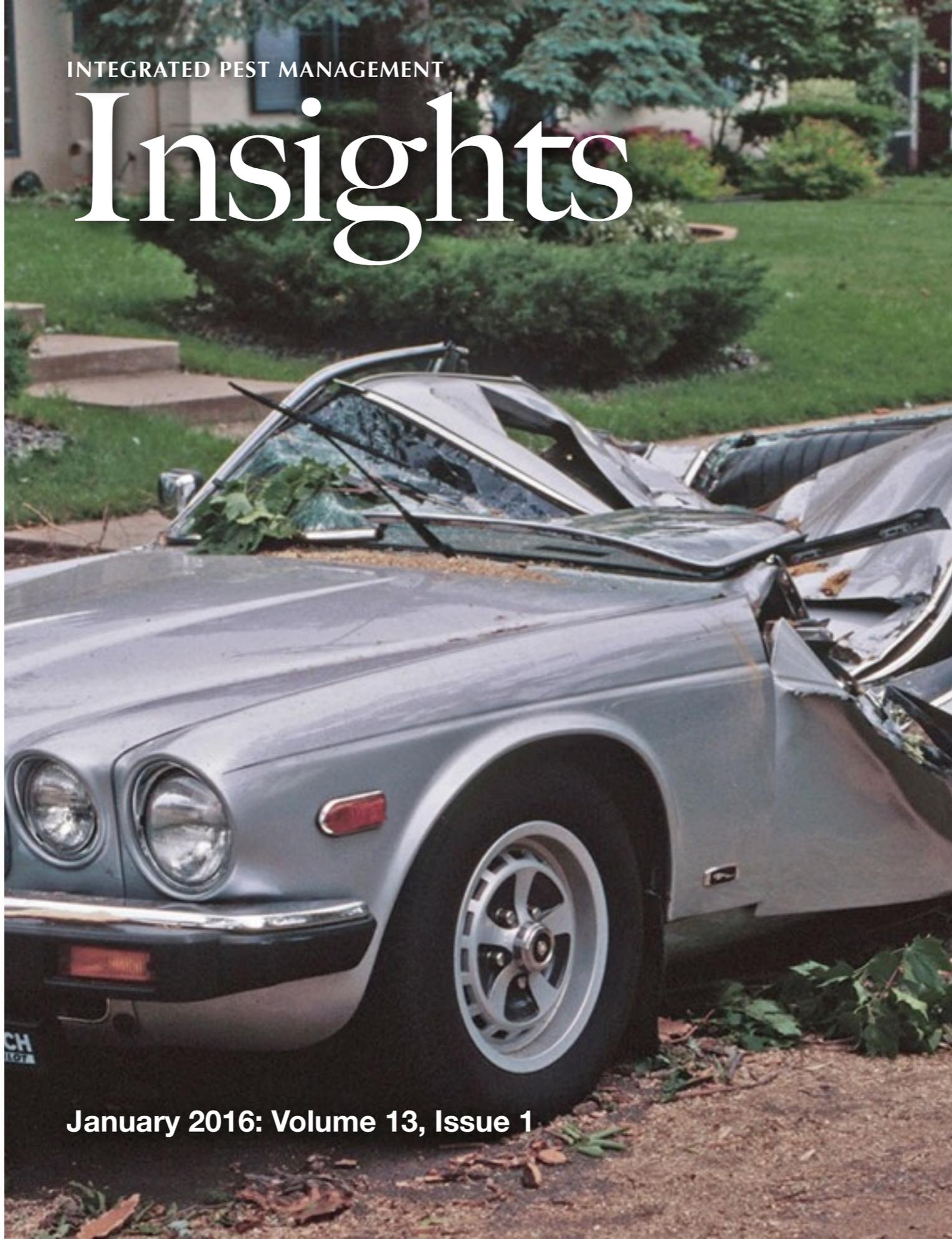


INTEGRATED PEST MANAGEMENT

Insights



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Climate Change and Uh, Hopperburners? —Arriving

Growers call it “hopperburn,” and scientists warn it’s a sign of things to come.



