Ocean Acidification Effects in Maryland Waters: Assessment, Findings and Recommendations

Task Force to Study the Impact of Ocean Acidification on State Waters

Report to the Governor and Maryland General Assembly

http://bit.ly/MDOATF_finalreport

Presented to Carbon Monitoring System (CMS) Applications Policy Speaker Series

Eric Schwaab, Senior VP and Chief Conservation Officer, National Aquarium

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TASK FORCE CHARGE

- Analyze the best available science regarding ocean acidification and the potential effects of acidification on the ecology of state waters and on state fisheries; and

- Make recommendations regarding potential strategies to mitigate the effects of acidification on state waters and on state fisheries.

TASK FORCE MEMBERS

- **Senator Bill Ferguson**
- **Delegate Eric Luedtke**
- **Eric Schwaab, Chair** (National Aquarium)
- **Tal Petty** (Aquaculture Industry)
- **Robert T. Brown** (Maryland Watermen's Association)
- **Bruce Michael** (DNR)
- **Lee Currey** (MDE)
- **Thomas J. Miller** (UMCES)
- **Doug Myers** (Chesapeake Bay Foundation)

WHY MARYLAND?

- High valued fisheries
- Progressive mindset
- Learning lessons from west coast
- Involved constituencies
- Other state experiences
- Growing scientific interest

THE HISTORY OF ACIDIFICATION

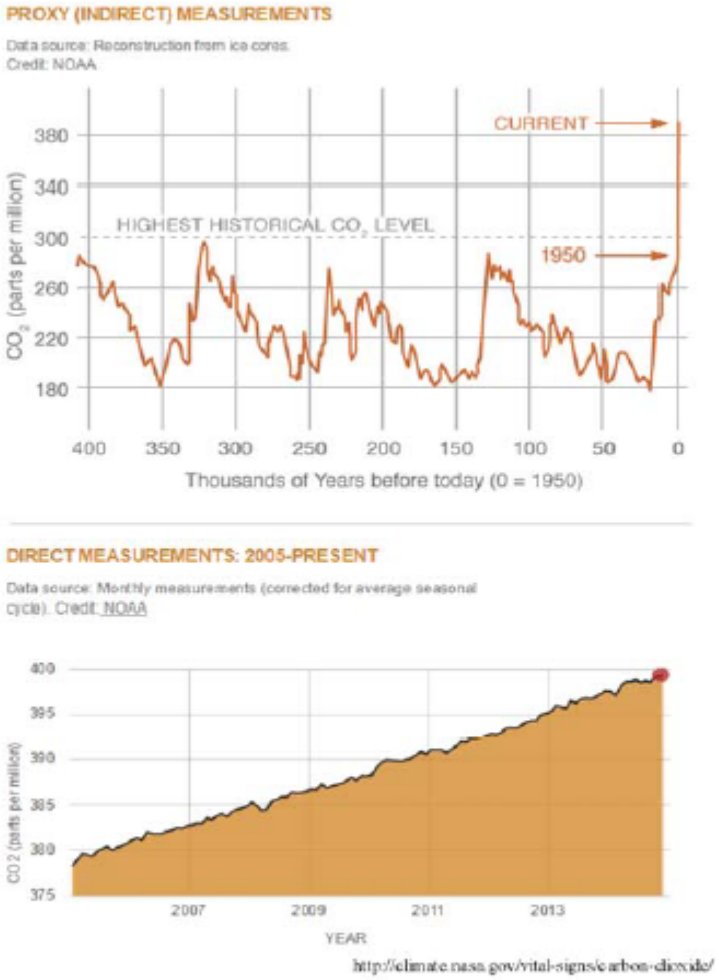
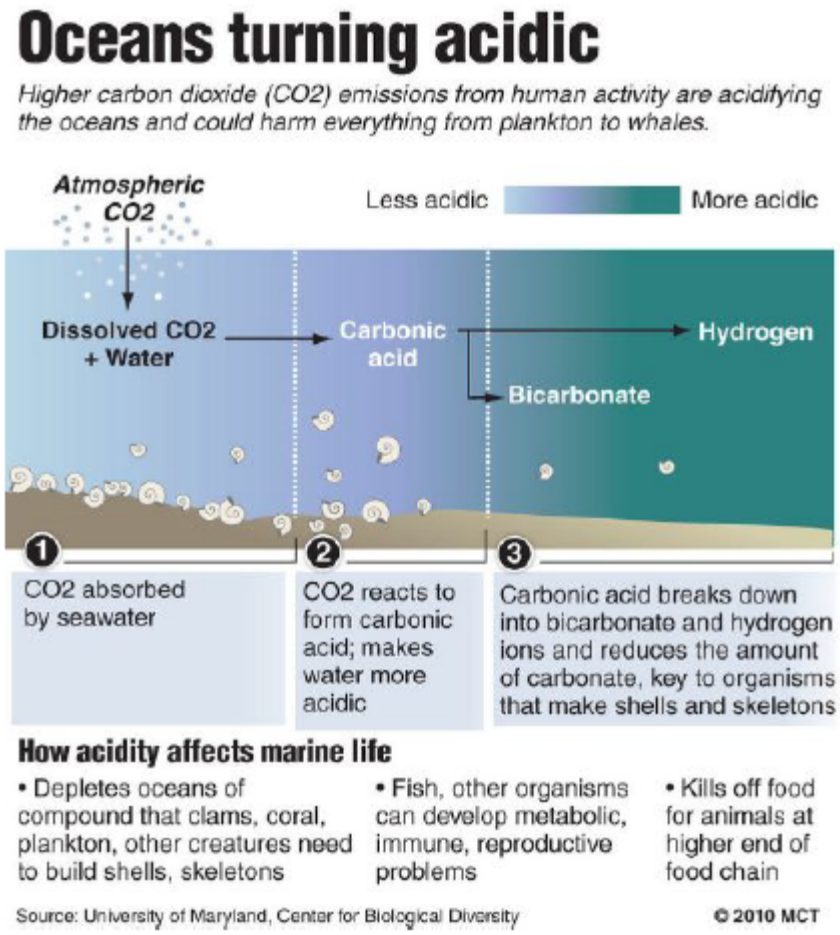


