The 2013 State of Our Estuaries
Acknowledgements
This 2013 Indictors Report

1,000,000+ individual data points, compiled in
250 tables and graphs, then grouped into
22 indicators, and summarized in
1 report

Why 22 Indicators in this 2013 report?

Multiple products to answer different questions

• State of Our Estuaries Report
• Technical Report; all of the data, analysis, and methods
• Policy Guide for Municipal Leaders and Legislators
• Citizens Guide
What Has Been Observed?
Environmental Indicators For This Report

**Pressure Indicators**
Pressure indicators measure key human stresses on our estuaries

**Condition Indicators**
Condition indicators monitor the current conditions in our estuaries

**Response Indicators**
Response indicators track what we are doing to restore our estuaries
Pressure Indicators
Pressure Indicators measure key human stresses on our estuaries
Impervious Cover

**FIGURE 1.1** Percent of land area covered by impervious surfaces in the Piscataqua Region watershed, 1990-2010

- 1,840 acres of impervious surfaces added each year

Data Source: UNH Complex Systems Research Center
Impervious Cover

FIGURE 1.2 Impervious surface cover in Piscataqua Region subwatersheds
**Figure 2.2** Trends in nitrogen loads and precipitation, 2003-2011

- **Nutrient Load**
  
  Load estimates from 2003-2008 are from NHDES (2010)
Nutrient Load

Total Nitrogen
1,225 tons/yr

Dissolved Inorganic Nitrogen
597 tons/yr

Total Nitrogen Loads to the Great Bay Estuary from Different Sources in 2009–2011 (Total: 1,225 tons/yr)

- Sewer Treatment Plants 32%
- Other Watershed Sources (e.g., fertilizer, septic systems, animal waste, atmospheric pollution) 68%

Dissolved Inorganic Nitrogen Loads to the Great Bay Estuary from Different Sources in 2009-2011 (Total: 597 tons/yr)

- Sewer Treatment Plants 52%
- Other Watershed Sources (e.g., fertilizer, septic systems, animal waste, atmospheric pollution) 48%
Condition Indicators
Condition indicators monitor the current conditions in our estuaries
**Nutrient Concentration**

**FIGURE 3.2** Dissolved inorganic nitrogen concentration trends at Adams Point in the Great Bay Estuary

- **Concentration (mg/L)**
- **Year**

- Average and Standard Deviation for Years with Complete Data
- Average for Years with Incomplete Data
- Trend for Years with Complete Data

New data since last report

Years with samples in 10 or more months are considered to have complete data.

Data Source: UNH Jackson Estuarine Laboratory
Microalgae

**FIGURE 4.1** Chlorophyll-α trends at Adams Point in the Great Bay Estuary

![Graph showing chlorophyll-α trends over time](image)

- Average and Standard Deviation for Years with Complete Data
- Average for Years with Incomplete Data

Years with samples in 10 or more months are considered to have complete data.

Data Source: UNH Jackson Estuarine Laboratory
Macroalgae

**FIGURE 4.2** Macroalgae percent cover at the Lubberland Creek site in Great Bay in 1979-1980 and 2008-2010

From Hardwick-Witman and Mathieson (1983)  
From Nettleton et al. (2011)
Dissolved Oxygen

**FIGURE 5.3** Number of days during summer months of each year when datasondes measured violations of state standards for dissolved oxygen (less than 5 mg/L)

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**Great Bay**

**Lamprey River**

Data Source: UNH Jackson Estuarine Laboratory
Eelgrass

FIGURE 6.1 Eelgrass Cover in the Great Bay Estuary

PREP Goal = 2,900 acres

Wasting disease years (1988-89)

Year

Entire Great Bay Estuary (all years when fully mapped)  Great Bay Proper

Data Source: UNH Seagrass Ecology Laboratory
Suspended Sediments

Figure 7.1: Suspended sediment trends at Adams Point in the Great Bay Estuary.

The graph shows the concentration of suspended sediments from 1970 to 2015. The data points indicate the average and standard deviation for years with complete data, the average for years with incomplete data, and the trend for years with complete data. The graph also notes new data since the last report and highlights years with samples in 10 or more months as having complete data.
Bacteria Pollution

**FIGURE 8.1** Fecal coliform bacteria concentrations at low tide during dry weather at Adams Point in Great Bay

![Graph showing fecal coliform bacteria concentrations at low tide during dry weather at Adams Point in Great Bay.](image)

Source: UNH Jackson Estuarine Laboratory

**FIGURE 9.1** Shellfish harvest classifications for Piscataqua Region estuaries, 2011

- ME waters closed all year 22%
- NH waters open for at least part of the year 36%
- NH waters closed all year 42%
- ME waters open for at least part of the year 0%

Data Source: NH Dept. of Environmental Services and Maine Dept. of Marine Resources

