Science Assessment of Chesapeake Bay Acidification: Towards a Research and Monitoring Strategy

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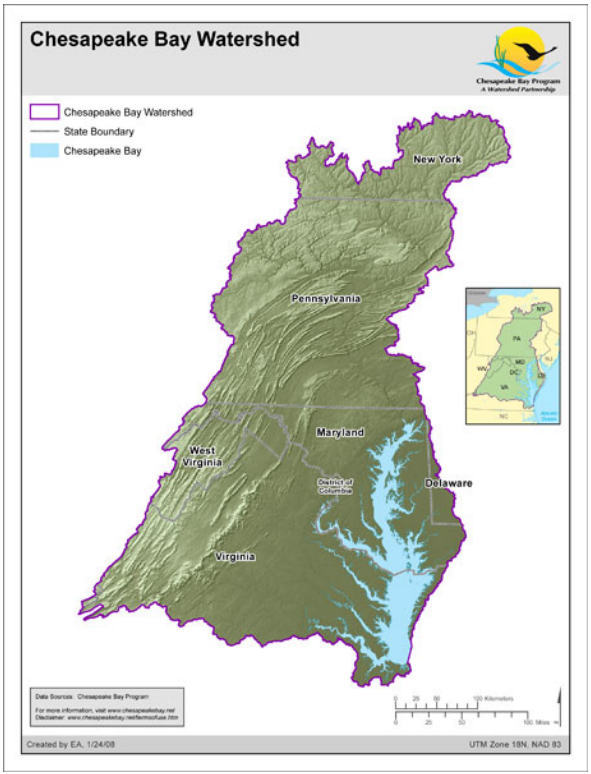

Acidification of the Chesapeake Bay

The combustion of fossil fuels during the past 200+ years has resulted in a significant increase in atmospheric CO_2 from approximately 280 pre-industrially to the current ~400 parts per million by volume (ppmv). Projections of fossil fuel use suggest that atmospheric concentrations may rise as high as 800 or 1000 ppmv in the next 100 years. Since 1800, surface ocean pH has declined ~0.1 units, and further reductions of 0.1 to 0.4 units are anticipated due to rising CO_2. There is widespread concern that these changes will lead to irreversible ecological regime shifts in marine habitats, such as massive reductions in coral reef habitats and the inhibition of other calcifying biota.

However, current predictions regarding the effects of elevated atmospheric CO_2 are driven almost exclusively by the open ocean assumption of an air: water equilibrium, regardless of geographic/oceanographic setting. Such assumptions clearly do not hold in coastal marine habitats, which are influenced substantially by terrestrial and near-shore phenomena, including significant biological perturbation to the water's carbonate chemistry and biogeochemical coupling of land and sea. Relying on the prevailing air:sea equilibrium assumption of open ocean acidification will surely result in unsound ecological predictions in coastal habitats.

To address effects of acidification processes in nearshore ecosystems, we will hold a workshop in Annapolis, MD (March 11-13, 2014). The workshop is designed to assess the science required for understanding coastal acidification in the Chesapeake Bay. The Chesapeake is the largest and arguably one of the most productive and complex estuaries in North America. Advancing our abilities to measure and understand carbonate chemistry dynamics/acidification in the Chesapeake Bay will enable us to make better predictions of ecological/environmental changes here and in other similar coastal ecosystems. A prime goal of the workshop will be to amass information on current monitoring assets, data sources, and data gaps as they relate to measuring and monitoring carbonate chemistry, with an eye toward designing a Chesapeake Bay Monitoring Network (CBAN).