

## CLIMATE CHANGE IN APPALACHIA:

A STUDY SHOWS THAT APPALACHIA MAY PROVIDE A “STRONGHOLD”  
OF NATURAL RESILIENCE — BUT DON’T GET COMPLACENT;  
OR, WHAT HAPPENS WHEN THE CHICKADEES RUN OUT OF MOUNTAIN

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Photo by James Edgar.

Initially, the headline appears to offer a glimmer of good news. “Nature Conservancy Study Shows Appalachian Mountains To Be A Climate Change ‘Stronghold.’”

That is the title of a June 2012 news report by Russell McLendon on the Mother Nature Network website. A student in a class I am teaching at East Tennessee State University, on a September afternoon in 2016, has projected the article onto the 4x6 foot screen at the front of the classroom. Sunlight filters through spaces between the slats of closed window blinds at the far side of the room. Beneath the headline, on screen, sprawls a stock photo of a gorgeous Appalachian mountain scene, apparently taken in the southern highlands from an aircraft in midsummer. The caption below the photo reads:

“A new study suggests the Appalachian Mountains are resilient to droughts, heat waves, and other effects of climate change.”

I am teaching an honors reading and writing course. The course centers around the broad topic of global warming. As you might imagine, happy news has been in short supply in this classroom, especially in this particular year. You may already know that global average temperatures recently have been going through the roof. 2014 was the hottest year on record. 2015 crushed 2014. And 2016 is on track to crush 2015. Fourteen of the fifteen hottest years have occurred since 2000. (See “Think It’s Hot Now? Just Wait,” by Heidi Cullen, in the August 20 *New York Times*, for a compelling analysis, as well as complete documentation.)

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Class discussions have thus touched on a seemingly endless procession of grim reports and prognostications: flood, drought, ocean acidification, coastal inundation, and—one of my favorite new terms, “dust bowlification.” A NASA study released in 2015 projects that, if CO<sub>2</sub> emission rates remain on their current upward trajectory, then by the end of the century, soil moisture averages throughout most of the Great Plains, the U.S. Southwest, Mexico and Central America will be lower than the averages recorded in the Great Plains during the 1930s Dust Bowl period.

In other words, NASA is saying that, before some people now living pass from this earth, Central America, Mexico, and large swaths of the U.S. will become dustbowlified.

As part of the class requirements, students are reading Elizabeth Kolbert’s *The Sixth Extinction*,

adaptable species of hairy biped. The same species that possesses the imaginative capacity to represent the world in signs and symbols, it turns out, has the corresponding capacity to change that world irrevocably, and perhaps to destroy it.

Thus, five weeks into the semester, we in the class have already discussed predictions of large-scale migrations of climate refugees marching northward through North America by the end of the century. (If the NASA soil-moisture projections do, indeed, come to pass, likely more than 100 million people will be displaced by the aforementioned dust-bowlification.) Students in the class have further gone on to discuss—get this—the possibility that we may be the last generation of humans to catch fish in large numbers because the world’s oceans will be depleted by the year 2100. (Google the 2012 BBC report for the depressing details.) We’ve

say that the students, to their great credit, encounter the relentless bad news in this class with endless good cheer. Perhaps because they’ve grown up with catastrophe looming, these twenty-year-olds—the post-9/11, *Game of Thrones* generation—seem comfortable with, or perhaps, rather, numbed to, the idea that cataclysm is ever ready to descend, be it by means of fire or ice.

Nevertheless, like me, the students still seem eager to pounce on the good news from the Mother Nature Network which is now projected up on the big screen in class. The student presenting the article is preparing for a research project with the working title “Climate Change in Appalachia.” She has found the article with the help of a quick web search and a Huffington Post link, and has brought it up on screen for discussion. Further digging reveals the back story: The Eastern Division

**“I HAVE BEEN EMERGING FROM THE CLASSROOM EVERY TUESDAY AND THURSDAY MODERATELY STUNNED BY THE BLEAKNESS OF IT ALL.”**

the winner of the 2015 Pulitzer Prize in General Nonfiction. That book relays how, over the course of its four-and-some billion year history, our planet has experienced five major extinction events. And now it is experiencing a sixth. Yes, as you may have heard, the globe is currently undergoing a major die-off of flora and fauna. Furthermore, Kolbert demonstrates persuasively that, as one of her subtitles put it, “the cataclysm is us.” The hypothesis, which is gaining widespread acceptance among scientists in a variety of disciplines, is that the cause of the Sixth Extinction is one particularly

gone so far as to talk in class about what species might replace homo sapiens, in the entirely conceivable if probably quite distant event that the planet does, indeed, become uninhabitable for us. (The leading candidate: giant rats. Or, to be more precise, rat-like creatures of variable sizes. Paleobiologist Jan Zalasiewicz contends that rats and their successors will be best positioned to occupy the ecospace that would open up, were humans to fade into oblivion.)

I have been emerging from the classroom every Tuesday and Thursday moderately stunned by the bleakness of it all. Yet I have to

of the Nature Conservancy has been working for years on a multi-million dollar “Resilience Analysis” for the eastern U.S. The 2012 news report concerns the completion of the first phase of the Nature Conservancy analysis, which focuses on the Northeast and Mid-Atlantic region. A second phase of the study, focusing on the Southeast, was completed in September 2014.