Climate Change and Uh, Hopperburners? — Arriving

Observers say climate change has destabilized Syria. A dust devil passes near Dikmetas, Turkey in September 2014 as thousands of refugees flee. Source: John Stanmeyer, National Geographic

Growers call it “hopperburn,” and scientists warn it’s a sign of things to come. The villain: the adult potato leafhopper, a winged, pale, green, wedge-shaped insect about 1/8-inch long. In hopperburn—the yellow, wilted area at the tips of alfalfa leaves, the plant’s characteristic response to leafhopper feeding—entomologists see a kind of climate footprint.

A toxin in the insect’s saliva causes hopperburn. The leafhopper reproduces on over 200 plant species in 25 different families, including alfalfa, potatoes, beans, peanuts, and woody ornamentals. The potato leafhopper feeds on many different crops, causing millions of dollars of damage every year. It migrates to northern climates in spring in high winds. Researchers in Maryland and New York examined six decades of data on leafhopper arrival dates and infestation. They found that the hopperburners are arriving to eastern U.S. farms earlier than in the 1950s, by as much as ten days. That’s roughly a day every six years.

“Prepare for the effects of climate change on migratory pests,” wrote *Utah Pests News* in the summer of 2015.

Wildfire and War

Due to abundant rain, weeds and wildfires will almost certainly follow, the Southern IPM Center’s Rosemary Hallberg wrote on August 14. Fuel loads had built up to the point where wildfire can travel fast and cross roadways once the

kochia weeds and Russian thistle dry out and begin tumbling across the countryside. An eerily similar pattern emerges in the West, where cheat grass has modified hydrological and fire cycles, aiding the weed's domination in sagebrush ecosystems.

In a study reported in National Geographic, climate change helped spark the Syrian war. A severe drought, worsened by a warming climate, drove Syrian farmers to abandon their crops and head to the cities. Resource shortage led to political unrest, accelerating the collapse of an already unpopular regime.

Doing Something

In February, the USDA National Institute of Food and Agriculture, which sponsors the Northeastern IPM Center, announced \$5 million in funding available for “agricultural and natural resources science for climate variability and change.” The Northeastern IPM Center applied for a grant with the intent to establish a national forum on climate and pests.

In September, the Northeastern IPM Center announced its request for applications for its Partnership Grants, emphasizing its call for projects in its new signature program on climate and pests.

On October 22, 2015, a Google search for “climate change” returned about 102 million results. A search of my personal e-mail from February 2 to September 17—before I began researching

