Climate Change and the Chesapeake Bay

FAQ: Frequently Asked Questions

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION • UNITED STATES DEPARTMENT OF COMMERCE

This document answers frequently asked questions about the potential impact of climate change on the Chesapeake Bay, the largest estuary in North America. Check back for more information as research continues.

What are climate change and global warming?

Climate change refers to changes in the Earth's average global temperature and weather patterns over an extended period. *Global warming* is sometimes used as a synonym for climate change but specifically refers to the increase in global temperature due to the increase of heat-trapping gases, or "greenhouse gases," in the atmosphere. These greenhouse gases include carbon dioxide, which has increased since the early 1800s primarily due to humans burning fossil fuels to power our homes, buildings, and cars. Changes associated with global warming include a rise in sea level globally due to both expansion of the ocean as it warms, and the runoff into the ocean of melt water from ice sheets and glaciers.

How much is sea level predicted to rise in the Chesapeake Bay?

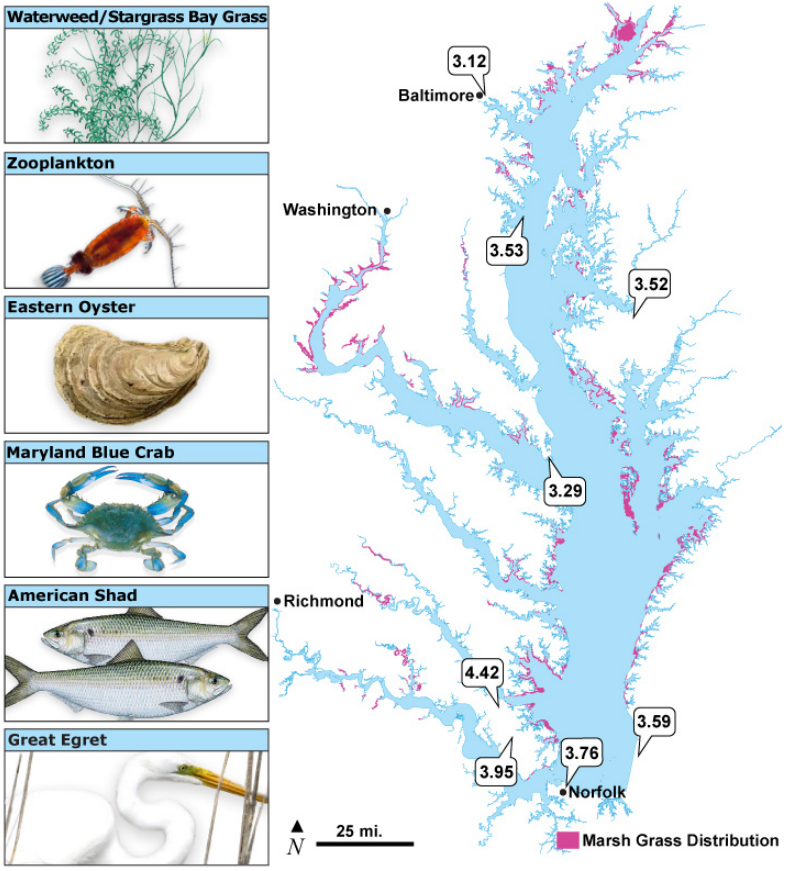
Sea level in the Bay has risen approximately one foot over the last century, with slightly higher rates in the southern Bay. This is about twice the global average and is believed to be a result of a combination of global sea level rise and regional and local sinking or "subsidence" of the land. The Intergovernmental Panel on Climate Change projects global average sea level will rise from 7 to 23 inches over the next century, although important regional variations from the global average are expected. This projection includes an estimate of contributions from ice sheets and glaciers melting, but because ice sheet dynamics are still poorly understood, sea level rise could be higher than projected. Additionally, sea level rise in the Bay will likely exceed the global rate if local subsidence continues.

Many Chesapeake Bay communities will be more prone to flooding as sea level rises. For example, the Hampton Roads area of Virginia is the U.S.'s second largest population center at risk from sea level rise (second to New Orleans).

How will climate change affect weather in the Bay region? Will we see more powerful hurricanes, changes in rain and snow, or longer droughts?

The U.S Climate Change Science Program (CCSP) has assessed whether we can expect more extreme weather events as a result of climate change. For the regional assessment that includes the Chesapeake Bay likely changes include more frequent hot days, fewer freezes and cold nights. The CCSP also indicates that heavy downpours are very likely to increase in frequency and magnitude.

NOAA models do not predict an increase in the frequency of Atlantic hurricanes as a result of climate change. However, current theory and models suggest there will be an increase in hurricane intensity (more rain and wind). This is an active area of NOAA scientific research. An increase in hurricane intensity coupled with rising sea level would lead to higher storm surge levels, and therefore more flooding in Chesapeake Bay communities hit by hurricanes.



