



**NEWTON
CONSERVATORS**

WINTER ISSUE

NEWSLETTER

Newton's land trust working to preserve open space since 1961

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Climate Change: What It Means for Newton and How We Can Help

By Richard Primack, Professor of Biology at Boston University

In October 2012 Hurricane Sandy hit the east coast of the United States. It took the lives of almost 300 people and caused billions of dollars worth of damage. It submerged much of the New York City subway system, disrupted electrical power for millions, and required months for recovery. Boston narrowly missed Sandy's 13-foot storm surge, but someday we likely won't be so lucky—and climate change will be a contributing factor.

When I began studying climate change in 2002, the effects here in eastern Massachusetts were much less obvious than they are now. We can see that many aspects of our lives are changing as a result of a warming climate. For example, ice skating on Newton ponds in winter—a favorite memory of my childhood—has become increasingly rare because of inadequate ice.

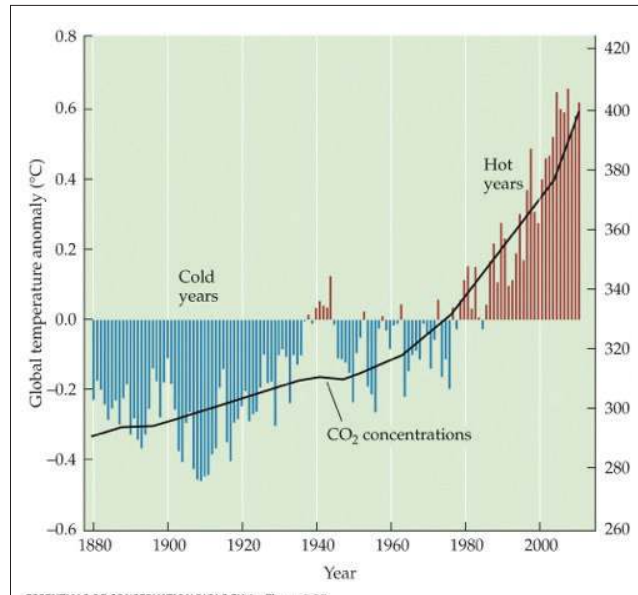
Some of the changes caused by a warming climate are mere inconveniences. Others are changing parts of our communities and family life in ways that affect us deeply and

help define who we are. I grew up walking and exploring the Hammond Woods in between Newton Center and Chestnut Hill. I found my calling as a botanist in those woods, and I hoped to pass this passion for

nature and exploration on to our children. But I was faced with a new danger in Lyme disease, which is spreading and intensifying in part because of a warming climate that extends the tick season earlier in the spring and later in the autumn. I still took my kids exploring in the woods, followed by tick checks, but many parents do not—they fear ticks and the

health problems of Lyme disease. That loss of time in the woods, which used to be so important to Newton's children, saddens me.

Given the magnitude of the impacts, climate change can feel overwhelming, and it can seem like we are helpless to do anything about it. But we can respond. In what follows, I will describe some of the basics about climate change here in Newton and the Boston area—and how we can address this pressing situation.



*Over the past 130 years, global temperatures and carbon dioxide levels have been rising. From *Essentials of Conservation Biology*, 6th Edition. Used with permission of Sinauer Associates.*

What does “climate change” really mean?



Bird's-foot Violet

The best known, and in some ways most important, characteristic of climate change is that the world is getting warmer. Over the past 100 years, the global temperature has increased by 1.4 degrees F. That may not seem like much, but nine of the ten warmest years on record globally have occurred since 2000. Some cities like Boston have warmed much more than average because they have the dual effects of both global warming and warming due to the growth of the city.

It can be hard to see or feel this change because not every year is warmer than the last, and we still get cold days and cold stretches—remember the record cold weather during the winter and spring of 2014—but abnormally warm days, months, and seasons are much more common now than they were in the past. Newton residents may have noticed the increasing number of days and nights that they need to cool their houses with air conditioners.