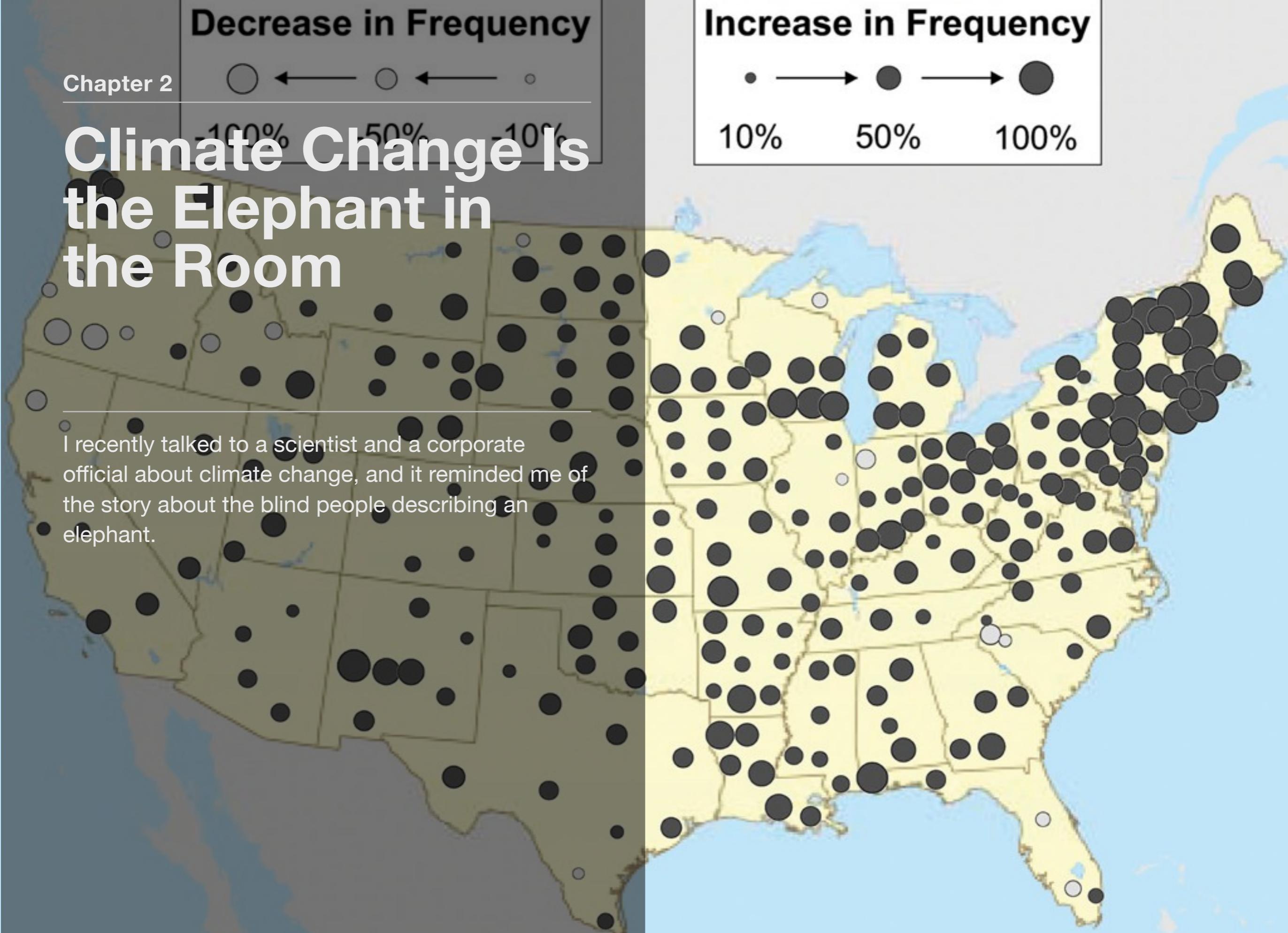
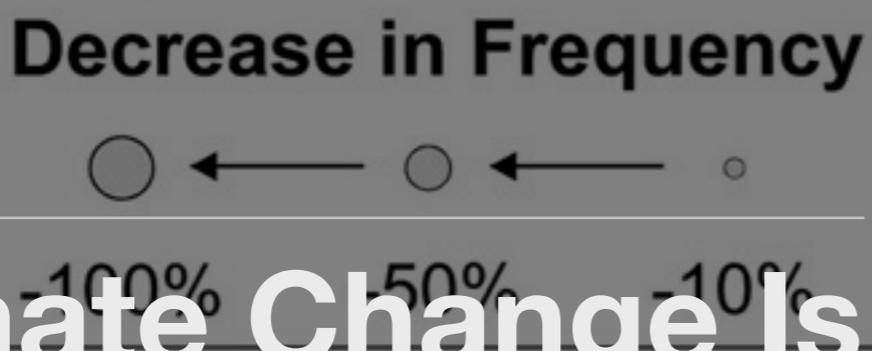
the topic—contained 182 messages about climate change. A typical message:

Louisiana State University AgCenter researchers are looking at different aspects of the redbanded stink bug, a major soybean pest. Changes in the state's climate seem to be causing changes in the population of this insect in Louisiana, LSU entomologist Jeff Davis said.

How can IPM respond to this message and the almost two hundred others like it? That may not be clear, but what we do know is that the redbanded stink bugs—and the hopperburners—are coming.

Climate Change Is the Elephant in the Room

I recently talked to a scientist and a corporate official about climate change, and it reminded me of the story about the blind people describing an elephant.



Climate Change Is the Elephant in the Room

Extreme storms are happening more frequently across much of the US. Source: T. Madsen and N. Willcox, Environment America Research and Policy Center

Five blind people encounter an elephant. One pats the stubbly flank, another feels the hot breath, a third grasps a bony tusk, another the bristly tail, and yet another the soft winding trunk. They find that their individual observations give completely different impressions of the thing they are trying to describe. I recently talked to a scientist and a corporate official about climate change, and it reminded me of the story about the blind people describing an elephant.

