NOAA: Interactive Visualization Tools for Climate

Presented by: LuAnn Dahlman and Bart Merrick

September 14, 2011
Interactive Visualization
Tools for Climate

NSTA Webinar — September 14, 2011

LuAnn Dahlman
Climate Program Office

Bart Merrick
Environmental Science Training Center
Tools we’ll use

Multigraph Climate Explorer
http://climateexplorer.multigraph.org

Global Climate Dashboard
http://www.climate.gov

Interactive Atmospheric Data Viewer
http://www.esrl.noaa.gov/gmd/dv/iadv/

Global Science Investigator
http://csc.noaa.gov/psc/dataviewer

Chesapeake Adaptation: Sea Level Viewer
http://www.chesapeakeadaptation.org/
1971 — Annual 4th of July Picnic — Minneapolis, Minnesota
1972 — Annual 4th of July Picnic — Minneapolis, Minnesota
1980 — Annual 4th of July Picnic — Minneapolis, Minnesota
1990 — Annual 4th of July Picnic — Minneapolis, Minnesota
2000 — Annual 4th of July Picnic — Minneapolis, Minnesota
# July 4 Temperatures (°F)

**Minneapolis, Minnesota**

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**Polling Question:** Did Charlie measure A) **Climate** or B) **Weather**?
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Average Minimum Temp = 64
Average Maximum Temp = 84
Minneapolis, Minnesota
(1971-2000)

1982

Observed high of 95°F

Observed low of 67°F
Minneapolis, Minnesota
(1971-2000)

1997

Observed high of 73°F

Observed low of 52°F

Dates in July

"Average High"  "Average Low"
Minneapolis, Minnesota

(1971-2000)

Dates in July

"Average High"  "Average Low"

Temperature (°F)

50  55  60  65  70  75  80  85  90  95  100
Minneapolis, Minnesota — July 1-10 Climate Normals (1971-2000)
Let’s pause for questions from the audience
Multigraph Climate Explorer

Click on a marker to view climate data for that location.
Multigraph Climate Explorer

Click on a marker to view climate data for that location.
Climate Normals from 1971-2000
Roll over x axis, hold your Shift key down, then click and drag
Shift key lets you squeeze or stretch either axis.
Click and drag **without** the Shift key to adjust the view without squeezing or stretching.
Any questions about what these graphs show?
A few caveats

• Some stations will be missing weather or climate data

• If you try to examine more than about 5 years of data at once, your computer will get noticeably slower
Your turn! Start Web Tour of http://climateexplorer.multigraph.org

• Zoom in to a station of interest
• Check out the graph
• Post a comment in the chat window comparing climate and weather
• What else can you discover?
Interpretation Questions
Interpretation Questions
Interpretation Questions
Questions?

Note that the 1981-2010 Climate Normals have recently been released

Fact Sheet from NCDC

Article from ClimateWatch
Drought Baking the Southern United States

Featured Article, September 02, 2011
Caitlyn Kennedy - NOAA Climate Program Office

An intense drought has gripped the southern tier of the United States for several months. With a forecast of above-normal temperatures and below-normal precipitation, the fall Drought Outlook from NOAA’s Climate Prediction Center indicates little relief for much of the Southwest and Southern Plains.

Read More
Input Request: National Climate Assessment

The U.S. Global Change Research Program is looking for expressions of interest on contributing to the National Climate Assessment. Interested parties should submit a brief expression of interest by October 1, 2011. More information on the request for input can be found in the Federal Register as well as the supplemental material. More information on the assessment itself can be found on USGCRPs assessment website.

Climate Science Assessment Reports
Documenting the current state of climate science knowledge

State of the Climate in 2010
Over 360 authors from 45 countries contributed to this comprehensive appraisal of the Earth’s climate. Observations from pole-to-pole show climate patterns like La Nina and El Nino contributed to some climate events this year while trends consistent with manmade climate change are also continuing. Full report and more

Presentation Library
Interactive slide sets about climate science, climate impacts, and adaptation strategies.