Red Oak

This rise in global temperatures is being driven by the increasing atmospheric concentrations of carbon dioxide and other heat-trapping gases, caused by the burning of fossil fuels such as coal, natural gas, and oil. Greenhouse gases in the atmosphere act like a transparent blanket on the Earth: they let sunlight pass through but prevent some of the resulting heat from leaving Earth's atmosphere. We need some greenhouse gases in the atmosphere in order to make the Earth a pleasant place to live. However, just like having too many blankets on your bed leads to feeling too hot in the middle of the night, putting too much of these greenhouse gases into the atmosphere is starting to make the Earth too warm.

These increases in heat-trapping gases and warming temperatures, in turn, affect lots of other parts of our climate system and our world. Patterns of precipitation and storms are changing: some places are getting drier, others wetter—sea ice and glaciers are melting; sea levels are rising; and the oceans are becoming more acidic. These changes affect our natural ecosystems and also human necessities such as where and how we grow crops, the reliability of our water

supplies, where and how we build roads and buildings, how we preserve our national parks and conservation lands, and how we manage pests, diseases, and allergies and maintain our own health.

For people living in Boston, the easiest way to “see” these changes in climate is in the earlier flowering and leafing out of plants and the earlier appearance of birds, bees, butterflies and other animals in the spring. Spring events are happening a week or more earlier than they were in the past. You can literally see these changes by looking at historical photographs or museum specimens or by reading old journals, including those of the Henry David Thoreau. I describe many of these changes in my new book, *Walden Warming: Climate Change Comes to Thoreau's Woods*. One of the most striking examples for me is the pink lady's slipper orchid; thirty to forty years ago, this beautiful woodland orchid typically opened its first flowers in mid to late May. Now it often flowers in the first week of May.



Lady Slipper Orchid

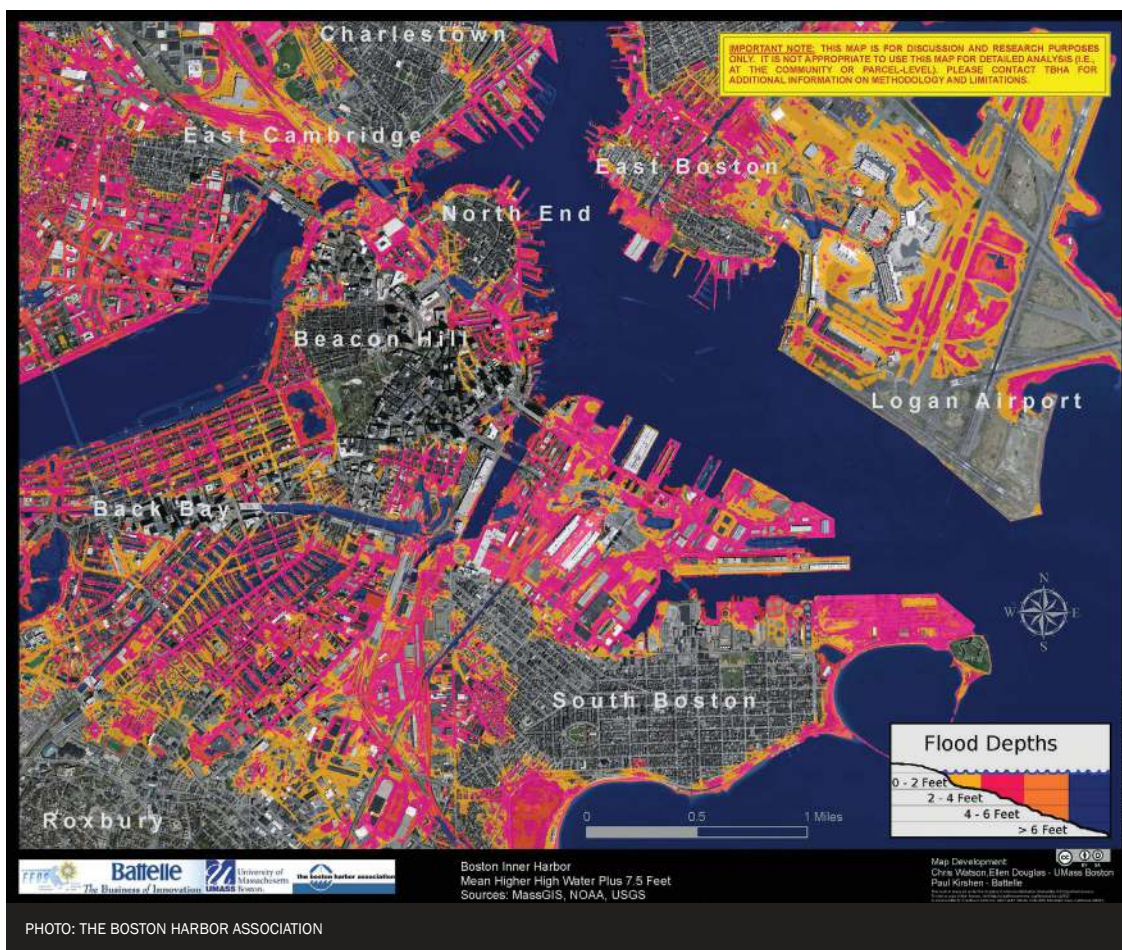
The particular problem of sea level rise.

