2010

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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State of the Bay 2010

The Condition of Casco Bay and Its Watershed

Curtis C. Bohlen, PhD
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
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

![Map of Casco Bay showing Total Nitrogen concentrations.](image)
Geography of Water Quality
Nutrients Entering Casco Bay

- Spatial patterns in nutrient concentrations suggest significant nutrient inputs from
  - Rivers
  - Sewage treatment plants
  - Kennebec river plume

- Other data also points towards input from airborne pollutants

Nutrient Concentrations in Casco Bay, May 10-11, 2007
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)
- Year
- 202-year trend (1.2 days earlier per decade)
- Ice-out
- No ice-in

Sea Level Rise at Portland Harbor (1912–2007)

- 95-year trend (rising 0.7 inches per decade)
- Relative Sea Level Difference (inches)
- Year

Casco Bay Estuary Partnership
# Sea Level Rise Projections

## Emissions Scenario

<table>
<thead>
<tr>
<th>Year</th>
<th>Lower 2050</th>
<th>Lower 2100</th>
<th>Higher 2050</th>
<th>Higher 2100</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998 stillwater elevation (ft)</td>
<td>8.9</td>
<td>8.9</td>
<td>8.9</td>
<td>8.9</td>
</tr>
<tr>
<td>Subsidence of coastline</td>
<td>0.024</td>
<td>0.043</td>
<td>0.024</td>
<td>0.043</td>
</tr>
<tr>
<td>Changes in ocean circulation</td>
<td>NE</td>
<td>0.52</td>
<td>NE</td>
<td>0.79</td>
</tr>
<tr>
<td>Global average sea level</td>
<td>0.66</td>
<td>1.6</td>
<td>1.4</td>
<td>4.6</td>
</tr>
<tr>
<td>Total stillwater elevation¹ (ft)</td>
<td>9.5</td>
<td>11.1</td>
<td>10.3</td>
<td>14.3</td>
</tr>
<tr>
<td>Change (ft)</td>
<td>0.5</td>
<td>1.2</td>
<td>1.4</td>
<td>4.4</td>
</tr>
</tbody>
</table>
Indicator 7: Water Temperature

Increase in Water Temperature Since 1993
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

\[ y = 0.85x + 0.16 \]

\[ R^2 = 0.95 \]