Fact Sheets
Short summaries on the state of knowledge about Earth’s climate system.

For the Record
Climate services, decision support, and applications.
Featured

Ocean Acidification Visualization

This 4-minute narrated video on "The Other Carbon Dioxide Problem" explains and illustrates the fundamental change occurring in seawater chemistry as our ocean absorbs carbon dioxide from the atmosphere. From NOAA.

Watch Video Clip »

Sections

Teaching Resources
Student activities, interactive tools, labs, and lesson plans present concepts of climate science. Lessons are correlated to education standards.

Professional Development
Professional development opportunities to support educators in learning and teaching about climate.

Multimedia
Movies, visualizations, multimedia galleries, interactive media, and educational games about climate science.

Why Teach about Climate?
A climate-literate citizenry is essential for protecting fragile ecosystems and building sustainable communities that are resilient in the face of climate change.

Climate Literacy Guide »
www.climate.gov

Scroll below the fold
Global Climate Dashboard — Quick, clear views of data and trends for 14 climate-relevant parameters
Time slider lets you show specific time periods.
Click and drag datasets from the list up to the display.
Click and drag datasets from the list up to the display.
Click and drag datasets from the list up to the display.
Get a quick description of what each graph shows
Global Climate Dashboard

Temperature (°C)

Ocean Heat ($10^{22}$ Joules)

Earlier melting of winter snow has reduced the area of land covered by snow in spring. The graph shows the area covered by snow in the Northern Hemisphere during March and April, shown as the difference from the 1971-2000 average.

Click Read more > to get a short, readable article and a larger graph.

www.climate.gov
Climate Change: Spring Snow Cover

January 29, 2011

Records from the last five decades show that on average, spring snow is disappearing earlier in the year than it did in the past. Across the Northern Hemisphere, the total area covered by snow during March and April has shrunk over time. In step with earlier dates of spring budburst for many plant species, reduced spring snow cover is a sign that winter conditions are lasting for a shorter period while growing seasons are getting longer. These changes in the timing of seasonal transitions are consistent with the observed accumulation of heat-trapping gases in Earth’s atmosphere.

Beginning in the 1960s, weekly maps of snow extent in the Northern Hemisphere were prepared from satellite imagery. Now, satellites provide daily maps of snow cover for both hemispheres. Ground observations, precipitation gauges, and weather stations with pressure-sensitive “pillows” measure the amount of snow on the ground and validate the satellite maps. The graph above shows how the average extent of snow cover each March and April compares to the long-term average extent for those months.
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Your turn! Start Web Tour of http://www.climate.gov

• Take a look at the Dashboard
• Check out some of the features to see what you can learn
• Post a note in the Chat Window describing how you might use this tool or what would make it more useful
Let’s pause for questions from the audience
NOAA’s Earth System Research Laboratory
Global Monitoring Division

Providing the best possible information on atmospheric constituents that drive climate change, stratospheric ozone depletion, and baseline air quality.

ESRL’s Global Monitoring Division conducts sustained observations and research related to global distributions, trends, sources and sinks of atmospheric constituents that are capable of forcing change in the climate of the Earth. This research will advance climate projections and provide scientific policy-relevant, decision support information to enhance society’s ability to plan and respond.
Interactive Atmospheric Data Viewer (IADV)
Interactive Atmospheric Data Viewer (IADV)
Start Web Tour: http://www.esrl.noaa.gov/gmd/dv/iadv/

Task: Choose a station and produce a time series plot showing carbon dioxide from 2000-2010
Interactive Atmospheric Data Viewer (IADV)

Carbon Cycle Gases
Mauna Loa, Hawaii, United States
Time Series

- **Parameter**
  - Carbon Dioxide (CO2)