For Boston and coastal New England, the rising sea level is an especially serious threat. Over the past 100 years, the global sea level has risen by about 8 inches. This is due to two features of climate change: first, water expands as it warms and takes up a larger volume, a phenomenon called thermal expansion, and, second, warmer temperatures are melting the world's glaciers and the polar ice caps. It is estimated that by the year 2100, sea levels will be 1 to 3 feet higher than today and perhaps as much as 6 feet higher.



Monarch Butterfly

Much of Boston is built on former mud flats and tidal marshes along the Charles River, the Mystic River, and inside Boston Harbor, including much of the Back Bay, Allston, Brighton, East Boston, Cambridge, Everett, Charlestown, Somerville, and other areas. These low-lying sections of the city are currently protected from storm surges by sea walls, the Charles River dam and the Mystic River dam. However, these barriers to the sea were designed to withstand hurricanes from the last century. As the sea level rises and as hurricanes



Areas vulnerable to flooding are highlighted in color in this map of the Inner Harbor of Boston; the Charles River basin is shown in the upper left.

become more intense, there is greater likelihood that future storm surges similar to Hurricane Sandy will overwhelm the sea walls and dams that protect Boston. In this scenario, all of the lands previously covered by seawater at high tide will be vulnerable to flooding, causing massive damage and disruptions to metropolitan Boston.

What can we do?

The most important thing that we, as individuals, can do to deal with climate change is to get involved. New Englanders have a tradition of civic engagement and of being adaptable and innovative. We have many organizations, such as the Newton Conservators, that can be leaders in dealing with climate change—and Boston is a hub for academic research and practical thinking.

Some of the solutions for dealing with climate change are daunting but not impossible. We can contact our state and federal representatives and agencies to voice our support for both national and international policies and actions that stabilize and reduce the production of carbon dioxide and protect our communities and the environment in

the future. We should also encourage the efficient use of energy in buildings, private homes, and vehicles. Preparations also need to be made for the near future—for example, we should strengthen and build up seawalls and dams that protect Boston and other low-lying coastal cities; adapt our roads, bridges, buildings, and other infrastructure to changing climate conditions; and adjust our farming, forest management, conservation, and health care to a warming climate and new diseases.

We can also support and participate in research to better understand how climate change is affecting our world. My primary role has been to conduct research and

empower citizen scientists to contribute their observations of the natural world. In my research, I have used our wealth of historical journals, photographs, and naturalist records to examine how plants and animals are responding to climate change. The residents of the Boston area have compiled some of the longest, most valuable records in North America of flowering, bird migrations, ice out and other natural phenomena. These local observations are valuable to scientists around the world. You can contribute too, by participating in new web-based citizen science projects such as eBird, FeederWatch, Nature's Notebook, and iNaturalist.

We cannot stop climate change overnight, but by getting involved, monitoring what is happening, supporting local actions to reduce greenhouse gases, and adapting to changing conditions—as New Englanders always have—we can take the lead in dealing with the threat of climate change. ■

You can read more about Dr. Primack's research on his lab's website: bu.edu/biology/people/faculty/primack/ Also check his research blog: primacklab.blogspot.com