The Condition of Casco Bay and Its Watershed (2010 State of the Bay Presentation)

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Casco Bay Estuary Partnership

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The Condition of Casco Bay and Its Watershed

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Director, Casco Bay Estuary Partnership
Casco Bay Estuary Partnership

- One of 28 National Estuary Programs
- Hosted by USM’s Muskie School
- A 23 member local advisory board
- Direct federal dollars to local priorities
Our Approach

- Casco Bay Estuary Partnership is a catalyst for action
- Many Partners
  - Private sector
  - Citizens and civic organizations
  - Governments and government agencies
  - Academia
- Focused, collaborative
- Credible data and information
- Strategic direction
- We build consensus, facilitate communications and attract funds for protection of the Bay
Why State of the Bay?

- Periodic reporting is an obligation of National Estuary Programs
- CBEP issues a “State of the Bay” report once every 5 years
- A set of 18 “indicators”
- Findings intended to provide understanding of the condition of the Bay
- Help provide direction not only for CBEP but for all members of the greater Partnership
Casco Bay Watershed

- 985 Square Miles
- 42 Municipalities
- About 200 Square Miles of Water
- More than 575 miles of shoreline
- ~785 islands, islets and ledges
- 3% Maine’s land area
- ~17% of population (2000 census)
Upstream From Casco Bay

- Mostly forest
  - ~ 67% Upland Forest
  - ~ 5% Wetland
  - ~11% Developed
  - Only about 6% impervious surfaces

- ~230,000 people in the watershed (2000 census)

- Population Density ~ 255 people per square mile
  (Sixth lowest population density among NEPs)
Casco Bay

- A marine dominated coastal embayment
- Tidal water exchange is (usually) much greater than river flow
- Conditions in Casco Bay reflect BOTH
  - Activities on land and
  - Large scale marine processes
- Details of water flow are not well understood
Population

- Population in the Casco Bay Watershed has been growing ~1% per year.
- Projections suggest continued moderate population increases.
Population Growth is Suburban

- While overall growth is moderate, rates vary significantly around the region.
- Growth is concentrated in suburban and exurban towns.
- Larger Towns tend to be growing more slowly or even losing population.
Dramatizing Change: Population 1950 - 2030

1950: ~229,500
2005: ~363,000
2030: ~405,500
Impervious Surface
Toxics in Stormwater

- 2006 study of 21 locations in Portland and South Portland

  - Copper:
    - Most sites exceeded Maine WQ criteria

  - Zinc:
    - Almost half of sites exceeded Maine WQ criteria

  - PAHs:
    - Found at levels of concern in about half the samples
Our Impaired Waters are Suburban

- A close relationship between impaired streams and watershed imperviousness
Combined Sewer Overflows

- Over the last two decades, the number of CSO outfalls has dropped from 80 in to 45 at the end of 2009.

- Total CSO discharges have not dropped consistently over the past decade because recent years have been wet.

- Discharge per inch of annual rainfall:
  - A decade ago: ~30 million gallons
  - Today: ~17 million gallons

- Models suggest that Portland’s remediation efforts have reduced CSO volumes by ~28 percent since 1997.
“Overboard Discharges”

Number of Permitted Overboard Discharges in Casco Bay

Data: Maine DEP
Shellfish Beds

The Area of DMR’s shellfish management areas that are permanently closed has gone up in recent years.

But the affect on actual clam Flats has been less severe.

~ ¼ of flats are permanently closed.
Casco Bay Water Quality

**Total Nitrogen (mg/L)**
- 0.25 - 0.34
- 0.45 - 0.64
- 0.35 - 0.44
- 0.64 - 0.90
Geography of Water Quality

Water Transparency

MEAN SECCHI DEPTH (m)

- Offshore
- Eastern Bay
- Eastern Coast
- Portland Coast
- Middle Bay
- Western Bay
- Foresides
- Maquoit Bay
- Cape Elizabeth
- Quahog Bay
- Harpswell Sound
- Portland Harbor
- Royal River
- Harraseeket River
- New Meadows River