- **Data Type**
  - Flask Samples

- **Data Frequency**
  - Discrete

- **Time Span**
  - All - a graph of all available data
  - Current - this year's data
  - Last year - previous full year of data
  - Some - a subset of the available data
  - Start Year: 2000
  - End Year: 2010

- Press "Submit" to get this plot
- Download Data
- Save this dataset for later plotting

Generated ESRL/GMD - 2011-September-07 14:09 pm
Interactive Atmospheric Data Viewer (IADV)

The Data: The Story Told from CO₂ Samples
Interactive Atmospheric Data Viewer (IADV)

Current selection:
Halocarbons and Trace Gases
Mauna Loa, Hawaii, United States
Time Series

Options
- Parameter
  - Nitrous Oxide (N2O)
- Data Type
  - Sulfur Hexafluoride (SF6)
  - HCFC-22 (HF22)
  - CFC-12 (FC12)
  - Methyl Chloride (MECL)
  - HCFC-142b (F142B)
  - Halon-1211 (H1211)
  - CFC-113 (F113)
  - carbon tetrachloride (CCL4)
  - Methyl Chloroform (MCF)
  - CFC-11 (F11)
- Data Frequency
- Time Span
  - All - analysis year
  - Current - this year's data
  - Last year - previous full year of data
  - Some - a subset of the available data
  - Start Year: 1974
  - End Year: 2011

Press "Submit" to get this plot
Submit

OR
- Save this dataset for later plotting
Save Dataset

Download Data

Mauna Loa, Hawaii, United States (MLO)

(N2O) Nitrous Oxide (nmol mol⁻¹)

Year


Generated ESRL/GMD - 2011-September-06 08:28 am

NSTA WEB SEMINARS
Education and Outreach

Carbon Cycle Toolkit
- Carbon Cycle Basics
- Student Activity
- Teacher Reference

Isotopes of Carbon Dioxide
- The Basics
- The Data
- The Measurements
- Other Isotopes
- A Note to Educators
- Site Information
- Technical Details

Measuring Greenhouse Gases
- Introduction
  - Air Sampling Network
  - Central Boulder Facility

Resources
- What's in The Air Video
- Lesson Plans
- FAQ's
- Glossary of Terms
- Web Page Links
- Fun Facts

Basics of the Carbon Cycle
An introduction to the Earth's atmosphere and the greenhouse effect, and the role of the carbon cycle in determining the amount of greenhouse gases in the atmosphere. Part of the Carbon Cycle Toolkit.

Isotopes of Carbon Dioxide
A website describing the study of isotopes of carbon dioxide and the process of measuring isotopic ratios. Users learn about both stable and radiocarbon isotopes of carbon dioxide in atmospheric science.

Measuring Greenhouse Gases
Take a tour of the Carbon Cycle Greenhouse Gases group of GMD, and learn the why, where and how behind the measurements of greenhouse gases.

What's in the Air Video
The What's in the Air video is a 13 minute look at the atmospheric monitoring efforts being put forth by NOAA's Carbon Cycle Greenhouse Gases group, and their partners across the globe.

Lesson Plans
Activities designed to facilitate as well as enhance teacher instruction on a variety of topics under the larger heading of "Greenhouse Gases and Earth's Changing Climate."

Frequently Asked Questions
Frequently asked questions about climate change, greenhouse gases, ozone depletion and air quality.
Let’s pause for questions from the audience
This dataset shows the intricate topography and bathymetry of the Earth. The Himalayas in Asia, are home to Mount Everest, the tallest point on Earth at 29,035 feet. The longest mountain range in the world, the global mid-oceanic ridge system, can be found on the ocean floors and runs for approximately 37,000 miles.

Please select a data set from the HAZARDS, OCEANS, and CLIMATE icons above. Manipulate the globe by clicking and dragging it. Click on the tabs (Narrative, More Info, FAQ, References, and Standards) for additional information and resources.

