Historical Context of the Tier 1 Submerged Aquatic Vegetation Mapping Efforts in Narragansett Bay, RI

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Where is Narragansett Bay?

1,705 square mile watershed between RI and MA

*~96 watersheds can fit in CA

*Actual name is Rhode Island and Providence Plantations. It doesn’t fit on the license plate 😊

- 196 square mile bay; 95% in RI
- 560 miles of shoreline
- >40 islands
Ecologically Important Habitat

- Aquatic vascular flowering plants
- Stabilize sediments; provide nurseries and habitat

SAV good for: bay scallops, flounder, striped bass, tautog, etc.

Threats

- Eutrophication – nutrients & clarity
- Rising water temperatures
- Rising sea levels

Require good water quality; Therefore indicator of ecosystem health
Seagrass = Important Indicator
RI Eelgrass Mapping Taskforce

- 2006 – Multi-agency group formed
  - Establish methods
  - Coordinates field work (including photography)

- 2009 – released recommended methods – 3 Tiers
  - Tier 1 – aerial photography
  - Tier 2/3 – more detailed studies at specific sites
Photography and Ground-truthing methods

• Second Tier 1 effort to include all RI Coastal waters

• Aerial photography collected on June 15, 26 2016 (Finkbeiner et al., 2001)

• Received ortho product September, 2016

• Goals

  1. Comprehensive survey
  2. Change analysis
  3. Trends analysis
Field Survey Methods

• Underwater video camera observations
• Each survey was location was recorded using GPS enabled tablet and receiver (+/- 1 m)
• We generally followed the Taskforce strategy for collecting video data
Results and Change Analysis

Things to remember:

- Based on Bradley et al. (2017)
- Only account for areas highlighted
- Focused on immediate change here

<table>
<thead>
<tr>
<th>Location</th>
<th>2012 (acres)</th>
<th>2016 (acres)</th>
<th>%change (2012-2016)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narragansett Bay</td>
<td>422</td>
<td>389</td>
<td>-8%</td>
</tr>
<tr>
<td>Coastal Ponds</td>
<td>522</td>
<td>442</td>
<td>-15%</td>
</tr>
<tr>
<td>RI Sound</td>
<td>104</td>
<td>108</td>
<td>+4%</td>
</tr>
<tr>
<td>Little Narragansett Bay</td>
<td>127</td>
<td>96</td>
<td>-24%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1,175</strong></td>
<td><strong>1,035</strong></td>
<td><strong>-12%</strong></td>
</tr>
</tbody>
</table>

*Sites with the most eelgrass:*

- Ninigret Pond (201 acres)
- Jamestown (187 acres)

%change = \[(2016 acres – 2012 acres) / (2012 acres)\] x 100
**Trends Analysis**

Tier 1 Surveys of Narragansett Bay waters  
(not including Coastal Ponds or Little Narragansett Bay)

<table>
<thead>
<tr>
<th>Year</th>
<th>Authors</th>
<th>Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>NBEP; NRAG</td>
<td>Huber 1999</td>
</tr>
<tr>
<td>2006</td>
<td>RI Eelgrass Mapping Taskforce</td>
<td>Bradley et al. 2007</td>
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</tbody>
</table>

NRAG = Natural Resources Assessment Group, UMass-Amherst
Trends Analysis

**Little Narragansett Bay**
- Green bars = USFW data sets
- Turquoise bar = NBEP;NRAG data set
- -27% 2006-2016

**Coastal Ponds**
- +27% 1999-2006
- -27% 2006-2016

**Rhode Island Sound**
- Turquoise bar = NBEP;NRAG data set
Trends Analysis

Prudence Island

1996-2012

+311%

-5%

Blue-green bar = NBEP;NRAG data set

Jamestown

+34%

-17%

Acreage


Historical Analysis

Based on Kopp et al. 1995 and Doherty 1995

Geo-referenced maps; SAV beds digitized*

<table>
<thead>
<tr>
<th>Year</th>
<th>Acreage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>2,675</td>
</tr>
<tr>
<td>1940</td>
<td>565</td>
</tr>
<tr>
<td>1980</td>
<td>1,139</td>
</tr>
</tbody>
</table>

*What about the oral histories or literature/herbarium?

Used Presence/Absence to look at extent

since 2006, we’ve had a stable bed of widgeon grass in Greenwich Bay
New Nautical Chart

1776 Des Barres Map

Eelgrass?
Graph: Cicchetti et al (In Prep); Eelgrass acreage derived from Doherty, 1995
Recovery post wasting disease and Hurricane '38

Seagrass Extent

TN (All Bay)

TN (3 Big WWTFs)
Summary and Conclusions

• 2016 maps indicate a ~12% decline in seagrass from 2012; increase from earlier mapping efforts (1996 and 2006)

• Historical maps and data are valuable to assess trends - baselines

• However, they are inherently flawed and probably are an under-representation of the total acreage

• Continue and expand the monitoring efforts

• Future considerations?
  • Reduce TN = more seagrass?
  • Increasing water temperatures
  • Changes to fresh/salt water balance changing key species of seagrass
Acknowledgements

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Historic Presence of Submerged Aquatic Vegetation (SAV) from 1840-1899

Legend
- SAV Present 1840-1899
- Narragansett Bay Estuarine Waters
Trends Analysis - Results

**Narragansett Bay**

![Bar chart showing trends from 2006 to 2016.]

**Jamestown**

![Bar chart showing trends from 2006 to 2016.]

**Prudence**

![Bar chart showing trends from 1995 to 2016.]

**Rhode Island Sound**

![Bar chart showing trends from 2006 to 2016.]

[Map insert showing geographic locations.]