Climate Change Here and Now: U.S. Forest Service Research Websites Which Model Potential Future Climate Change and Changes to Bird and Tree Species Distribution

Presented by: Vicki Arthur

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U.S. Forest Service

Climate Change Education Resources to Help You Bring the Climate Change Issue Home

Bird & Tree Atlas

Vicki Arthur
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Also Joining Us

Matt Peters
U.S. Forest Service
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Steve Matthews
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Poll Question

Would it help you be more effective in teaching climate change if you had education resources that brought the issue closer to home?

A. not necessary
B. somewhat helpful
C. very helpful
D. critical
Climate Change Here and Now

http://ipcc.ch/
The Template for Assessing Climate Change Impacts and Management Options (TACCIMO) is a Web-based tool that provides land owners, managers, and planners with the most current climate change science available. Developed by EFETAC researchers in partnership with USDA Forest Service Southern Regional Planning, Land and Resource Management; Southern Regional Cooperative Forestry; and Western Wildland Environmental Threat Assessment Center, the TACCIMO tool:

- compiles climate change projections, literature-based impacts and management options, and Forest Service land and resource management plans in an online database;
- synthesizes these inputs based on user-defined criteria; and
- generates customized reports to aid forest planning and management.

Information generated by TACCIMO can satisfy a range of needs for a variety of users including federal planners and managers as well as state, private, and cooperative forestry stakeholders. Click here to begin exploring TACCIMO or to read the latest TACCIMO news and updates.

TACCIMO includes user guides and training videos as well as a feedback form to guide future development. Demonstration and training webinars are also available for the TACCIMO suite of tools. For more information, please contact:

- Steve McNulty, ecologist and team lead (EFETAC), at steve.mcnulty@ncsu.edu or
• Explanation of Carbon Emissions Scenarios
• Precipitation and Temperature Models

<table>
<thead>
<tr>
<th>Modeling Group</th>
<th>GCM</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canadian Centre for Climate Modeling &amp; Analysis</td>
<td>CGCM3.1</td>
<td>Wet and Cool</td>
</tr>
<tr>
<td>Hadley Centre for Climate Prediction and Research / Met Office</td>
<td>UKMO-HadCM3.1</td>
<td>Hot</td>
</tr>
<tr>
<td>US Dept of Commerce / NOAA / Geophysical Fluid Dynamics Laboratory</td>
<td>GFDL-CM2.0</td>
<td>Dry and Warm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Emissions Path</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRES A2</td>
<td>higher emissions path</td>
<td>technological change and economic growth more fragmented; slower, higher population growth</td>
</tr>
<tr>
<td>SRES A1B</td>
<td>middle emissions path</td>
<td>technological change in the energy system balanced across all fossil and non-fossil energy sources, not relying too heavily on one particular energy source</td>
</tr>
<tr>
<td>SRES B1</td>
<td>lower emissions path</td>
<td>rapid change in economic structures toward service and information; emphasis on clean, sustainable technology</td>
</tr>
</tbody>
</table>

*Decadal averages were calculated from monthly averages of the five years before and after each referenced decade (e.g., 2010 decadal average is an average of monthly data from 2005 to 2014). Temperature is unaffected by reporting the monthly average, but precipitation values must be multiplied by 12 to obtain an annual average.*
Display Temperature Models for Different Emissions Scenarios
Display Precipitation Models for Different Emissions Scenarios
Let’s pause for questions from the audience.
Modelling Climate Change

As the reality of global climate change becomes increasingly apparent to the public and to many policymakers, scientists are being called on to provide information about possible outcomes. Dr. Louis Iverson and Anantha Prasad began modelling and mapping tree species from the eastern United States for their potential response to several scenarios of climate change around 1996. Their first climate change atlas for trees examined 80 tree species and was published in hardcopy and web. Then they joined with Stephen Matthews and Raymond O’Connor (now deceased) to produce a change atlas for 150 bird species. Now, along with Matthew Peters, they have expanded their analysis and loaded to the web 134 tree species and 147 bird species at 20 km resolution, using more accurate modelling tools and newer climate models (GCMs).

Climate Change Tree Atlas

Examine current distributions and modelled future-climate habitats for 134 individual tree species or combined species by geographic areas.

Start using the Climate Change Tree Atlas
Demonstrate:

- How climate change can affect tree and bird species habitat distribution
- Potential impact of different carbon emissions scenarios on tree and bird suitable habitat
- How computer models work and how data drives them
- How computer models are tested for reliability
Show changes to tree and bird suitable habitat from different carbon emissions scenarios.
For many of the species, future suitable habitat is very different depending on whether a low or a high emissions scenario is used.
See introductory videos on website for an overview of how to use and interpret the Bird & Tree Atlases

http://www.nrs.fs.fed.us/atlas/
Try it Out!

You now have five minutes to try out the Bird & Tree Atlases on your own.

When we come back, you can ask questions.
Let’s pause for questions from the audience.
http://www.globalchange.gov
Climate Change, Wildlife and Wildlands Toolkit

NEW Climate Change, Wildlife and Wildlands Toolkit!

http://www.globalchange.gov/climate-toolkit

The kit is designed for classroom teachers and informal educators in parks, refuges, forest lands, nature centers, zoos, aquariums, science centers, etc., and is aimed at the middle school level. The U.S. Environmental Protection Agency, in partnership with six other federal agencies, developed the kit to aid educators in teaching how climate change is affecting our nation’s wildlife and public lands, and how everyone can become “climate stewards.”