Look/play with the globe to see if you can answer the question posed in the Narrative section.
This is an animation of the daily distribution of carbon dioxide (CO2) in the atmosphere in 2004. The colors represent different CO2 concentrations. The black and white dots show where NOAA Earth Systems Research Lab and its collaborators collect samples of air, to analyze the contents for CO2 and other gases.

CO2 tracking equipment can distinguish between changes in the natural carbon cycle and those occurring in human-produced fossil fuel emissions. This accurate information helps NOAA scientists project future climate change.

Where are there major sources of carbon dioxide? How does the carbon dioxide distribution change with the seasons?
NOAA’s National Weather Service began tracking carbon dioxide in Earth’s atmosphere from a small observatory at the summit of Mauna Loa in Hawai’i 50 years ago. Carbon dioxide is the most important of the greenhouse gases produced by humans and very likely responsible for the observed rise in global average temperatures since the mid-20th century.

During the day, leaves from plants absorb sunlight to take up Carbon Dioxide (CO2) from the atmosphere in a process called photosynthesis. At the same time, plants, animals, and soil microbes consume the carbon in organic matter and return CO2 to the atmosphere during respiration. During winter in the Northern Hemisphere, photosynthesis ceases when many plants lose their leaves, but respiration continues. This condition leads to an increase in atmospheric CO2 concentrations during the Northern Hemisphere winter. With the onset of spring, however, photosynthesis resumes and atmospheric CO2 concentrations are reduced.

The Mauna Loa atmospheric CO2 concentration measurements taken since 1958 constitute the longest continuous record of atmospheric CO2 available in the world. The measurements related to this program are among the most highly regarded achievements in the history of Mauna Loa Observatory. Dr. Keeling was the first to report that global atmospheric concentrations of carbon dioxide were rising.
Climate Literacy Principles
2) Climate is regulated by complex interactions among components of the Earth system.
2c) The amount of solar energy absorbed or radiated by Earth is modulated by the atmosphere and depends on its composition. Greenhouse gases—such as water vapor, carbon dioxide, and methane—occur naturally in small amounts and absorb and release heat energy more efficiently than abundant atmospheric gases like nitrogen and oxygen. Small increases in carbon dioxide concentration have a large effect on the climate system.

5) Our understanding of the climate system is improved through observations, theoretical studies, and modeling.
5c) Observations, experiments, and theory are used to construct and refine computer models that represent the climate system and make predictions about its future behavior. Results from these models lead to better understanding of the linkages between the atmosphere-ocean system and climate conditions and inspire more observations and experiments. Over time, this iterative process will result in more reliable projections of future climate conditions.

6) Human activities are impacting the climate system.
6a) The overwhelming consensus of scientific studies on climate indicates that most of the observed increase in global average
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Where are there major sources of carbon dioxide? How does the carbon dioxide distribution change with the seasons?
Where are there major sources of CO2?
Place a piece of clip art on the globe where you see some evidence of CO2 sources.
How do CO2 levels change with the seasons? (Type your thoughts in the chat box)
This dataset shows the intricate details of Earth's topography and bathymetry. The Himalayas in Asia, for example, are the highest mountains on Earth, reaching up to 29,035 feet. The Long Island Ridge, a significant feature of the Earth's mid-ocean ridge system, runs for approximately 37,000 miles.

Please select a data set from the available icons above. Manipulate the globe by clicking and dragging. Use the tabs (Narrative, More Info) to access additional information and resources.

Look/play with the globe to see if you can answer the question posed in the Narrative section.
The NOAA Geophysical Fluid Dynamics Laboratory (GFDL) created the model shown here, which displays how the growth in CO2 production causes temperatures to increase for the years 1870 to 2100. Blue colors represent temperatures cooler than those in 2000 and red colors represent temperatures warmer than in 2000.