“I use weather data to help growers make management decisions for their crops,” said Glen Koehler, an associate scientist at the University of Maine Cooperative Extension in Orono. He cites a report by the Maine state climatologist that rains over two inches in 24 hours have increased 50 to 100 percent at weather stations across Maine in the last ten years.

“That is a phenomenal difference in just ten years,” Koehler said. “That kind of ‘precipitous’ change has serious consequences for agriculture, roads, drainage culverts, and other things affected by intense rainfall.”

Clouds like the Skin of an Elephant

Eric Ritchie is agriculture manager for the North American operations of McCain Foods Canada. He notes with worry the prospect of potatoes, wet soil, and pathogens.

On September 30, 2015, the forecast called for five inches of rain in 24 hours, with more to follow through rest of the week. This was unwelcome news to potato growers. With 40 percent of the crop harvested, many fields had just had their soil disturbed. Intense rainfall on disturbed soil exacerbates soil erosion, a serious problem for potato fields. And the 60 percent of the potato crop not yet harvested was at risk of sitting in wet soil in fields that could not support harvest equipment for a prolonged period of days.

“If the spuds sit in wet soil too long, rot and anaerobic nastiness can set in,” Ritchie said.

Weather is extremely important to agriculture because it both gives and takes away.

“The growing season up to that point had been nearly perfect,” Ritchie said. “It would have been acutely painful to have torrential rain stress the crop right before harvest, which could cause later storage losses.”

As it turned out, it did rain five inches but the days after the rain were dry, which allowed harvest operations to continue. Ritchie and his team saw a huge crop in some locations.

Feeling the Heat

Fire blight is a fast moving bacterial disease that can quickly devastate an apple orchard. It used to be a non-issue in Maine, according to Koehler. Now it is a required management item for every successful grower.

“Fire blight has long been a major problem in warmer apple growing regions to the south of Maine. With temperatures and fire blight increasing at the same time, it’s easy to suspect a connection to climate change. It’s because climate is so connected to everything else that climate change is so important,” he said.

Parts of the Beast

Potatoes, apples, roads, culverts—and everything else—make up the whole. Things aren’t always as simple as what they seem at first glance. The more you look into it, the more you see that climate change means a lot more than extra days at the beach.

There’s another expression about elephants: the one in the room. The difficult situation that people do not want to talk about.

“Talk is a starting point for action,” said Steve Young, director of the Northeastern IPM Center. “We hope to inspire scientists and growers to formulate IPM strategies that address climate change, because pest pressure is changing, too.”

Pests a Top Concern for USDA Northeast Climate Hub

David Hollinger, the director of the Northeast Climate Hub, recently visited Cornell University and highlighted opportunities for collaborative research.



Pests a Top Concern for USDA Northeast Climate Hub

Hail damage in a corn field. John D. Byrd, Mississippi State University, Bugwood.org

David Hollinger, the director of the Northeast Climate Hub, recently visited Cornell University and highlighted opportunities for collaborative research.

“Hubs are the key USDA response to weather variability and climate change,” said USDA Secretary Tom Vilsack, who formed the network of regional hubs in 2014.

The seven regional USDA Climate Hubs deliver science-based climate adaptation information. They focus on current trends that are impacting growers right now rather than on longer time horizons.

“Farmers and growers need tools to deal with climate change now,” said Hollinger. “The impact of climate change on pests is a top concern for the Hub.”

The Northeast Climate Hub has envisioned a seven-pronged approach to help meet those needs:

- **Develop partnerships** with land grant universities, USDA, and others to collectively assess situations and develop products and materials.
- **Identify priority research needs** and collaboratively develop research proposals.
- **Synthesize information** and produce fact sheets, literature summaries, a partner capacity survey, and a Forest Adaptation Workbook for agriculture.

- **Conduct assessments**, including working with the US Global Change Research Program to identify assessment needs, responsibilities, and a timeline.
- **Host** a Greenhouse Gas Mitigation workshop and webinar series.
- **Communicate** using online media and robust digital content.
- **Demonstrate examples of adaptation and mitigation** through a network of field sites to show effective strategies in the Northeast region.