**FIGURE 10.2** Advisories at tidal beaches in the Piscataqua Region, 2003-2011

![Graph showing advisories at tidal beaches in the Piscataqua Region, 2003-2011.](image)

Data Source: NH Dept. of Environmental Services and Maine Dept. of Environmental Protection
Toxic Contaminants

**FIGURE 11.2** Total PCBs in Mussel Tissue in Portsmouth Harbor

Data Source: NH Gulfwatch Program

**FIGURE 11.3** Lead in Mussel Tissue at Dover Point

Data Source: NH Gulfwatch Program

**FIGURE 11.4** Total DDT Pesticides in Mussel Tissue in Hampton-Seabrook Harbor

Data Source: NH Gulfwatch Program
Oysters

FIGURE 12.2 Number of adult oysters* in major Piscataqua Region beds

* Shell height greater than 80 mm

Data Source: NH Fish and Game Department
FIGURE 13.2 Number of adult clams* in Hampton-Seabrook Harbor and recreational clam harvest license sales

*Shell length greater than 50 mm

Data Source: NextEra Energy Seabrook Station and NH Fish and Game Department
FIGURE 14.1 Returns of river herring to fish ladders in the Great Bay Estuary

Data Source: NH Fish and Game Department
Response Indicators
Response indicators track what we are doing to restore our estuaries
FIGURE 16.1 Conservation lands in the Piscataqua Region watershed

<table>
<thead>
<tr>
<th>Year</th>
<th>Acres</th>
</tr>
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<tbody>
<tr>
<td>2008</td>
<td>60,000</td>
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<tr>
<td>2011</td>
<td>100,000</td>
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</tbody>
</table>

PREP Goal for 2020

Data Source: NH GRANIT & Wells National Estuarine Research Reserve

FIGURE 16.2 Percent Conservation Lands

Response Indicators
Conservation of Priority Areas

**FIGURE 17.1** Percent of core priority areas in the Piscataqua Region that are conserved in their natural state

- **Conserved** 28%
- **Not Conserved** 72%

Data Source: NH GRANT and Wells National Estuarine Research Reserve

**FIGURE 17.2** Percent of each Core Priority Area in the Piscataqua Region that is conserved in its natural state

Legend:
- < 10%
- 10 - 25%
- 25 - 50%
- > 50%
- PREP Watershed
- PREP Towns
- MA
- ME
- NH

NH GRANT & Wells National Estuarine Research Reserve
Restoration

**FIGURE 18.1** Cumulative acres of oyster restoration projects, 2000-2011

<table>
<thead>
<tr>
<th>Year</th>
<th>Acres</th>
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<tbody>
<tr>
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<td>2002</td>
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<td>2003</td>
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<td>2004</td>
<td>1.68</td>
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<td>2005</td>
<td>3.28</td>
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<td>2006</td>
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<td>2007</td>
<td>6.58</td>
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<td>2008</td>
<td>6.58</td>
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<tr>
<td>2009</td>
<td>7.78</td>
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<tr>
<td>2010</td>
<td>9.78</td>
</tr>
<tr>
<td>2011</td>
<td>12.3</td>
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Goal - 20 acres

**FIGURE 20.2** Upstream river miles re-connected for migratory herring on the mainstems of major rivers

<table>
<thead>
<tr>
<th>Year</th>
<th>River Miles</th>
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<tbody>
<tr>
<td>2010</td>
<td>40.75</td>
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<tr>
<td>2011</td>
<td>48.55</td>
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Long Term Goal - 115 miles

2020 Goal - 58 miles

**FIGURE 15.1** Cumulative acres of salt marsh restoration and enhancement projects, 2000-2011

<table>
<thead>
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<th>Year</th>
<th>Acres</th>
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</thead>
<tbody>
<tr>
<td>2000</td>
<td>0</td>
</tr>
<tr>
<td>2001</td>
<td>10</td>
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<tr>
<td>2002</td>
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<td>90</td>
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<td>2010</td>
<td>100</td>
</tr>
<tr>
<td>2011</td>
<td>110</td>
</tr>
</tbody>
</table>

Goal - 300 acres

**FIGURE 19.1** Cumulative acres of eelgrass restoration 2000-2011

<table>
<thead>
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<th>Year</th>
<th>Acres</th>
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</thead>
<tbody>
<tr>
<td>2010</td>
<td>10</td>
</tr>
<tr>
<td>2011</td>
<td>7.8</td>
</tr>
</tbody>
</table>

Goal - 50 Acres

**FIGURE 18.1** Cumulative acres of oyster restoration projects, 2000-2011

- **Completed 2000-2011**

- **Cumulative Connected River Miles**
- **Re-connected Miles During Year**
Summary

9 environmental indicators are negative
6 environmental indicators are cautionary
7 environmental indicators are positive

Stresses impacting the health of our estuaries are increasing, and there is reason to be concerned.