Marshes and bay grasses (pink areas) provide food and a vital habitat for many species that thrive in and around the Bay. Marshes also serve as a buffer zone to help reduce the impact of hurricane storm surges. As sea levels rise, bay grass habitats are increasingly threatened. The balloons on this map show the average rates of sea level rise (in millimeters per year) for those locations, dating back to 1965 or earlier. (Map by Howard Weinberg, Chesapeake Bay Program; sea level rise data courtesy NOAA.)

How will sea level rise affect the Bay's coastal and marine life?

The rate of sea level rise may outpace living creatures' ability to respond to it. Many plant and animal species may not be able to adapt to the changing conditions. If sea level rises at projected rates, valuable coastal habitats will be threatened.

For example, marsh grasses grow at the water's edge, and marshes would have to retreat or "migrate" up the shore to survive. Sea level rise and wetland loss could increase shoreline erosion rates and expose new areas to the erosive forces of waves.

Shoreline erosion can lead to cloudy shallow waters, making it difficult for underwater grasses to survive. In some areas, depending on the local rate of sea level rise, wetlands may not be able to migrate quickly enough and therefore would become inundated or submerged by rising water levels, or lost if their retreat up shorelines is restricted by seawalls and bulkheads.

As sea level rises, more salty ocean water will enter the Bay. This could mean that local salinities will increase as sea waters push farther into the Bay and rivers—unless this increase in salt water is offset by increased rainfall around the Bay watershed.

How will warmer and saltier Bay waters affect plants and animals?

Water temperatures are increasing as a result of climate change. These temperature increases could alter the geographical distributions of common Bay plants and animals. All species have certain preferences for where they live, based on local conditions, including temperature, salinity, and availability of food. When these conditions shift, plants and animals tend to shift in response (though plants adapt much slower). Eelgrass is an important underwater grass that provides habitat and food for many Bay species. It is particularly sensitive to changes in water temperature. If water temperatures continue to rise as predicted, this important species could disappear from the Bay.

An increase in water temperature could also affect local fish populations, and cooler-water species such as striped bass may be replaced by warmer-water species such as brown shrimp. While warmer temperatures may increase the growing season of species such as oysters, it may also increase the early onset of devastating oyster diseases that thrive in warmer temperatures and saltier waters.

Low-lying areas near the Chesapeake Bay, like this marsh, could be dramatically affected by climate change.

What can I do to reduce my own greenhouse gas emissions?

The most important actions you can take to reduce your greenhouse gas emissions are to reduce your fuel and energy consumption. Here are some important choices you can make:

- Purchase and use energy-efficient appliances and light bulbs in your home and office.
- Turn off lights when they are not in use.
- Unplug electrical appliances, if possible, when they are not in use.
- Insulate your house and adjust your thermostat to use less energy.
- Purchase fuel-efficient vehicles, keep your tires properly inflated, and slow down.
- Drive less and carpool when possible.
- Take public transit, walk, or bicycle when you can.

I own waterfront property in the Chesapeake watershed. What can I do to protect my property and help the Bay?

If you own waterfront property, you can take additional steps to both protect your property and help the Bay deal with rising water levels. Consider leaving all existing vegetation in place, especially large older trees, and replacing seawalls and bulkheads on your property with more natural "living shorelines." Living shorelines may offer better protection against storm damage than seawalls and bulkheads and also provide land where marsh grass could grow as sea level rises. Other options to plan for and respond to sea level rise include setbacks and moving or elevating structures.

What is NOAA's role with respect to climate change?

NOAA recognizes that climate change is a serious problem, that the Earth is warming, and that humans are the leading cause. NOAA is charged with helping society understand, plan for, and respond to climate change. NOAA aims to provide decision makers and the public with an understanding of the global climate through NOAA's observing systems that monitor changes, research on key climate processes, modeling, and development and delivery of climate information and services.

How does NOAA predict climate change?

Due to the enormous complexity of the ocean-atmosphere system, the most useful forecasting tools for future global changes are climate models—computer-based mathematical models that simulate the changes in climate and what these changes can mean for the Earth. Observations such as those made by NOAA's National Water Level Observation Network are also used to inform and verify the predictions of computer models.

Where can I find more information?

NOAA's gateway website for information about climate change can be found at www.noaa.gov/climate.html.

The Intergovernmental Panel on Climate Change (IPCC) website contains a wealth of information on current predictions for climate change and can be found at www.ipcc.ch.

For information about NOAA's work in the Chesapeake Bay, visit http://chesapeakebay.noaa.gov.