N/A
Spatial patterns in nutrient concentrations suggest significant nutrient inputs from Rivers, Sewage treatment plants, and Kennebec river plume. Other data also points towards input from airborne pollutants.
Indicator 9: Mussels (Regional)
Metals in Portland Harbor Mussels

Gulfwatch Data from Portland Harbor
Toxics in Osprey Eggs

“Toxics of Emerging Concern”
A Forested Watershed, but Little Interior Forest

- ~69 percent of the Casco Bay watershed is forested
- 17.5 percent is high quality forest interior habitat.
- Remaining forest is fragmented
- Fails to provide good habitat for forest interior species
Riparian Habitat Mirrors Forest Cover
Protected Lands

<table>
<thead>
<tr>
<th>Level of Protection</th>
<th>Number of Parcels</th>
<th>Total Acres Protected</th>
<th>Percent of Casco Bay Watershed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation Land</td>
<td>438</td>
<td>15,694</td>
<td>7.5%</td>
</tr>
<tr>
<td>Open Space (no protection)</td>
<td>306</td>
<td>7,494</td>
<td>3.6%</td>
</tr>
<tr>
<td>Recreational Land</td>
<td>110</td>
<td>1,917</td>
<td>0.9%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>854</td>
<td>25,105</td>
<td>12.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Sites</th>
<th>Area Permanently Protected (acres)</th>
<th>Percent of Study Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>246</td>
<td>7,300</td>
<td>3.5%</td>
</tr>
<tr>
<td>2005</td>
<td>341</td>
<td>10,900</td>
<td>5.2%</td>
</tr>
<tr>
<td>2010</td>
<td>438</td>
<td>15,694</td>
<td>7.5%</td>
</tr>
</tbody>
</table>
Climate Change and Sea Level Rise

Day of Ice-Out at Sebago Lake (1807–2008)

- Number of Days After January 1 (Julian Days)
- 202-year trend (1.2 days earlier per decade)
- Ice-out
- No ice-in

Sea Level Rise at Portland Harbor (1912–2007)

- Relative Sea Level Difference (inches)
- 95-year trend (rising 0.7 inches per decade)
# Sea Level Rise Projections

## Sea Level Rise at Portland Harbor (1912–2007)

The chart illustrates the trend of sea level rise from 1912 to 2007 at Portland Harbor. The trend shows a steady rise of 0.7 inches per decade, indicated by the red line. The data includes fluctuations year over year, with the overall trend upwards.

## Emissions Scenario

<table>
<thead>
<tr>
<th>Year</th>
<th>Lower</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998 stillwater elevation (ft)</td>
<td>8.9</td>
<td>8.9</td>
</tr>
<tr>
<td>Subsidence of coastline</td>
<td>0.024</td>
<td>0.043</td>
</tr>
<tr>
<td>Changes in ocean circulation</td>
<td>NE</td>
<td>0.52</td>
</tr>
<tr>
<td>Global average sea level</td>
<td>0.66</td>
<td>1.6</td>
</tr>
<tr>
<td>Total stillwater elevation¹ (ft)</td>
<td>9.5</td>
<td>11.1</td>
</tr>
<tr>
<td>Change (ft)</td>
<td>0.5</td>
<td>1.2</td>
</tr>
</tbody>
</table>

¹ Total stillwater elevation includes the contributions from all factors listed above.
Indicator 7: Water Temperature

Increase in Water Temperature Since 1993

Mean Water Temperature (°C)

Casco Bay

- Remains relatively healthy

- Protected by
  - Strong marine influences
  - Relatively low population density
  - A watershed that is still largely forested
Issues on the Horizon

- Water quality inshore
- Concentrations of nutrients in near shore waters
- Fecal contamination; ~ ¼ of all clam flats permanently closed
- Many toxics are declining; others remain high
- Climate change and ocean acidification
- Suburbanization
Thank You!
Riparian Habitat Mirrors Forest Cover

\[ y = 0.85x + 0.16 \]

\[ R^2 = 0.95 \]