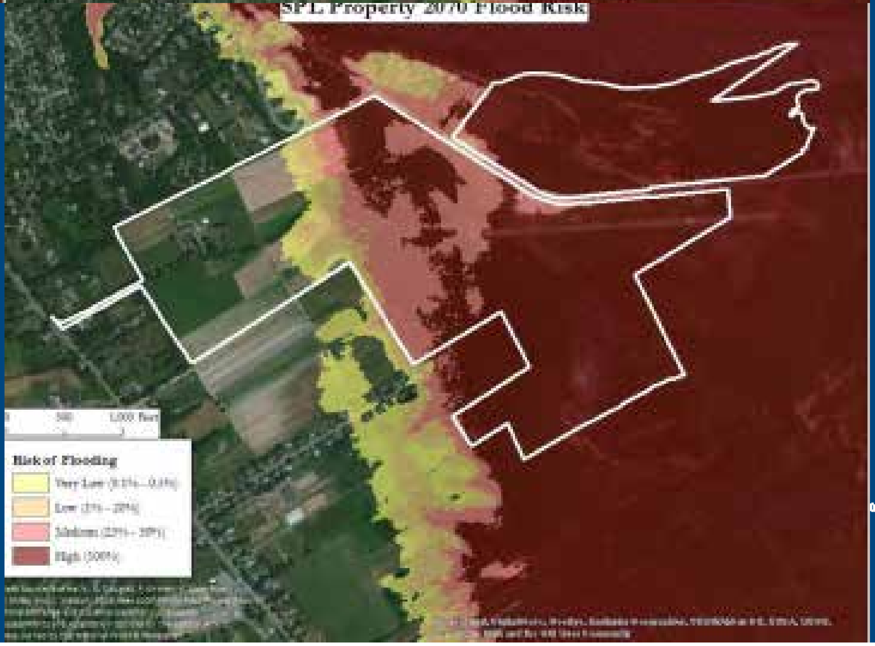
Sea Level Rise



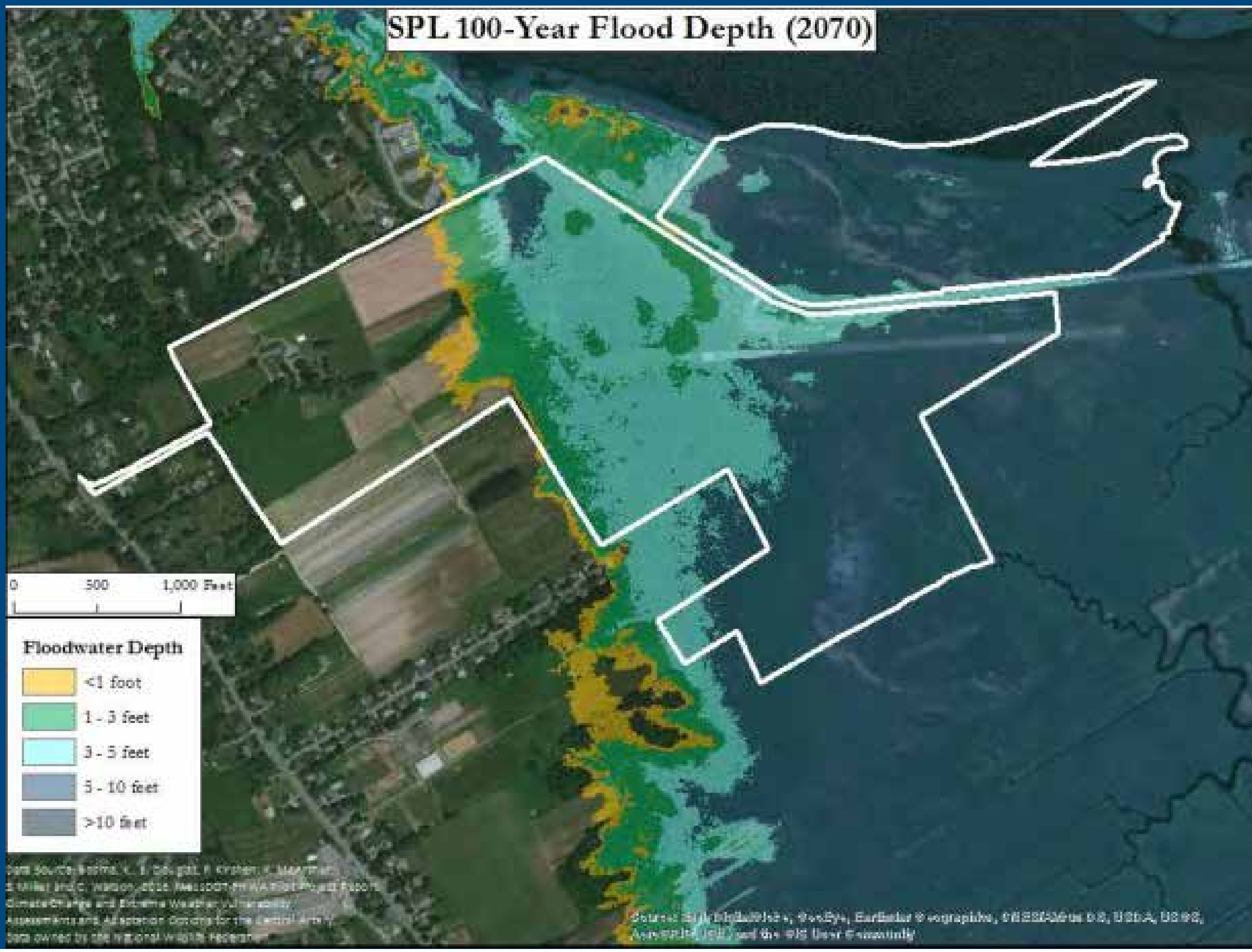


Spencer-Peirce-Little Farm