The Intergovernmental Panel on Climate Change, or IPCC, releases assessment reports on the current and future state of the climate. This A1B scenario, often called “business as usual,” makes the following assumptions: Rapid economic growth; a global population that reaches 9 billion in 2050 and then gradually declines; the quick spread of new and efficient technologies; income and way of life converge between regions; extensive social and cultural interactions worldwide; a balanced emphasis on all energy sources.

Which areas does the model predict will warm the most?
How much warming does the model predict where you live?
How does this scenario compare with the “ecologically friendly” B1 model?
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This dataset shows the intricate details of Earth's topography and bathymetry. The Himalayas in Asia are the highest mountains on Earth, reaching 29,035 feet. The long, global mid-oceanic ridge system runs for approximately 37,000 miles, playing a crucial role in the Earth's tectonic activity.

Please select a data set from the icons above. Manipulate the globe and view the tabs (Narrative, More Info) for additional information and related data.

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The Intergovernmental Panel on Climate Change, or IPCC, releases assessment reports on the current and future state of the climate. This B1 scenario, which assumes a more ecologically friendly outlook, makes the following assumptions: Rapid economic growth as in the A1B model, but with rapid changes towards a service and information economy; population rising to 9 billion in 2050 and then declining as in the A1B model; reductions in material intensity; the introduction of clean and resource efficient technologies: an emphasis on global solutions to economic, social and environmental stability.

Which areas does the model predict will warm the most?
How much warming does the model predict where you live?
How does this scenario compare with the “business as usual” A1B model?
When do the projected temperature changes in the different models begin to diverge (What modeled year)?
a.) 2025  
b.) 2050  
c.) 2075  
d.) 2100
Now, you all give it a try.

http://csc.noaa.gov/psc/dataviewer/

START WEB TOUR.
Using the NOAA Global Science Investigator try to answer the following questions. Type your thoughts in the chat box.

Use the Sea Surface Temperature Anomalies section to answer these questions.

1. What is an El Nino and what evidence of an El Nino can you see in the animations?

2. What climatological impacts does an El Nino have on the US?

Use the Sea Level Rise section to answer the next question.

1. What areas in the US appear to be impacted by a 1 meter rise in sea level?
Use the Sea Surface Temperature Anomalies section to answer these questions.

1. What evidence of an El Nino can you see in the animations?

1. What climatological impacts does an El Nino have on the US?

Use the Sea Level Rise section to answer the next question.

1. What areas in the US appear to be impacted by a 1 meter rise in sea level?
What do you think?

How could you use this tool with your audience?

What suggestions do you have that would make this tool even better?

Please put suggestions in the chat box.
Let’s pause for questions from the audience
Chesapeake Adaptation – A tool for understanding the impacts of climate variability in the Chesapeake Bay
Map Tools:
- Pan
- Zoom

Access labels and Map Key

Introduction

Land and sea have generally mingled softly here where the tide meets the fresh flow of East Coast rivers. The Chesapeake Bay is the largest estuary in the United States and one of the world's most biologically rich and productive. For decades, because of the high population of its watershed, the bay has been degraded by toxic contaminants, excessive nutrients, and sedimentation that have shrunk critical habitats.

Now climate change threatens to undo conservation efforts. Bay water is two degrees warmer than in the 1960s, and while global seawater has risen at the rate of six inches in 100 years, the bay has risen nearly a foot because of its naturally subsiding coastal land. The combination of rising seas and subsiding lands has created higher water that has inundated entire islands and left the bay vulnerable to more destructive storm surges from hurricanes. Immediate action is needed, ecologists say.