Figure 1. Atmospheric carbon dioxide concentrations during the past 400 million years (top) and during the last five years (bottom).

The world's oceans are estimated to absorb 25% of the CO2 released into the atmosphere annually

THE BASIC SCIENCE AND PROBLEM OF ACIDIFICATION



1. Carbon dioxide combines with water and is converted into carbonic acid
2. The carbonic acid breaks down into hydrogen and bicarbonate ions
3. The bicarbonate breaks down into carbonate and hydrogen ions
4. Reduced carbonate available to marine animals

OCEAN ACIDIFICATION SCENARIOS

Ocean Acidification v1.0

Small changes in pH are significant and occur relatively slowly

Ocean Acidification v2.0

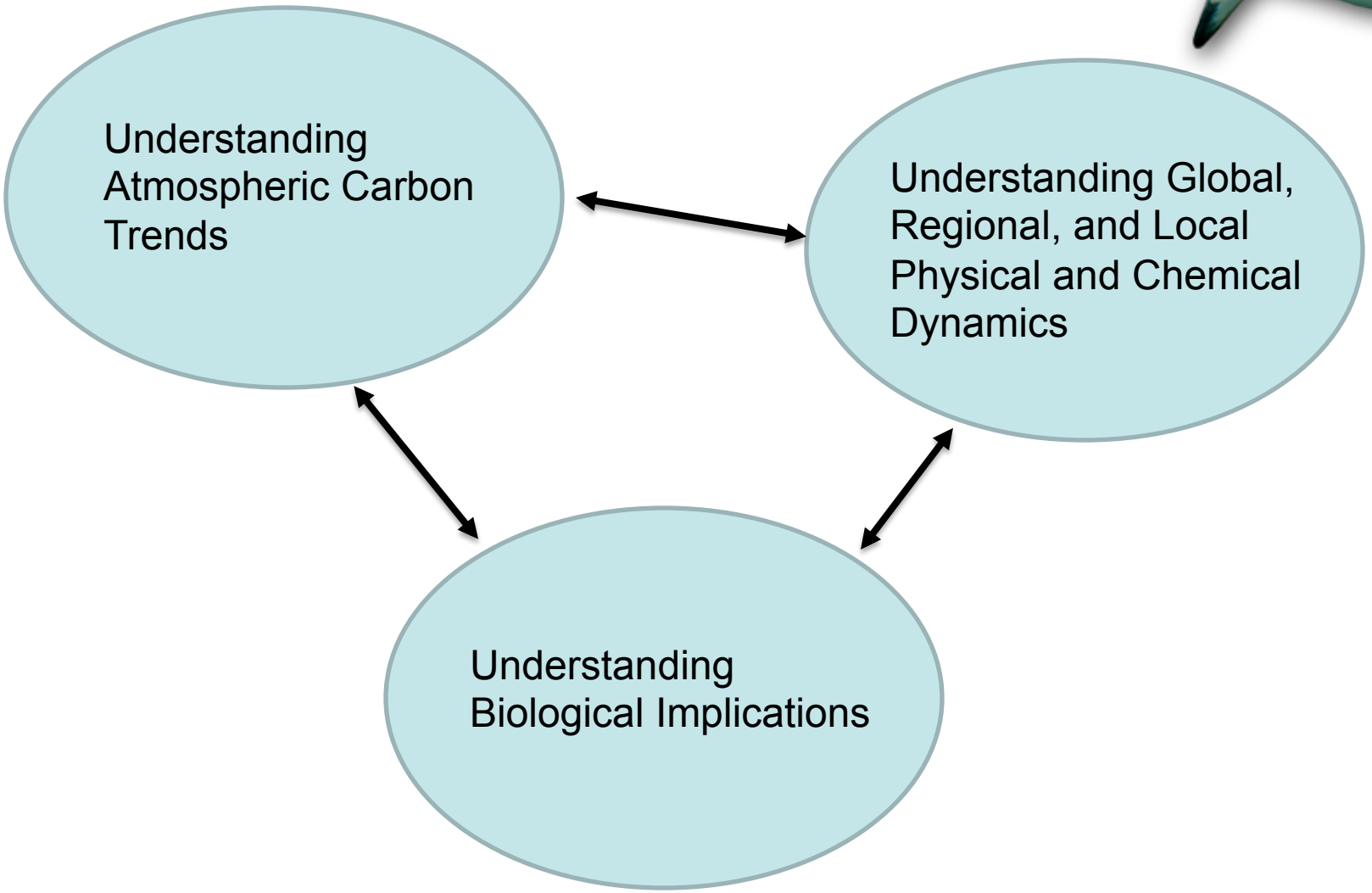
Combines the influences of atmospheric CO2 with physical oceanographic factors such as upswelling of carbon-rich lower pH deep ocean water

Ocean Acidification v3.0 (Chesapeake Bay)

Occurs in inshore and estuarine waters that are lower in salinity, are naturally less alkaline, and have less buffering capacity than seawater against larger swings in pH

