

# How Do Weather, Insects, and Diseases Impact Forests? It Depends

By Kim Crider

**F**orests of the southern US are among the most productive and intensively managed in the world. Disturbances naturally alter forest stands, sometimes creating conditions that benefit plant or animal communities, but they also can cause major economic losses to landowners. What's more, the impacts from one disturbance may invite other disturbances—dead and damaged trees can attract bark beetles, wood-boring beetles, or diseases.

US Forest Service scientists recently led a research synthesis focused on catastrophic weather-related disturbances, insects, and diseases—events that can dramatically change forest composition and structure. James T. Vogt, Don Bragg, and Rabiul Olatinwo, with partners Kamal Gandhi of the University of Georgia and Kier Klepzig of The Jones Center at Ichaaway, authored a general technical report on the research, *Interactions between Weather-Related Disturbance and Forest Insects and Diseases in the Southern United States* (see [srs.fs.usda.gov/pubs/60817](https://srs.fs.usda.gov/pubs/60817)).

“The goal was to assess the current state of our knowledge around disturbance and subsequent insect and disease activity,” says Vogt. “Do damage levels from disturbance affect your management decisions after the damage occurs? Are those damage levels related to insect and disease outbreaks?”

Not all weather disturbances are created equal, and neither are their impacts. The report describes the major weather disturbances in the South, including wind, ice and snow, hail, and flooding.

The extent of impacts is as variable as the weather events themselves. And then there are factors that may reduce or exaggerate a weather event's impact—like the species, size, or age of a tree or stand, recent management activities, and tree spacing—and dramatically influence the outcome. For instance, longleaf pine trees less than five years old were the only trees largely undamaged in areas that experienced the strongest winds of Hurricane Michael.

Knowing how the impacts of distur-

bance can influence the onset of insects or disease could help landowners know what kind of action to take, and how quickly to take it.

In pursuit of patterns, the researchers combed exhaustively through decades of annual Forest Health Protection reports on “Major Forest Insect and Disease Conditions in the United States” (spanning 1955 to 2019) and noted observations in which weather damage matched up with reports of insect or disease (see [tinyurl.com/4gztgvj3](https://tinyurl.com/4gztgvj3)). Their search found frequent reports of insects and diseases on stressed or disturbed trees, but those individual observations didn't readily translate into predictable patterns. The researchers examined existing research studies to look for further connections.

It is often assumed that weather events incite infestations or outbreaks of bark or wood colonizing insects. Vogt explains, “While bark beetles can increase in dead and dying trees following disturbance, there are no published data to support observations that, for example, southern pine beetle reaches outbreak status as a result of weather disturbances. Outbreaks tend to occur in older stands, with high basal area and closely spaced trees.

“Ips beetles, often called engraver beetles, are probably more of an issue in the South than we give them credit for. We need to learn more about Ips beetle population dynamics and their capacity to cause damage following disturbance events,” adds Vogt.

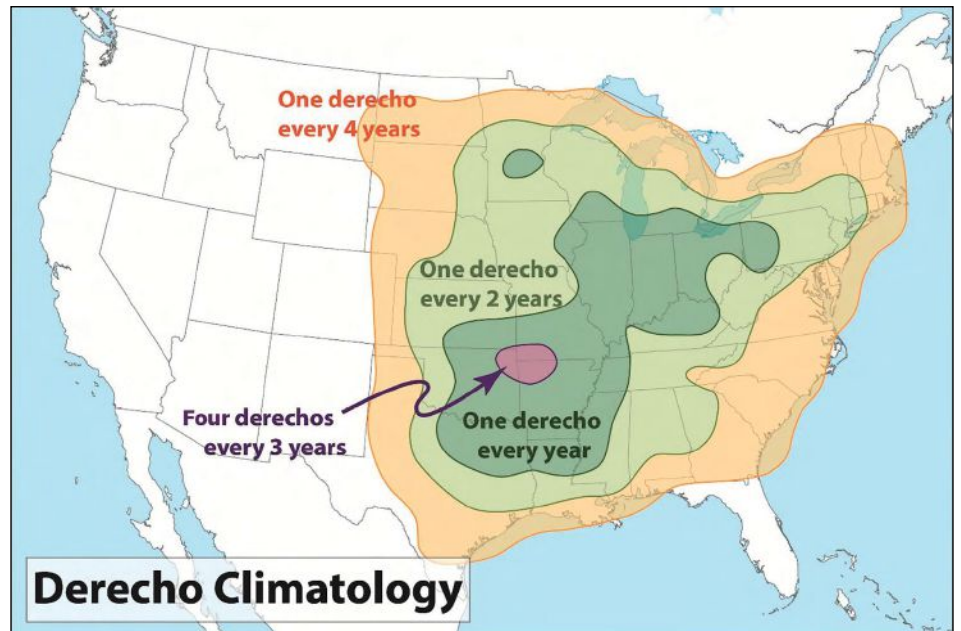
The research did not show strong relationships between disturbance type or impacts with incidence of insects and disease.