Impacts to Environment

People and Infrastructure at Risk

Effects on Wildlife

Adaptation and Mitigation

Map Key

Potential relative sea level rise in the Chesapeake Bay may make these areas vulnerable to inundation:

<table>
<thead>
<tr>
<th>Elevation above sea level in meters (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 2 m (6.5 feet) coastal flooding and/or storm surge possible during major storm events.</td>
</tr>
<tr>
<td>1.2 m (3.97 feet) Coastal inundation possible under highest scenario (note: actual limit of ≤1.59 m estimated by Pyke and Najjar Sept. 2008).</td>
</tr>
<tr>
<td>0-1 m (0.3-0.9 feet) Coastal inundation likely.</td>
</tr>
</tbody>
</table>

PROTECTED AREAS

- Federal
- State
- Federal, state, or other
- Built-up area

Scale 1:475,000

1 CENTIMETER = 5 KILOMETERS; 1 INCH = 7 MILES

Sources: Environmental Protection Agency (EPA); World Database on Protected Areas (WDPA); University of Maryland; National Atlas of the United States of America
Select Topics

Select sub-Topics

Select Themes

Introduction

Impacts to Environment

The accelerating sea level rise and increased frequency and intensity of storms will alter the topography of the bay. Since the area was mapped by Jamestown's Captain John Smith in the 1600s, coastal wetlands and beaches have been lost and many others have shrunk dramatically. Dozens of islands have been inundated. Studies suggest that 167,000 more acres of fecund tidal marshes will be gone by 2100, when bay water is expected to have risen some two feet. Marsh habitat will also be lost to saltwater intrusion, causing die-off.

- Underwater Aquatic Grasses
- Wetlands and Forests
- Disappearing Islands
- Watersheds
- Hampton Roads, Algal Blooms
- Barrier Islands

People and Infrastructure at Risk

Effects on Wildlife

Adaptation and Mitigation
The accelerating sea level rise and increased frequency and intensity of storms have had a significant impact on the topography of the bay. Since the 1980s, many coastal wetlands and beaches have shrunk due to storm surges. Many others have been inundated. Since the 1980s, 167,000 more acres of fertile land have been lost to saltwater intrusion, caused by the rising sea levels.

**Wetlands and Forests, Nanticoke River**

A tributary of the lower Nanticoke River flows from the surrounding forest. Such forests prevent millions of pounds of nitrogen and other pollutants from reaching the bay each year, and they maintain underground water recharge, but the watershed has lost 100 acres of forestland per day since the mid-1980s.

**People and Infrastructure at Risk**

- Underwater Aquatic Grasses
- Wetlands and Forests
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- Barrier Islands

**Effects on Wildlife**

**Adaptation and Mitigation**
untold millions and brought death to many town and cities.

Hurricane Isabel, which arrived 70 years later in September 2003, lashed the same terrain as the 1933 storm, with about the same force, but pushed a storm surge and created flooding nearly a foot higher than the unnamed storm of 1933 because of higher sea levels and greater land subsidence since 1933. It also ripped apart previously spared building, beaches, and wetlands and was directly responsible for 16 deaths. Storm surges of three to five feet above normal tide levels swept across the bay, rising to six to eight feet in Annapolis and Baltimore and nearly eight feet along the docks at Washington, D.C., breaking water level records set in 1933. Isabel downed 1,600 trees in Washington and cut electric power to half million people for a week. What would a similar storm bring 70 years from now? It is not hyperbole to talk of hurricanes whose surges will reach deeply into cities and lowlands that have never before been flooded. We presumably will only see worse, because the projected rises in sea level and land subsidence. Unless heroic efforts slow the rate of global warming, sea level could be a meter higher in 2033 than it was in 1933.
Regional Impact Analysis

Introduction

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Washington, D.C.