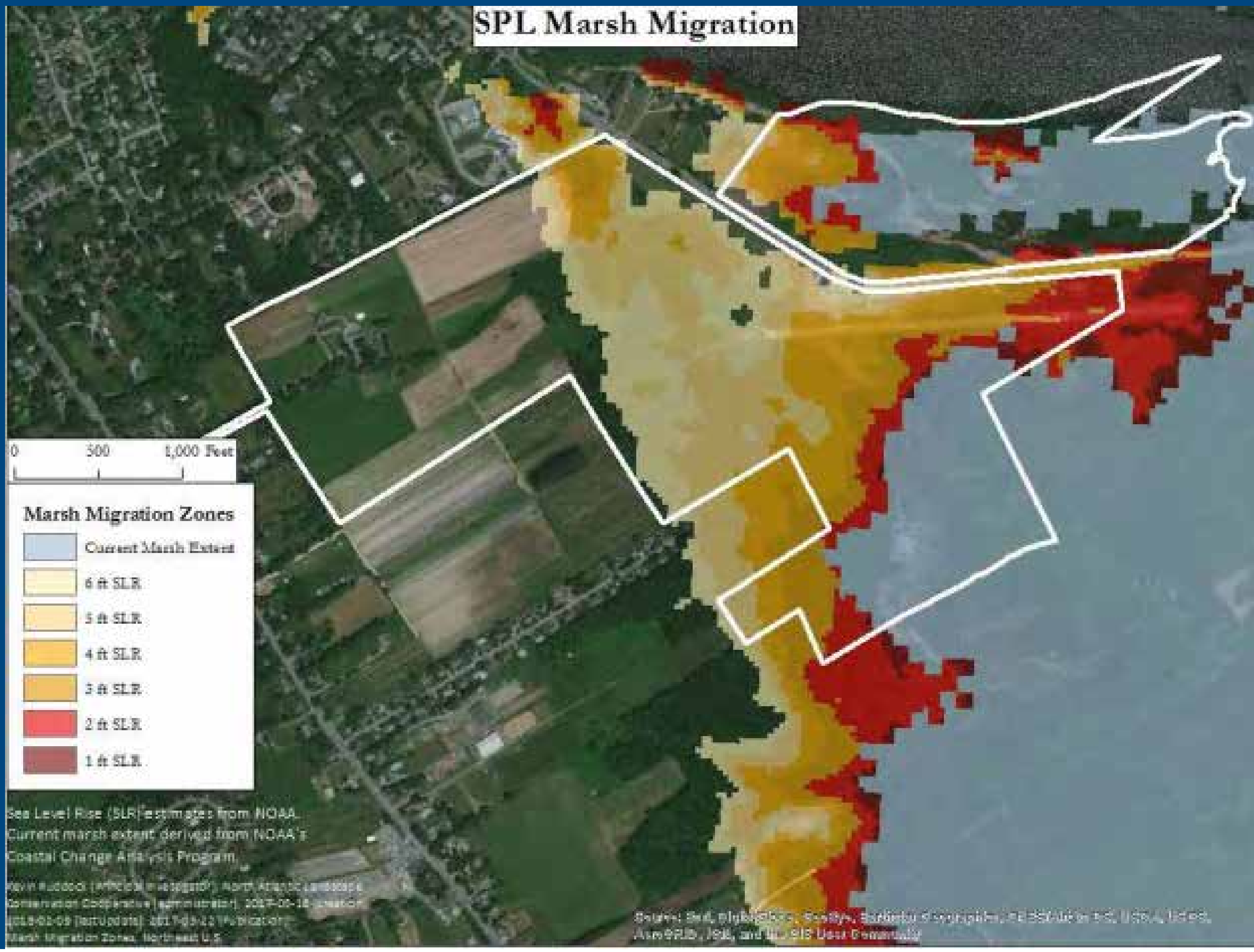
SPL Flood Depth Maps

- Represent depth of flood waters for a 100-year flood (1% probability)



