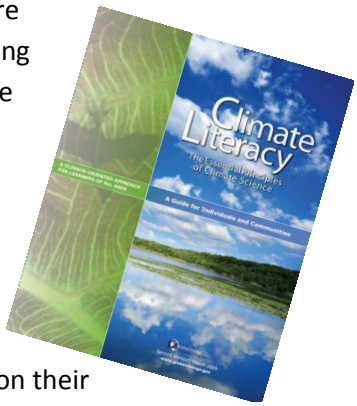
CECB @ MHS

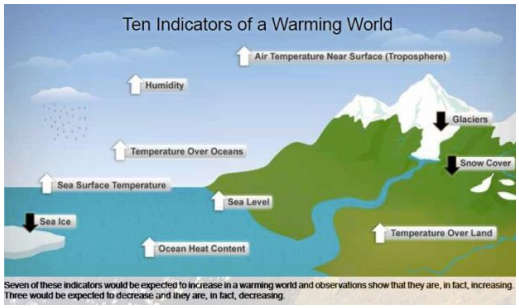
The Chesapeake Bay National Estuarine Research Reserve (CBNERR) is one of 28 protected areas that make up the National Estuarine Research Reserve System established to promote informed management of the Nation's estuaries and coastal habitats. The Chesapeake Bay National Estuarine Research Reserve in Virginia is located at the Virginia Institute of Marine Science (VIMS), part of The College of William and Mary. CBNERR received a National Oceanic and Atmospheric Administration (NOAA) Bay Watershed Education and Training grant to work with 9th grade Earth Science students at Gloucester and Mathews High Schools. The program, entitled *Climate Education for a Changing Bay (CECB)* will engage audiences with meaningful Chesapeake Bay field experiences that are deeply integrated into the classroom and with teacher professional development, sharing results from the project through outreach events and conferences. The overall objective of *CECB* is to improve climate literacy within local high schools by advancing the use of locally relevant environmental data and information in classroom curriculum, field experiences, and professional teacher training. Throughout the school year, each Earth Science class receives classroom lessons given by CBNERR education staff, a field experience on their school grounds, and a field experience to VIMS and CBNERR facilities.



We hope you take the time to read about the lesson presented to the 9th grade Earth Science students at Mathews High School. Enjoy the information, pictures, and examples of the activities presented below!

On January 7th and 8th, 2015, CBNERR educators attended Mathews High School to give the first lesson of the *CECB* program to each of Mr. Wygant's and Mr. Tomcany's Earth Science classes. The classroom visit was the students' initial exposure to CBNERR educators and the *CECB* program where they were introduced to the NERRS system, the program outline, climate change science, and water quality. The first visit was the preparation phase for their Meaningful Watershed Educational Experience, where-by subsequent outdoor field experiences will build upon the knowledge gained from the classroom lesson.

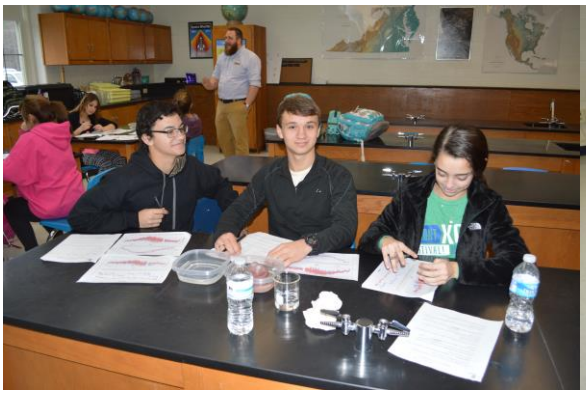
After briefly reviewing some basic concepts of the Chesapeake Bay estuary, identifying the difference between weather and climate, and explaining the greenhouse effect, students were introduced to the mechanisms behind our changing climate. With the excess burning of fossil fuels such as oil, gas, and coal, carbon dioxide is



entering our atmosphere in even increasing numbers. This increase in CO2 acts like a blanket around the Earth, trapping in heat, and causing temperatures to rise both in the air and in the water. Understanding changes in sea level and inundation, and the associated responses of critical habitats and coastal communities are key to the Chesapeake Bay region. Students brainstormed a list of factors which could be impacted by climate change. The named responses such as sea level rise, warming of ocean temperatures, and ocean acidification were discussed in more detail through hands on demonstrations and examples. Throughout the class, students observed how the melting of ice, whether on land or in the water, would affect sea level. As a result of this activity, students were able to see that the melting of continental ice mixing with water resulted in the sea level rising. Students also observed the reaction that occurs between an acidic solution and calcium carbonate, by placing a piece of chalk in to a beaker of vinegar, to demonstrate the process of ocean acidification. Ocean acidification acts like "osteoporosis of the sea." Just as humans need calcium to build their bones, some marine organisms, like oysters and scallops, need calcium carbonate to build strong tests and shells. The ocean absorbs some of the extra carbon dioxide we emit into the atmosphere when we burn fossil fuels, and that changes the chemistry of the ocean. The change in chemistry is reducing the amount of calcium carbonate in the ocean globally, ultimately increasing the H+ ions in the water resulting in a lower pH, or more acidic ocean.

At VIMS and CBNERR, we collect data, and through monitoring we are able to see changes over time. Water quality data is readily available to the public, and students were shown where to get historic and real-time data at locations such as the Virginia Estuarine and Coastal Observing System (VECOS) and the Chesapeake Bay Interpretive Buoy System (CBIBS). Various water quality parameters were discussed as a class, and some students had the opportunity to use a refractometer to measure the salinity of water samples. Salinity is the measurement of the number of grams of salt per 1,000 grams of water. The unit of measure for salinity is ppt (parts per thousand). The average ocean salinity is between 33-35 ppt. The reserve has 4 sites located along the York River salinity gradient, with salinity decreasing as the distance to the ocean increases.

Students then interacted with and interpreted water quality graphs created from data collected at Goodwin Island, one of CBNERR's reserve sites. Students compared graphs to look for trends in the data. They were also asked to think about how marine organisms could be impacted as water conditions changed. Students hypothesized that some organisms may be able to migrate with changing sea temperatures or that some organisms and plants may be able to adapt to the changes at their given location.



To conclude the lesson, students briefly discussed costal community impacts. It was emphasized that as a community we can take action to reduce the impacts of climate change. Can you think of some ways to reduce our impact on climate change?

In the next lesson, students will focus on wetlands and will participate in a mock marsh transect on their school grounds. Students will learn how to run a transect line and will then focus on the importance of wetlands and examine how they respond to sea level changes.

Thank you to all of the students and teachers participating in *CECB*!