

## How will a changing climate affect the southern Appalachian Mountains



*Scientists predict more rain will come in the fall and winter months when runoff is greatest and less rain in the spring and summer months when plants need the moisture.*

Well, so much for global warming! Right? Beijing just had its coldest morning in almost 40 years and its biggest snowfall since 1951. Britain is the coldest its been since the early eighties. The oranges are freezing in Florida and a few excited souls in the Sunshine State were able to scrape enough snow together right after Christmas to make a snowball. Here in western North Carolina, this frigid winter of snow and ice is the worst since the 1970's.

First of all, global warming is not the correct term nowadays. Climate change is the currently in-vogue term for describing what is going on in the atmosphere. What happens this month and this year is weather. Climate occurs over an extended period of time - decades or centuries. When scientists speak of rising temperatures, they are speaking of a **global** average temperature. In general, global temperature is easier to project than local or regional changes.

Second, according to Gerald Meehl, a senior scientist at the National Center for Atmospheric Research in Boulder, Colorado, "we'll still have record cold temperatures. We'll just have fewer of them."

Deke Arndt of the National Climactic Data Center in Asheville, NC says that "2009 will rank among the 10 warmest years since 1880.

What exactly is climate change? Not to over simplify, but change is inevitable in all aspects of life. To deny change is like denying you woke up this morning.

The earth's climate has changed many times during the planet's history. Climate change events have ranged from ice ages to long periods of warmth. Historically, natural factors such as volcanic eruptions, changes in the earth's orbit, and the amount of energy released from the sun have affected our climate. (EPA, <http://epa.gov/climatechange/basicinfo.html>).

### Here are a few Climate Change fast facts from the National Geographic:

- ✓ Average temperatures around the world have climbed 1.4 F degrees since 1880.
- ✓ The rate of warming is increasing. The 20th century's last two decades were the hottest in 400 years.
- ✓ Arctic ice is measurably melting.
- ✓ Glaciers and mountain snows are melting. Montana's Glacier National Park now has only 27 glaciers, compared with 150 in 1910.
- ✓ Coral reefs, which are highly sensitive to small changes in water temperature, suffered the worst bleaching, or die-off in response to stress, ever recorded in 1998. Some areas saw die-off rates of 70%.



*Ice storms, like the one that hit the Southern Highlands Reserve this winter, are a part of weather, not climate.*

According to the EPA, "over the past 200 years, the burning of fossil fuels and deforestation have caused concentrations of heat-trapping 'greenhouse gases' to increase significantly in the atmosphere. These gases prevent heat from escaping to space - much like the glass panels of a greenhouse."

SHR staff recently attended the 19th annual meeting in Asheville, NC of SAMAB (Southern Appalachian Man and the Biosphere). SAMAB is an annual gathering of 11 federal agencies and 3 state agencies, all involved in management of our natural resources. Also in attendance were representatives from the academic community and non-profit conservation groups like The Nature Conservancy and the Southern Highlands Reserve. The theme of this year's conference was climate change. Of the 300 people attending the two day conference, not one seemed to question the science. All were concerned with formulating the right questions to ask in regards to planning for a future no one could predict except to say that changes were coming.

There are skeptics, however. The global warming debate shows no signs of cooling off. The recent discovery of emails between British and US scientists that expose private conversations about whether certain data should be released to the public have fueled the debate.

### **Here's the 'climategate' controversy in a nutshell:**

While thermostat readings have consistently shown a temperature rise over the past 100 years, tree-ring samples show temperature increases stalling around 1960. A graph was produced that demonstrated only the temperature increases, leaving off the tree-ring data. Scientists, however, have argued that dropping the tree-ring data was no secret and has been written about in scientific literature for years. Climate change skeptics have heralded the emails as an attempt to fool the public. Climate scientists, however, maintain that these controversial points are small blips that are inevitable in scientific research and that the evidence for human-induced climate change is much broader and still widely accepted.

**Tom Friedman, columnist for the New York Times, seems to have the right idea when he proposes that we adopt the 'Dick Cheney approach' to the climate change controversy.**

Right after the terrorist attack of September 11, Cheney, in the face of concerns that a Pakistani scientist was offering nuclear weapon expertise to Al Qaeda, reportedly declared: "If there's a 1% chance that Pakistani scientists are helping Al Qaeda build or develop a nuclear weapon, we have to treat it as a certainty in terms of our response." Cheney contended that the US had to confront a new type of threat: a "low probability, high-impact

event."

"This is not complicated," states Friedman. "Our planet is enveloped in a blanket of greenhouse gases that keep the earth at a comfortable temperature. As we pump more carbon-dioxide and other gases into that blanket, more heat gets trapped."

When I see a problem that has even a 1 percent probability of occurring, says Friedman, and that problem is irreversible and potentially catastrophic - I buy insurance. In regard to climate change, the odds are a lot higher than 1 percent.

What does all this mean for the southern Appalachian mountains? The southern Appalachians are full of iconic images that describe the mountains to all of us .... spruce and fir trees shrouded in clouds and fog on the Blue Ridge Parkway, the graceful and stately Rhododendron maximum covered with white and pink blooms in early summer and all the exquisite and sometimes hard-to-find rock outcrop plants of the Smokies and the Blue Ridge Parkway.

Are all these iconic images in our minds eye going away? No one knows. The ecosystems that will be affected by climate change are complicated. That complication, or diversity, in addition to making ecosystems difficult to understand, is the one thing that makes them the most resilient to change. If warming temperatures reduce this complexity, the result will be more fragile communities. Sam Pearsall of the Environmental Defense Fund says that 'preserving the complexity and redundancy of ecosystems so they do not disappear is the foremost objective. Who knows where they will be located or what state of existence they will be in .... just be sure they are still here.'