That second study is entitled “Resilient Sites for Terrestrial Conservation in the Southeast Region.” The study is designed to help conservationists confront the fact that, as the planet warms, as



habitats change, plant and animal species distributions are likewise changing in unpredictable ways. The question is: how do you maximize biodiversity in the future, if you don't know exactly where different plants and animals are going to want to live? The answer is to identify "resilient" sites. The study team used newly developed digital tools to map the region's geophysical characteristics, including geophysical diversity, topographical complexity, and local connectedness and natural cover. It likewise mapped current biodiversity, based on information about the locations of rare species and natural communities. The result of all this work is the 2014 report, and a "Resilient Lands Mapping Tool," which will help conservationists to acquire a "conservation portfolio" that should maximize the amount of biodiversity preserved in the future, in the face of the fact that species distribution will change in unpredictable ways.

So what makes Appalachia a good region for "strongholds" of resilience? Pretty much what you might expect: First of all, according to the NASA predictions, the Appalachian region should be able to avoid the worst of the chronic drought expected in Central and North America by the end of this century. Take a look at the NASA map that illustrates projected moisture levels for the year 2095. (Available here: [www.nasa.gov/press/2015/february/nasa-study-finds-carbon-emissions-could-dramatically-increase-risk-of-us](http://www.nasa.gov/press/2015/february/nasa-study-finds-carbon-emissions-could-dramatically-increase-risk-of-us).) The color brown indicates dust-bowl levels of dryness. As you'll see, much of North America is covered brown, on the map. However, a hopeful crescent of light blue appears along the Appalachian range, indicating that our region is not expected to be hit too badly.

More important, according to the Nature Conservancy study, the variable altitudes in the mountains provide ecological resilience. As the planet warms, variable terrain will allow both plant and animal species a chance to "micro-migrate"—basically, to climb up to cooler areas if they need to. This second aspect of Appalachian natural resilience already makes intuitive sense to

of New England—is that, compared to other regions in the eastern U.S., this region has high rates of undeveloped land, including vast stretches of public lands owned by the good ol' USDA Forest Service. This undeveloped land allows for high "permeability"—movement of species which would otherwise be interrupted by roads, buildings, and other elements of human settlement.



The author's class discusses global warming in Appalachia. Photo by James Edgar.

me. As I mention during class discussion, I already know, from Tim Silver's *Mount Mitchell and the Black Mountains: An Environmental History* (2004), that some migrating bird species, for example, including the Carolina wren and the Carolina chickadee, spend their entire year on Mount Mitchell, merely moving up and down elevations as the seasons change. This is what the study means by a resilient landscape.

Another resilient characteristic of the Appalachian mountain range—the conservancy study views that range broadly, from the southern highlands, to the Adirondacks, and on up to the high mountains

Here is how the 2014 Nature Conservancy report describes the resulting "strongholds":

Natural strongholds are places where the direct effects of climate change are moderated by complex topography and connected natural cover, and where the current landscape contains high quality biodiversity features. Natural strongholds can serve as a bridge to grant safe passage into the future for thousands of species.

The research project, and the corresponding "Resilient Lands

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Mapping Tool”—[maps.tnc.org/resilientland](https://maps.tnc.org/resilientland)—are part of an effort to guide the Nature Conservancy and its affiliates, during the decades to come. The goal is to prioritize the conservation of lands that will allow for natural resilience. It is a very smart approach: The report will help conservationists decide where best to spend resources. The initiative is important—truly visionary, there’s no question.

However, the more we read about the project, in my classroom—and the more these college students discuss it—the more the initiative starts to feel like a kind of last-ditch effort. Sure, this conservation plan will help slow down species loss, as the planet inevitably warms. The regional director of conservation science with the Nature Conservancy, Mark Anderson, puts it this way: Appalachian conservation strongholds “could serve as breeding

grounds and seed banks for many animal and plant species that otherwise may be unable to find habitat due to climate change.” Breeding grounds and seed banks are great. But they don’t sound like long term solutions.

So, as the class period draws to a close, the question repeatedly arises: What happens when the planet keeps warming, as it is projected to do if CO<sub>2</sub> emissions continue unabated? Put another way, what happens when the wrens and chickadees get to the top of the mountain and the temperatures still keep rising?

I understand and respect that the conservationist’s job is to be hopeful and forward looking. I support the nature conservancy resilience plan wholeheartedly. Nevertheless, the phrase “safe passage into the future,” in the passage cited above from the report, is awfully misleading.

There is no “bridge to grant safe passage into the future” if that future is, in turn, an ice sheet that continues to break apart. In the meantime, there’s still that nagging question of what will happen with those 100 million refugees from Central America and Mexico that we’re leaving for our children and grandchildren to deal with.

As the class period wraps up, I turn off the projector and open the blinds on the far wall, to reveal a heart-achingly beautiful early fall afternoon outside. The students chatter and laugh amongst themselves as they disperse into the sunlight. My own thoughts are a bit grim, nevertheless. On the one hand, I’m glad that—for now, at least—my children live in these resilient mountains. On the other hand, all I can think, as I pull the classroom door shut, is let us not allow these mountains to make us complacent! ❖

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