

# Natural Communities Coping With Climate Change

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**T**here is now no doubt that people are changing the climate on earth: change is already well underway, and will continue at ever-increasing rates. While most attention naturally focuses on the implications of these changes for human welfare, we must remember climate change profoundly affects animals, plants, and even microbes and perhaps more quickly. It is crucial that we understand climate change and how it will affect our primary objects of concern as environmental guardians, so that we can try to minimize the most harmful changes that could be coming.

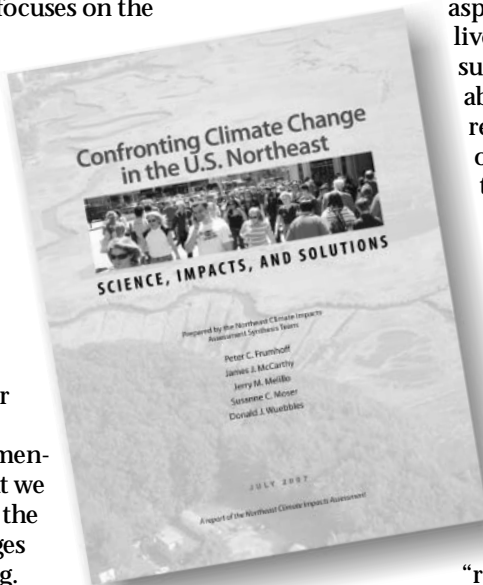
Projections of climate change in the mid-Atlantic regions show that we can expect warmer and shorter winters with more rain and less snow, droughts occurring during most summers and longer, hotter summer seasons (*Confronting Climate Change in the US Northeast 2007* publication available at [www.northeastclimateimpacts.org](http://www.northeastclimateimpacts.org)). If

emissions continue at their current rates, by 2070-2090, New Jersey could have Georgia's and South Carolina's current climate. These long-term changes affect all aspects of animal and plants lives - their physiology, susceptibility to disease, ability to grow and reproduce, and the timing of events such as migration, egg-laying and flowering. Also, extreme events - very hot, cold, dry and wet - often have larger effects on natural communities than do the slow changes in seasonal averages. So do large storms, forest fires, or insect outbreaks. In other words, one extreme event can "re-set" plant and animal populations and re-structure whole ecological communities for a long time.

## Examples of Climate Changes

Climate change is already affecting plants and animals throughout the world in many ways.

- Through increasing events coral reefs turn white and die. The symbiotic algae,



which live within the body of the coral (the animal within the hard outer casing that makes up a reef), cannot tolerate increasing ocean temperatures because their photosynthetic enzymes malfunction. When the algae are expelled, the corals die. As this has been happening at a rapidly accelerating rate over the past ten years, it is now estimated that up to 50 percent of coral reefs may currently be on the verge of collapse (Ove Hoegh-Guldberg, *Coral Bleaching, Climate Change and the Future World's Coral Reefs*, 1999).

- Closer to home, the copepods, one of the main components of the North Atlantic zooplankton (the small floating animals that are at the base of the food web for most fish) have changed their distribution in response to climate change. Southern species have moved north, and some northern species have disappeared, having no place further north to which they can move.

Terrestrial organisms are similarly showing the effects of climate change.

- Warmer temperatures and summer droughts in Alaska have led to a decrease in growth of white spruce, the major timber tree, and a four-fold increase in the incidence of wildfire.
- In England, a 40-year-long study of wildflowers has shown that most plants are now flowering about six days earlier in the spring, and living about five days longer, with the greatest effects on early spring blooming species.
- In the Netherlands, a long-term study of pied flycatchers has found that over the past several decades, migratory birds are laying their eggs earlier, and the chicks are hatching earlier, but their insect food source is not changing in the same way. As a result, most populations have

experienced a 90 percent decline in numbers since the study began in the 1970's.