During the startup phase a knowledge gap has emerged.

“Our collaboration with the Northeast Climate Hub happens as we move into a new era in pest management,” said Steve Young, director of the Northeastern IPM Center. “I expect that climate change will lead to greater mobility of pests. Therefore, we need a carefully considered regional and national response.”

Despite the interest in finding ways to develop ecosystem resiliency and mitigate reduction of greenhouse gases, the Hub needs to identify more people with expertise in the region.

“We have the passion and interest to take forward the pest aspect of climate change,” said Hollinger. “We are actively looking

for partners like the Northeastern IPM Center and its stakeholders.”

National Forum on Climate and Pests

Recent changes in climate indicate that weeds, insects, and diseases could become more significant.



National Forum on Climate and Pests

Common ragweed, *Ambrosia artemisiifolia*.

Bruce Ackley, The Ohio State University,

Bugwood.org

The climate is changing and the evidence is all around us. Springs are arriving earlier, summers are longer and hotter, winter temperatures are warmer, and plant hardiness zones have shifted northward.

Weeds, insects, and diseases have always had an impact on agriculture and forestry ecosystems, but with recent changes in climate, these could become more significant. Many pests are resilient under normal conditions, but with climate change they could adapt and become a more difficult challenge.

What is increasingly being studied, but still not fully understood is the distribution of pests, changes in cycles, and the resulting impacts on the environment, economies, and society and culture.

Therefore, the Northeastern IPM Center, together with scientific partners, have proposed to hold a National Forum on Climate and Pests. Its purpose will be to gather those in the scientific community who are working in this area. Watch this space for details about this upcoming event.

Chapter 5

Scientist Sees Weeds as Indicators of Climate Change

People allergic to ragweed suffer weeks of coughing, sneezing, and plain misery.



Scientist Sees Weeds as Indicators of Climate Change

Japanese stiltgrass, *Microstegium vimineum*.
Chuck Barger, University of Georgia,
Bugwood.org

There's an age-old saying about how kudzu ate the South. Lew Ziska, a scientist with the USDA Agricultural Research Service in Beltsville, Maryland, has taken the adage to heart.

For the past 25 years, Ziska has been studying the effects of carbon dioxide on crop plants. In the mid-1990s, something changed. Global carbon dioxide concentration levels went above 387 parts per million (ppm) and the Kyoto Protocol, an international treaty pledging to reduce greenhouse gas emissions, was signed. Ziska says there was no coincidence, but an entirely different interest: human health. Instead of crops, Ziska began looking at weeds, and in particular, ragweed.

Ragweed, a perennial, produces copious amounts of seed. People allergic to ragweed suffer weeks of coughing, sneezing, and plain misery.

"The climate is warming," Ziska said. "A warming climate facilitates widespread distribution of ragweed. You've got a recipe for a perfect storm."

Ziska and his team have been conducting research to address basic questions about climate and weed population dynamics. For example, herbicide efficacy could be hindered by extreme rainfall that washes away chemicals. High winds increase drift and complicate spraying practices. In addition, elevated carbon dioxide levels could change how herbicides work, even making them less

effective. For example, he found that Canada thistle regrows after glyphosate applications in high-carbon-dioxide conditions. The silver lining is that there are tools other than chemicals in the IPM tool box.

Ziska and his team warn that the evolutionary potential of invasive species should be given more attention at the molecular level, as such changes could lead to rapid range expansion.

“There are an increasing number of studies suggesting that many invasive plants are capable of rapid genetic change and evolutionary adaptation, which may speed their spread,” says Ziska.

This is not good news for those with allergies or who want to bring Japanese stiltgrass under control in their back pasture or favorite national park.

Resources

Resources from the January 2016 issue of *IPM Insights*.



Resources

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Wind and tree damage. Source: Joseph O'Brien, USDA Forest Service, Bugwood.org

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“Climate Change Is the Elephant in the Room” by Chris Gonzales and Glen Koehler

“Pests a Top Concern for USDA Northeast Climate Hub” by Jana Hexter

“Scientist Sees Weeds as Indicators of Climate Change” by Steve Young

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