Land managers and conservation professionals, both public and private, are beginning to ask these questions in an attempt to form new approaches to their management techniques. In short - how to respond to unavoidable unknowns. All the factors surrounding climate change are complex and confounding. This makes explanation difficult and prediction even more difficult.

A 2009 Department of the Interior report titled *Climate Change: Concepts and Approaches for Management Adaptation* states "management adaptations to climate change has focused mostly on strategies for bolstering the resilience of ecosystems to persist in their current states. Yet, in the longer term, it is anticipated that climate change will push certain ecosystems and species beyond their capacity to recover. When managing to support resilience becomes infeasible, adaptation may require more than simply changing management practices - it may require changing management goals and managing transitions to new ecosystem states. After transitions have occurred, management will once again support resilience - this time for a new ecosystem state."

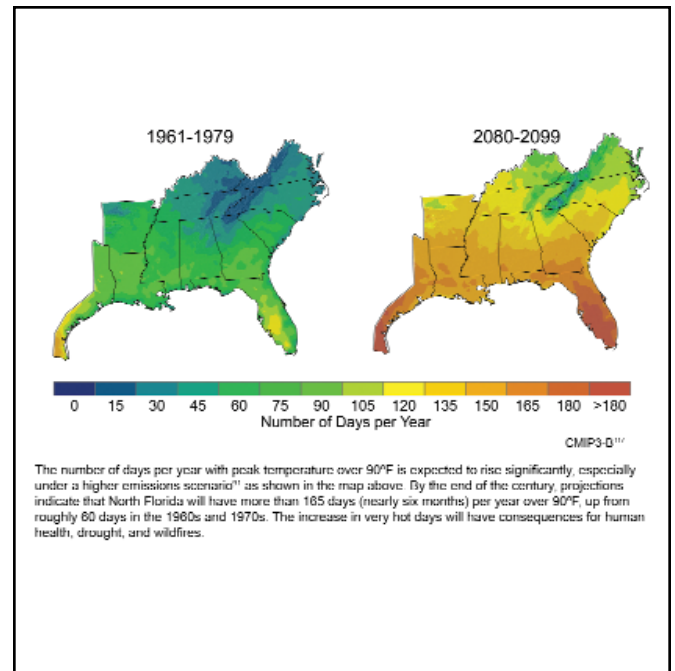
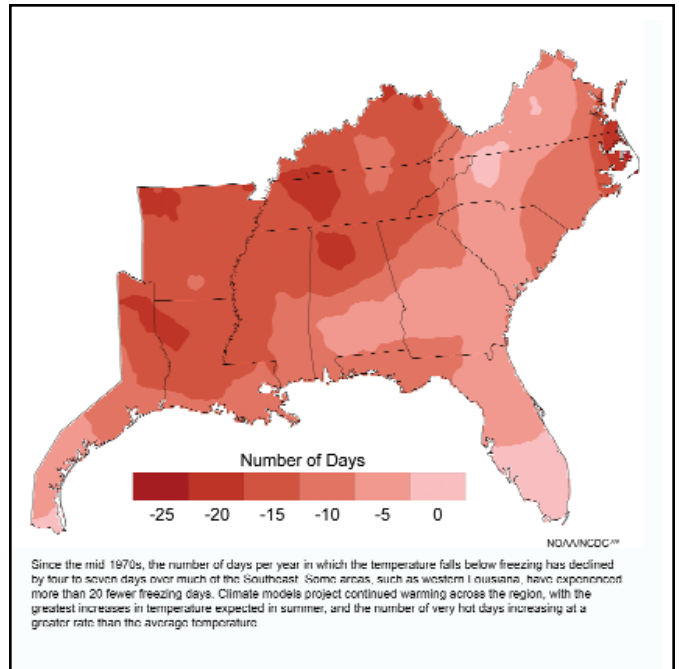
Steve McNulty, of the US Forest Service Southern Research Station in Raleigh, compares climate change to gradually turning up the thermostat in a room full of people.

As the temperature warms, some will begin to remove jackets and roll up their sleeves. They are adapting to a changing environment. If the temperature continues to rise, however, some may actually leave the room. The diversity in the room is suddenly reduced and the question arises - what do we do about those people (and plant and animal species) that are now out in the hall?

The future seems sure to be filled with uncertainty but as Sam Pearsall urged in his keynote address at this fall's SAMAB conference, the answer lies in changing and adapting to future conditions and, above all, to assume hope.

Hope lies with the young generation of land managers and students preparing to enter this exciting field. Over coffee earlier this winter, Dick Bir, retired from a 25 year career with NC State University at the Fletcher Research Station, observed that in 1965 there were only two universities in the US that offered courses in ecology. Today, most major universities have extensive conservation and ecology departments that are filled with young people dedicated to a life of preserving our natural resources. Advances in GIS technology, computer modeling and data collection and processing techniques will provide a basis for future decisions that has not existed in the past.

*The following illustrations are from the US Global Change Research Program ([www.globalchange.gov](http://www.globalchange.gov))*



Although the understanding of climate change has advanced significantly during the past few decades, many questions remain unanswered. It is important that we continue to improve our understanding of changing climactic conditions on our planet.

If current scientific research and understanding proves correct, changes are coming. The challenge will be to resist the urge to preserve landscapes as we know them today but to adapt and manage for these changes in a way that insures ecosystems remain viable, complex and diverse.

