ClimAID

—Recommendations for adapting to a changing climate

By Jonathan Comstock

This past March, I put some snowshoes in the trunk of my car and drove to Tupper Lake to give a talk at the Wild Center. My presentation was a public prelude to a meeting of the Adirondack Climate and Energy Action Planning group (ADKCAP), and interest in it was heightened by the abnormally early snowmelt that had rendered my snowshoes useless baggage. Snowshoes would normally be required for any trail excursion in Tupper Lake in March.

In 2009, I joined a team of scientists commissioned by the New York State Energy Research and Development Authority (NYSERDA) to draft a report—called the ClimAID report—explaining our society's vulnerability to climate change, and detailing how we might adapt to it. My role was to help with the Ecosystems and Agriculture sections, overseen by Cornell University's David Wolfe.

Following the publishing of the report in 2011, I and many members involved in that effort have traveled across New York and the region to educate the public. People everywhere want to know what to expect from climate change and what they can do about it. I've met with grade-school classes, college groups, church groups, and the Science Cabaret, an informal group of people who meet regularly in Ithaca to discuss current and sometimes controversial topics in science.

Climate is fundamental to the human experience. We tend to view climate as a permanent feature, like a mountain, lake or valley, even though natural change occurs, albeit slowly. Significant shifts in climate, like going from the last ice age to our current climate, generally occur over tens of thousands of years. What concerns most scientists today is the rate of change —temperature increases projected for the next 100 years may be as dramatic as those that separate us from the last ice age, thousands of years ago. At that pace (up to 100 times faster than the transition from the last ice age), by the year 2100 the resulting warmer temperatures could cause New York's landscape to change from its current maple-beech-birch forests to a pine-oak woodland that is characteristic of today's mid-south. This could mean major stand die-offs of trees due to their inability to adapt quickly enough, as well as from disease, insect outbreak, and extreme heat or drought. On the other hand, if this change were to occur much more slowly, gradual competition,

Gerard Miller

Extreme weather events cause property damage like the coastal erosion shown here on Staten Island.

recruitment and replacement could occur, one tree and one generation at a time.

One concern in such scenarios is that foreign invasive species might co-opt the transitions. By their very nature, invasive species are specialists in rapid colonization from afar, and in fast growth. Their presence might lead to entire new communities with little room for our native species, rather than the intuitive progression of southern forests shifting their range northward across the continent in a manner akin to ice-age advances and retreats.

Scientists are working to fend off these invaders. At the front line of this battle in New York State is the Partnerships for Regional Invasive Species Management network. PRISM consists of eight regional groups of scientists and volunteers charged with coordinating invasive species partner efforts, recruiting and training citizen volunteers, identifying and delivering education and outreach, establishing early detection monitoring networks and implementing direct eradication and control efforts.

Kelly Elliott, NOAA Office of Ocean Exploration

Rising sea surface temperatures and melting ice caps threaten to alter the habitat of many wildlife species.

PRISM is active across the state and could use additional support. Consider getting involved; it's a great way to actively support the wild lands we love.

As the climate changes, other vegetation, as well as the associated wildlife species, will change. Today's land managers cannot prevent a shift in species composition, but perhaps they can help guide it. For example, we can welcome North American flora and fauna that are adapted to warmer conditions, while trying to keep out aggressive invaders from other parts of the world. We must accept that some change is inevitable, but cherish and preserve our biological heritage at the same time.

Across our state, municipal planners are trying to determine how climate change will affect their operations and infrastructure. I participated in several meetings to revise the Tompkins County Hazard Assessment, a local plan to prepare for and deal with all kinds of emergencies, from flooding to earthquake to industrial accidents. One issue discussed was the topic of more pronounced heat waves in the future, as outlined in the ClimAID report. Extreme heat accounts for more human deaths each year than does extreme cold. Heat also affects infrastructure like asphalt roads, which are more easily damaged at high temperatures. Because we can expect heat waves

Because we can expect heat waves to be more intense, planners will have to take this into consideration when outlining their future needs and responses.

The ClimAID report details a number of climate issues facing us, including more pronounced drought and heat waves in the future.

ClimAID*report*

Commissioned by NYSERDA, the ClimAID report was released in 2011. It provides a comprehensive assessment of climate change vulnerabilities and adaptation strategies for human health, agriculture, native ecosystems, and infrastructure from transportation and communication to water management and energy production. It details likely change and evaluates possible solutions. Many earlier studies analyzed the root causes of climate change and how to reverse them. Scientists refer to those efforts as mitigation. In dealing with this worsening crisis, we need to engage in both mitigation and adaptation; that is, to hold change within manageable limits, and then deal with it effectively. The ClimAID report provides a toolbox of information, ideas and approaches for New Yorkers to deal with the climate changes we face. For more information, visit **www.nyserda.ny.gov/climaid**.

to be more intense, planners will have to take this into consideration when outlining their future needs and responses.