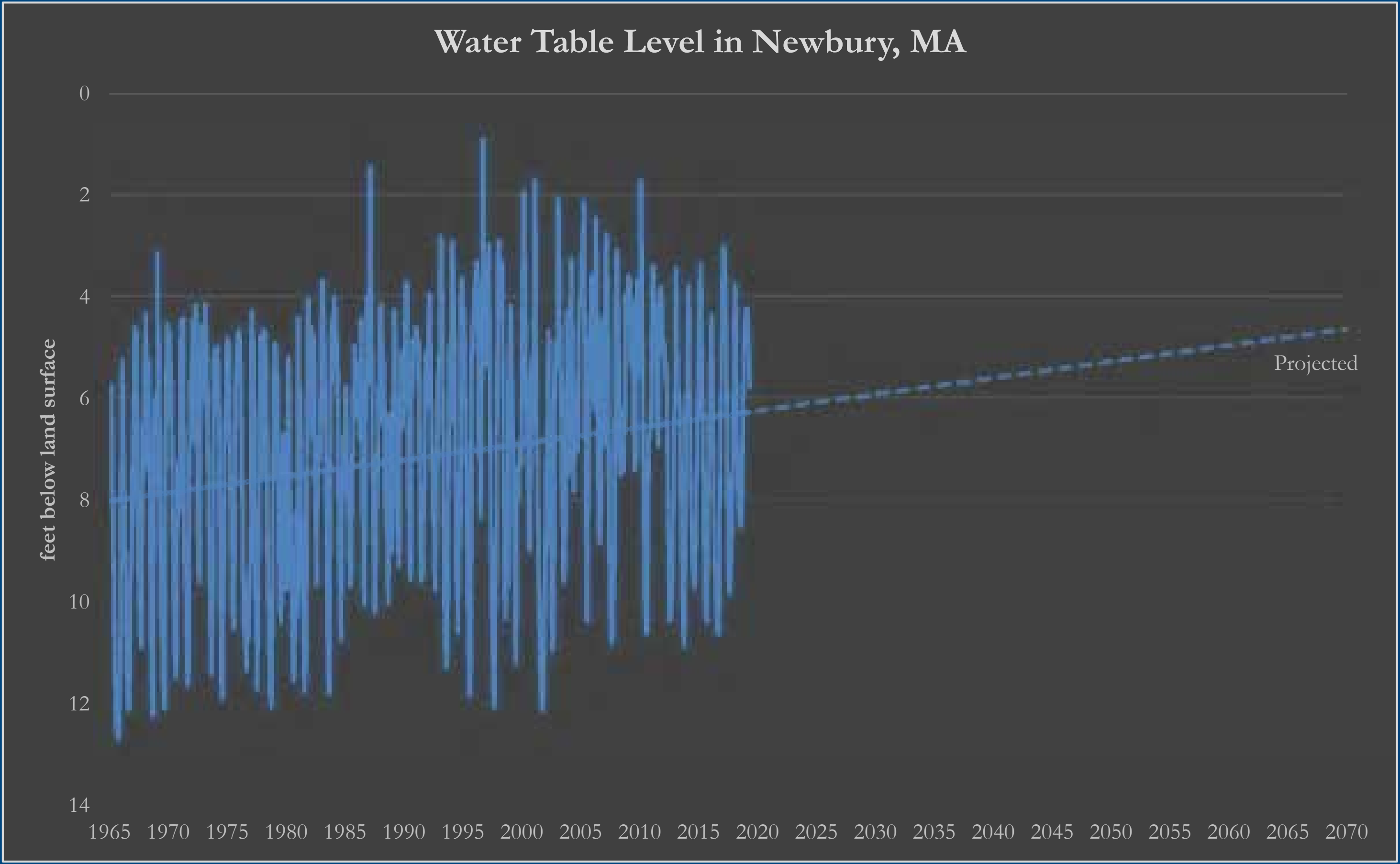
SPL Marsh Migration

- SLR will alter salt marsh habitat, moving it upland



Water Table Rise

- Rising water tables could threaten buildings, drainage and septic systems



Vegetation Management

- Changing phenology
  - Warmer and shorter winters
  - Higher summer temps
  - Longer periods of drought, but also heavier rain saturation
  - Changes in timing of migration and growing season

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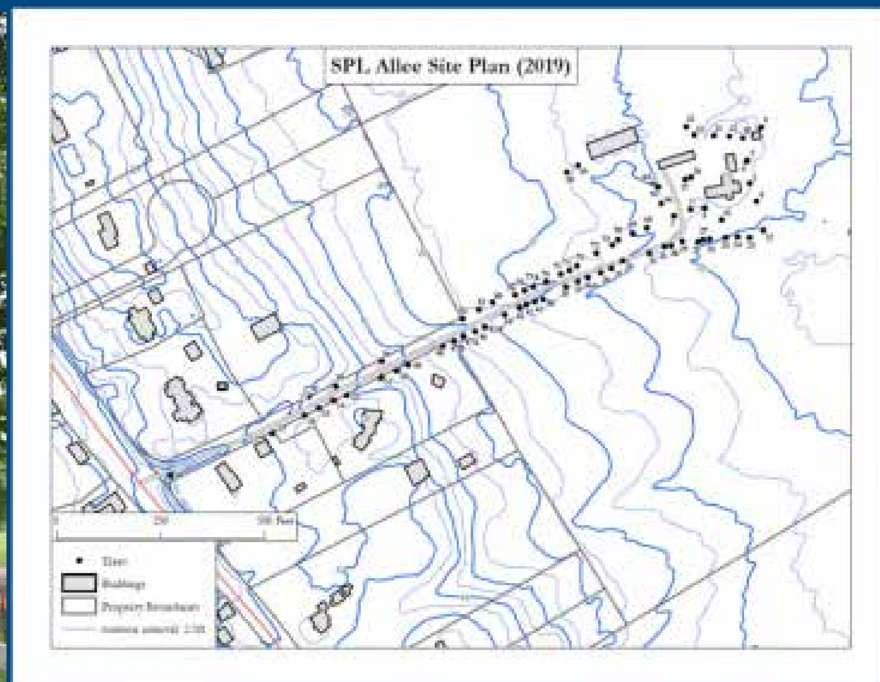
Threats and Dangers of Invasive Plants

- Ability to move and inhabit new areas of land
  - Changes in the environment
- Take food and resources away from native species
  - Lack of predators
- Out-compete and dominate over the native plants
  - Reproduce quickly and spread widely
- Change the ecosystem
- Reduce the biodiversity level
- Loss of habitat

Spencer-Peirce-Little Farm



Next Steps

- Integrate gutter changes in every project
- Funding for marsh related planning
- Funding for rain garden development
- New Climate Change Framework integration
  - Tree and plant species
  - Water table data
  - Infrastructure development

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