Dorchester County

Virginia Beach

Baltimore

0.31 meters

1.02 feet

from 1902-1999
Cities around the world are using technology such as tide gates and dikes to limit the effects of seawater rise, but the Chesapeake Bay's sprawling geography often makes such structural solutions ineffective. In Washington, D.C., a powerful storm surge 70 years from now could sever Interstate 395 and flood the tunnel that carried traffic in front of the Capitol. Only the cupola of the Jefferson Memorial would be left poking from the water covering East Potomac Park, and both the bronze statue of Franklin D. Roosevelt and his wheelchair would be lost. The reflecting pool near the Lincoln Memorial would spill over a ridge, lap at the back edge of the Ellipse behind the White House, and seep into the bottom floors of the federal buildings across the street. Anacostia Naval Station and the Washington Navy Yard would also be deep in water. The Main Avenue Fish Market, often flooded even now, would be lost. The greatest risk to built and natural infrastructure occurs during storm surges. By applying the buttons to the map, you can explore the effects of recent Hurricane Isabel and what a storm like Isabel is predicted to do under future conditions of a one or two meter sea level rise.
Cities around the world are using technology such as tide gates and dikes to limit the effects of seawater rise, but the Chesapeake Bay's sprawling geography often will make such structural solutions ineffective. In Washington, D.C., a powerful storm surge 70 years from now could sever Interstate 395 and flood the tunnel that carried traffic in front of the Capitol. Only the cupola of the Jefferson Memorial would be left poking from the water covering East Potomac Park, and both the bronze Franklin D. Roosevelt and his wheelchair would be lost. The reflecting pool near the Lincoln Memorial would spill over a ridge, lap at the back edge of the Ellipse behind the White House, and seep into the bottom floors of the federal buildings across the street. Anacostia Naval Station and the Washington Navy Yard would lie deep in water. The Main Avenue Fish Market, often flooded even now, would be lost.

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The greatest risk to built and natural infrastructure occurs during storm surges. By applying the buttons to the map, you can explore the effects of recent Hurricane Isabel and what a storm like Isabel is predicted to do under future conditions of a one or two meter sea level rise.
What is your favorite monument in Washington D.C.?
The land is starkly flat where Dorchester County, Maryland weaves into the marshlands, and the marsh simply has not kept pace with the rising waters. Here the 26,000-acre Blackwater National Wildlife Refuge, one of the bay's treasured places, harbors a wealth of fish and wildlife, and serves as a stopover and wintering area for thousands of migrating ducks, geese, and swans. Even today some 150 to 400 acres of Blackwater marshland turn into mudflats or water each year, and scientists predict that refuge lands will be gone by 2050. Accelerating the erosion are large rodents called nutria, once introduced from South America to enhance the fur trade, that eat the grasses that keep marsh sediment in place.

The greatest risk to built and natural infrastructure occurs during storm surges. By applying the buttons to the map, you can explore the effects of recent Hurricane Isabel and what a storm like Isabel is predicted to do under future conditions of a one or two meter sea level rise.
The accelerating sea level rise and increased frequency and intensity of storms will alter the topography of the bay. Since the area was mapped by Jamestown's Captain John Smith in the 1600s, coastal wetlands and beaches have been lost and many others have shrunk dramatically. Dozens of islands have been inundated. Studies suggest that 167,000 more acres of fecund tidal marshes will be gone by 2100, when bay water is expected to have risen some two feet. Marsh habitat will also be lost to saltwater intrusion, causing die-off.
The accelerating sea level rise and increased frequency and intensity of storms will alter the topography of the bay. Since the area was mapped by John Smith in 1610, many islands have been lost to erosion, many have begun to fill in from having been filled by land fill, and many have been brought to shore by new channels. Disappearing Islands, Holland Island, MD

In the late 18th century, Holland Island in Dorchester County, Maryland, was five miles long and supported a thriving community with a post office, a church, a schoolhouse, and several stores. Now, only 100 acres of marsh and one building remain, because of subsidence, erosion, and rising sea water.
Now, you all give it a try. 

Using the Chesapeake Adaptation tool,

What are some strategies for adapting to and mitigating the impacts of sea level rise?
What do you think?

How could you use this tool with your audience?

What suggestions do you have that would make this tool even better?

Please put suggestions in the chat box.
Thank You
(This presentation will be archived on NSTA, and please do not hesitate to contact us regarding the use of these tools)

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