The agricultural community is another segment of our society wrestling with the effects of climate change. Farmers are always watching the weather and trying to make the right choices for their crops. I have found that recognition of climate change is mainstream in some groups, like the Northeast Organic Farmers Association or the Northeast Sustainable Agriculture Working Group, but many farmers are still skeptical that human activity can affect the climate. However, skepticism is overridden by realism when success depends on making the right choices: optimal planting dates are getting earlier; wet conditions during spring planting are an increasing challenge; new pest and weed problems will likely come with milder winters; and new plant varieties may prove more productive during longer, hotter growing seasons. Within the past few years, New York farmers lost crops to flooded fields from intense rainfall events one year, and then had reduced yields the next year because of midsummer droughts. Last autumn, fruit growers in many parts of New York lost most of their 2012 crop to frost damage, because an unprecedented March warm spell brought fruit trees into bloom a month earlier than usual. Frosts then killed the blossoms, so the apple crop was ruined.

These challenges have management solutions, but the solutions sometimes involve expensive adaptive strategies like new equipment. Making wise decisions in tight economic times depends in part on recognizing that past experience alone is an imperfect guide to a changing future. Luckily, the ClimAID report gives guidance on what to expect.

Overall, the impact of climate change on our natural ecosystems is likely to be more profound than that on agriculture, because natural ecosystems will largely need to adapt themselves. The projected change in climate this century would require an average range shift for all species of several hundred miles (mostly moving northward or significantly higher in elevation) across the landscape.

Jon Morrison

In 2012, a lot of New York's apple crop was lost to frost damage following an unprecedented warm spell that brought apple trees into bloom a month early.

Can species do it on their own? For some, the answer is yes. Birds and other mobile creatures are already showing shifts in their breeding range and overwintering habitats. Not all creatures have wings, however, and for those who do successfully move with the climate, will the species they depend on for habitat and food be there, too?

In many cases the best thing we can do for these assemblages of immobile wild species is ensure that they aren't trapped in "wilderness islands" with no way to reach the next available habitat. We must manage our wild lands to retain bands of connection across the entire landscape, not just in island-like preserves. Many organizations from state and federal agencies, to non-governmental organizations like The Nature Conservancy, to local land-trusts, are working hard to achieve this, but they all need your help because they are struggling against suburban sprawl and development. We need coherent regional plans to meld economic development with ecosystem health.

The prospect of holding climate change in check seems remote today, not because of a lack of technical ability, but because most people have not made arresting climate change a personal top priority. I'm certain that in time, driven by accumulating effects, we will demand effective action, both of ourselves and of our leaders. But how much will our climate change before that happens?

Whether wild or managed, New York's landscape faces a future of upheaval and transition. How much is saved, and what is lost will depend, in part, on each of us. Now is the time for both individual and collective action, as our choices define how society will adapt to the global changes set in motion by our energy consumption and land-use practices.

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Earth showing Hurricane Sandy
October 28, 2012

NASA

SUPERSTORM SANDY AND CLIMATE CHANGE

In today's society, climate change is a hot-button issue. When Superstorm Sandy smashed into the East Coast this past October, it had many back at the discussion table asking important questions, like: Was Sandy's destructive impact increased by climate change?

Hurricane development depends on many complex factors. Did climate change alter certain factors associated with Sandy (like sea surface temperatures, and the high pressure over Greenland that made the storm turn inland instead of out to sea), to cause it to become a "superstorm"? This sort of postulation is what climate scientists call "attribution"—how a specific weather event can be attributed to a particular cause in a global climate system that is very capable of producing extreme events from time to time on its own. It is one of the hardest things to do, and, in the case of Sandy, is a source of some debate. Many climate scientists view Sandy's origins as fairly typical; others think that things like the loss of arctic sea ice played an important role in the storm's development and path.

About 15% of the elevated sea surface temperatures feeding Sandy can be attributed to global warming as opposed to other regional patterns. There has also been nearly a foot of sea-level rise over the past century as the oceans have warmed. These factors, as well as others (like peak storm surge coinciding with high tide), increased Sandy's coastal flooding and damage.

We can predict that climate change will become more important throughout the coming century as major flooding events could become relatively commonplace. This would be due, in part, to steadily rising sea temperatures, ice melt and, in this context, to an accelerating rate of sea-level rise.

The ClimAID report discusses two different projections of sea-level rise. The more conservative estimate suggests an additional two feet in sea-level rise due to the warming ocean water expanding and melting of the Greenland and Antarctic ice sheets. However, more attention is being given to the alternative idea that, even though total melting of these ice sheets will take centuries, they may melt more quickly than anticipated and could contribute to a sea-level rise of more than four feet this century.

Climate scientists continue to try to resolve the difference between these two projections. However, the rapid loss of arctic sea ice and current estimates of melt rates cause many to take higher rates more seriously. If the more dire predictors occur, and if carbon emissions continue on a high trajectory, coastal flooding events that now occur about once in a hundred years would happen as frequently as once in every 15 to 20 years.