Changes in pH can be substantial, rapid, and cyclical

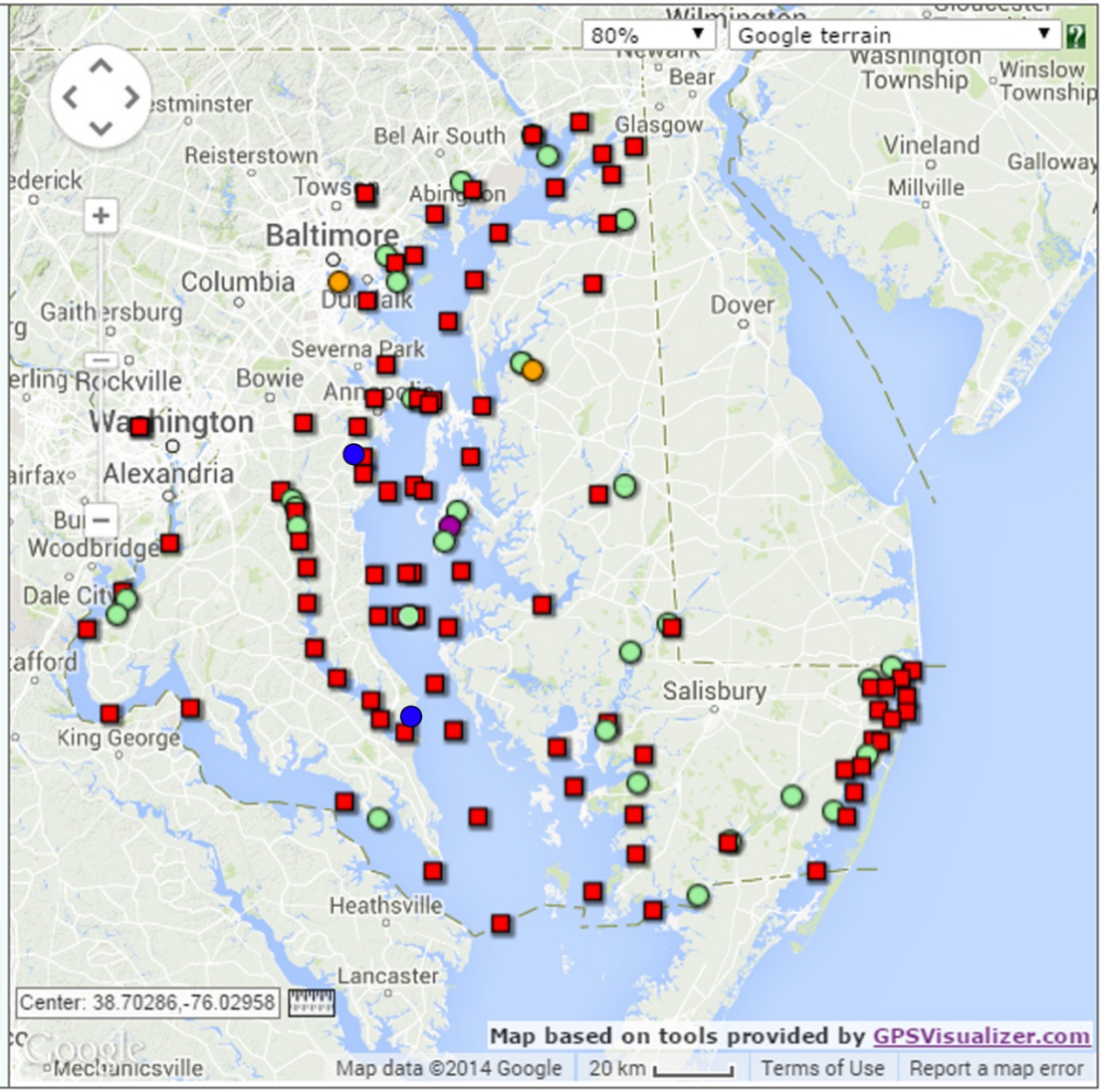
FUNDAMENTAL OCEAN ACIDIFICATION CHALLENGES