Entire Kit Contents Available on Website

• 12 minute video introducing climate change issues as they affect wildlife and wildlands

• Overview of the science of climate change

• Case studies on 11 ecoregions highlighting regional impacts to habitats and wildlife, and information on what people can do to help

• Glossary of climate change terms to build vocabulary

• Classroom Activities keyed to national science standards, developed by participants in the 2008 Albert Einstein Distinguished Educator Fellowship Program

• Additional hands-on activities and formal and informal educator resources
Carbon, Oxygen, Water and Shade: Putting a Price on the Benefits of Your School Yard Trees

Vicki Arthur
David V. Bloniarz
U.S. Forest Service
i-Tree: Demonstrating That Trees Pay Us Back!

In its lifetime, this tree has “paid us back” an estimated $1,500.
National Tree Benefit Calculator

Trees in urban areas provide a number of important benefits. They help to clean the air, curb stormwater runoff, raise property values, sequester carbon, and reduce energy costs.

You have chosen:

- Zip Code: 01107
- City: SPRINGFIELD, MA
- Climate Zone: Northeast

Enter information about a street-side tree and learn about the benefits it provides. Street-side trees are typically located in front yards, medians, parkways, planting strips or other common planting areas adjacent to streets.

The National Tree Benefit Calculator was conceived and developed by Casey Trees and Davey Tree Expert Co.

http://itreetools.org/design.php
Instructions

Species: If you’re looking for a Willow Oak it’s listed as “Oak, Willow”. If your tree isn’t listed, use the general “Other” listings.

Diameter: How wide is your tree at about 4.5 feet from the ground?

Enter your tree info:

Enter your tree’s species:
* Maple

Enter your tree’s diameter (between 0 and 45 inches):
* 12

What land-use type is this tree nearest?
* Small commercial business

Calculate
Calculate a Price for Your Tree’s Overall Benefits!

This 12 inch Maple provides overall benefits of: $92 every year.

While some functional benefits of trees are well documented, others are difficult to quantify (e.g., human social and communal health). Trees’ specific geography, climate, and interactions with humans and infrastructure is highly variable and makes precise calculations that much more difficult. Given those complexities, the results presented here should be considered initial approximations—a general accounting of the benefits produced by urban street-side plantings.

Benefits of trees do not account for the costs associated with trees’ long-term care and maintenance.

If this tree is cared for and grows to 17 inches, it will provide $137 in annual benefits.
Your 23 inch Black oak will eliminate 3,406 gallons of stormwater runoff this year.

Urban stormwater runoff (or “non-point source pollution”) washes chemicals (oil, gasoline, salts, etc.) and litter from surfaces such as roadways and parking lots into streams, wetlands, rivers and oceans. The more impervious the surface (e.g., concrete, asphalt, rooftops), the more quickly pollutants are washed into our community waterways. Drinking water, aquatic life and the health of our entire ecosystem can be adversely effected by this process.

Trees act as mini-reservoirs, controlling runoff at the source. Trees reduce runoff by:
- Intercepting and holding rain on leaves, branches and bark
- Increasing infiltration and storage of rainwater through the tree’s root system
- Reducing soil erosion by slowing rainfall before it strikes the soil

For more information visit The Center for Urban Forest Research
Calculate Your Tree’s Air Quality Benefits!

Air quality benefits of your 23 inch Black oak shown in the graph at left.

Air pollution is a serious health threat that causes asthma, coughing, headaches, respiratory and heart disease, and cancer. Over 150 million people live in areas where ozone levels violate federal air quality standards; more than 100 million people are impacted when dust and other particulate levels are considered “unhealthy.” We now know that the urban forest can mitigate the health effects of pollution by:

- Absorbing pollutants like ozone, nitrogen dioxide and sulfur dioxide through leaves
- Intercepting particulate matter like dust, ash and smoke
- Releasing oxygen through photosynthesis
- Lowering air temperatures which reduces the production of ozone
- Reducing energy use and subsequent pollutant emissions from power plants

It should be noted that trees themselves emit biogenic volatile organic compounds (BVOCs) which can contribute to ground-level ozone production. This may negate the positive impact the tree has on ozone mitigation for some high emitting species (e.g. Willow Oak or Sweetgum). However, the sum total of the tree’s environmental benefits always trumps this negative.

For more information visit: [The Center for Urban Forest Research](#)
Calculate Your Tree’s Carbon Sequestration!

This year your 12 inch Red maple tree will reduce atmospheric carbon by 338 pounds.

How significant is this number? Most car owners of an "average" car (mid-sized sedan) drive 12,000 miles generating about 11,000 pounds of CO2 every year. A flight from New York to Los Angeles adds 1,400 pounds of CO2 per passenger. Trees can have an impact by reducing atmospheric carbon in two primary ways (see figure at left):

- They sequester ("lock up") CO2 in their roots, trunks, stems and leaves while they grow, and in wood products after they are harvested.
- Trees near buildings can reduce heating and air conditioning demands, thereby reducing emissions associated with power production.

Combating climate change will take a worldwide, multifaceted approach, but by planting a tree in a strategic location, driving fewer miles, or replacing business trips with conference calls, it's easy to see how we can each reduce our individual carbon "footprints."

For more information visit: The Center for Urban Forest Research
Poll Question

Are you likely to use these climate change education resources in your teaching and/or recommend them to other educators?

- TACCIMO
  - A. No
  - B. Maybe
  - C. Definitely
- Bird & Tree Atlas
- i-tree Tree Benefits Calculator
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A. No       B. Maybe       C. Definitely
Thank You!

Questions?

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