- Numerous other studies have shown that many other bird species, butterflies and amphibians are breeding and emerging earlier, and/or changing their migration schedules. Species are moving north, into areas that had never been inhabit-

able for them before. What about at home? What can we expect in New Jersey? Because temperature and moisture conditions affect so many aspects of the lives of all plants and animals, it is certain that the biologies of many species will change, but it is very difficult to predict exactly which species will change, in what ways, and by how

much. It can be expected that more southern species, including pest species like kudzu, the highly invasive vine, may move north into our area, and any heat-sensitive species that reach their southernmost point of occurrence in New Jersey may depart for more northern areas. The abundance of other species may neither newly appear nor disappear, but subtly change from abundant to rare or vice versa. To project where forest trees will be found, the US Forest Service has combined a climate model with detailed information about climate tolerances ([www.nrs.fs.fed.us/atlas/tree/ne\\_fortypes.html](http://www.nrs.fs.fed.us/atlas/tree/ne_fortypes.html)). For example, American beech, part of the northern hardwood forests of northern New Jersey, may become more abundant, and even be found in the Pinelands (probably because of the projected increase in precipitation in future climates), by 2100. Black oak, a tree associated with dry habitats, is projected to become less common especially in southern New Jersey, but possibly more



widespread in northern New Jersey. The Forest Service scientists' projections also project a change from diverse forest communities in north Jersey to a situation with only oak-hickory forests throughout the state. Finally, applying these models to migratory birds, Forest Service scientists forecast that forest birds, such as wood warblers, thrushes and orioles, may experience major shifts in their ranges as climate and the plant communities' change.

### Effects on Communities

Climate change is not alone as an emerging threat to our natural communities. A number of other same-time problems - including the invasion of exotic insect pests, pathogens, invasive plant species and the presence of extremely high densities of deer - are making for dire situation indeed for our natural world. Gypsy moths, hemlock woolly adelgids, Asian long-horn beetles, bacterial leaf scorch of oak, and the possible arrival of sudden oak death (a new fungal disease), are all examples of exotic pests that kill forest trees. The openings created by these pests are often filled by invasive non-native plants - Norway maple, barberry, mile-a-minute vine, and many others. Extreme deer browsing compounds the problems, as many non-native plants are much more resistant to heavy browsing than the native species. When climate extremes - heat and/or drought - or very intense storms affect New Jersey, the combination of climate effects on individual plant and animal species, excess deer, and invasive species all combine in a "perfect storm" of stresses from which our natural communities may not ever recover.

What can we do against such a frightening situation? I believe that municipalities can take several important steps to alleviate the stresses of climate change on our plants and animals, amidst the multiple other threats to their existence, and to maximize the chances for them to adjust and survive.

1. It is essential to preserve land in connected corridors, so that species can move in response to climate changes.

This implies that adjoining municipalities should work together to ensure that the lands each one preserves and protects link together to provide the maximum amount of flexibility to organisms to respond to environmental changes.

2. Recent research in New Jersey has shown that even small patches of land surrounded by dense suburbia or even factories and shopping centers retain considerable biodiversity. No patch is too small to warrant an effort to protect it as habitat for a wide range of species. Again, the more patches are available, the more likely it is that species can adjust to changing climate by finding new homes.
3. Municipalities need to take the initiative to control deer populations, since the state will not address this. Municipalities should work together to control deer developing and implementing management plans, so that the animals do not simply move from one town to the next to avoid control efforts in one locality. Without effective reduction in deer numbers, many native species will have little chance of surviving the multiple stresses that are occurring. This point cannot be stressed too strongly!
4. Promote backyards as wildlife habitat, with the planting of native species. This will help migrating animals and reduce the presence of potentially invasive exotic species in residential areas.
5. Undertake vigorous campaigns to limit the planting of known invasive plants on municipal, residential, and commercial properties. Numerous non-invasive horticultural species, both native and non-native and many sources of information to help land owners choose plantings wisely are available.

With some foresight and care, we can indeed help the organisms we so highly value adjust to a changing world.

Specific references to **Science** and **Nature** magazines are available at [www.anjec.org/html/report.htm](http://www.anjec.org/html/report.htm) as separate PDFs. 