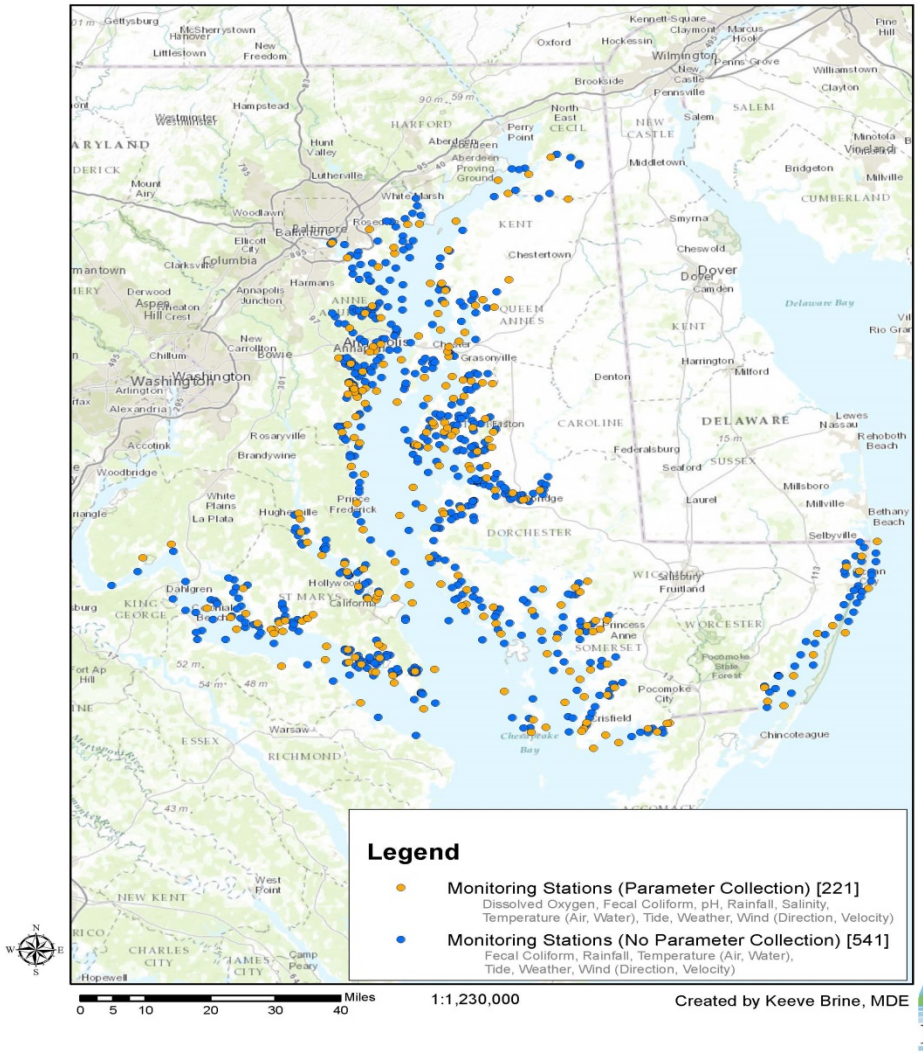
2014 MARYLAND DNR LONG TERM AND CONTINUOUS MONITORING TIDAL WATER QUALITY SITES AND CBL/SERC CARBONATE MONITORING

Station Legend

- Long-Term Fixed Station
- Continuous Monitoring Station with Real-time Telemetry
- Continuous Monitoring Station without Telemetry
- Vertical Profiler
- Carbonate Monitoring - Chesapeake Biological Lab & Smithsonian Environmental Research Center



MDE SHELLFISH MONITORING STATIONS



TASK FORCE RECOMMENDATIONS

- Enhance monitoring of State waters to quantify scale, patterns, and trends of ocean acidification
- Identify and address additional research priorities in estuarine and coastal waters
- Improve coordination with other states and federal resource managers
- Focus on impacts to key species and industries that depend on those resources

TASK FORCE RECOMMENDATIONS

- Provide direct support to affected industries
- Pursue legislative support and administrative action
  - DNR should lead in establishing an interagency commission to implement recommendations, help identify additional resources, and report on the progress of interstate initiatives
  - Targeted funding should be secured for research priorities, enhanced monitoring, and coordination of activities with affected industries
  - Present to the Chesapeake Bay Commission
- Improve communications and outreach

Monitoring Questions

How do we enhance our monitoring capabilities at finer spatial and temporal scales to better inform scientific understanding, scientific collaborations, policy decisions and management responses?

Can NASA carbon monitoring products intersect with existing or planned surface water monitoring to enhance efficiency and effectiveness?

Can satellite data help us to tease out the differences between land based carbon inputs, respiration, and atmospheric components of carbon dioxide contributions?

Are there regional differences in inputs that could have direct implications for Chesapeake Bay region?

How do we sustain this conversation?

Thank you.

Questions, Comments, Discussion.

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