Eastern Shore of Virginia

USGS Research:

Land Subsidence and Relative Sea-Level Rise in the Southern Chesapeake Bay Region (USGS Circular 1392; 2013)

Sediment Distribution and Hydrologic Conditions of the Potomac Aquifer in Virginia and Parts of Maryland and North Carolina (USGS SIR 2013-5115)

January 2014
Land Subsidence and Relative Sea-Level Rise in the Southern Chesapeake Bay Region

- The lower Chesapeake Bay region is experiencing the highest rates of sea-level rise on the US Atlantic Coast.

- Global sea level rise plus regional land subsidence have resulted in a 1.1 to 4.8 mm/yr (≈0.5 to 2 in/decade) relative rate of sea rise in the lower Chesapeake Bay area.

Measured Subsidence in California
Source of Land Subsidence

- Predominately due to groundwater withdrawals from confined aquifers
- Amount depends on:
  - Water level decline
  - Sediment compressibility
  - Sediment thickness

Figure 10. Aquifer-system compaction caused by groundwater withdrawals A, before and B, after pumping. Modified from Galloway and others (1999).
Methods of Measurement

- Borehole Extensometers
- Tidal Stations
- Geodetic Surveys
Lower Chesapeake Bay Monitoring Stations

- Extensometers
- Tidal Stations
- Geodetic Survey Station
Relative Sea Level Rise

- Tidal Stations

<table>
<thead>
<tr>
<th>ID</th>
<th>Site name</th>
<th>Period</th>
<th>Rate of relative sea-level rise</th>
<th>Measured, (mm/yr)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>8632200</td>
<td>Kiptopeke, Virginia</td>
<td>1951–2006</td>
<td></td>
<td>3.5</td>
<td>±0.42</td>
</tr>
<tr>
<td>8637624</td>
<td>Gloucester Point, Virginia</td>
<td>1950–2006</td>
<td></td>
<td>3.8</td>
<td>±0.47</td>
</tr>
<tr>
<td>8638610</td>
<td>Sewells Point, Virginia</td>
<td>1927–2006</td>
<td></td>
<td>4.4</td>
<td>±0.27</td>
</tr>
<tr>
<td>8638660</td>
<td>Portsmouth, Virginia</td>
<td>1935–2006</td>
<td></td>
<td>3.8</td>
<td>±0.45</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td></td>
<td>3.9</td>
<td>±0.40</td>
</tr>
</tbody>
</table>
Land Subsidence

- Extensometers
Relative Sea Level Rise

- Greatest:
  - Franklin
  - West Point

- Lowest:
  - Kiptopeke
Sediment Distribution and Hydrologic Conditions of the Potomac Aquifer in Virginia and Parts of Maryland and North Carolina

- Evaluated depositional environment on aquifer characteristics
Sediment Distribution and Hydrologic Conditions of the Potomac Aquifer in Virginia and Parts of Maryland and North Carolina
Potomac Aquifer System

- Generalized – best represents sediments in Norfolk Arch area
- Immature, high gradient braided streams deposited longitudinal bars and channel fills
Cross-Section Across Northern Accomack

- Sediments part of Salisbury Embayment
- Mature, medium to low gradient meandering streams deposited medium to coarse grained channel fills and point bars