“Responses of pests and pathogens can be complex and dependent on stand structure and composition, previous stressors such as drought, and the timing and severity of disturbance. The response may be quite complex, but the general advice to timber managers remains the same—salvage sooner rather than later whenever possible,” says Vogt. “In other situations, such as land set aside for recreation or hunting, gaps created by disturbance can be beneficial, increasing abundance and diversity of understory plants, creating mixed-age stands, and increasing habitat for a diversity of animals.”

Indeed, insects and disease are vital parts of forest ecosystems. Their role as consumers is important to forest nutrient cycling, which in turn provide opportunities for microbes, symbiotic fungi, or ambrosia beetles that work to break things down even further.

The report identified some key considerations for managers and landowners:

- Identify post-disturbance forest or woodland management goals.
- Expect damaged forests to be colonized by bark and wood-boring insects and monitor to track increases in activity and populations.



**Derechos are a family of long-lasting, damage-causing downbursts of wind. From *Interactions between Weather-Related Disturbance and Forest Insects and Diseases in the Southern United States* (see [srs.fs.usda.gov/pubs/60817](https://srs.fs.usda.gov/pubs/60817)).**



**Example of severe ice damage in a recently thinned loblolly pine plantation in central Arkansas showing the most prominent and typical types of immediate damage: uprooting, stem breakage, stem bending, and branch (crown) loss. Additional injuries and tree death can also come later from insect attack or disease on affected trees. Photo by Don C. Bragg, USDA Forest Service, Southern Research Station. From *Interactions between Weather-Related Disturbance and Forest Insects and Diseases in the Southern United States* (see [srs.fs.usda.gov/pubs/60817](https://srs.fs.usda.gov/pubs/60817)).**

- Salvage damaged forests sooner, rather than later. Salvage logging and other management activities, such as prescribed burning, can have variable impacts on species diversity and vulnerability to disease or insects.
- Replant forests promptly to jump-start restoration of economic and ecological values.

The report also sets up some key paths for future research. One goal will be how to extend the useful lifespan of salvage timber. Learning more about how wood degrades over time, and the relationships among disturbance, insects and disease, and forest conditions in the wake of these events, can inform land managers' decisions.

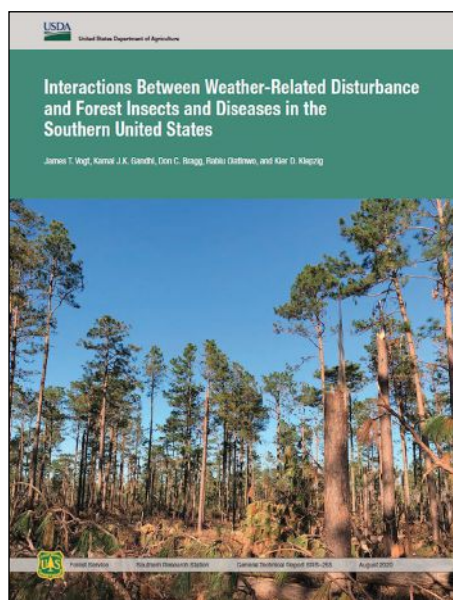
For more information, contact J.T. Vogt at [james.t.vogt@usda.gov](mailto:james.t.vogt@usda.gov). **FS**

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writer at the US Forest Service Southern Research Station (SRS). This article was originally published on the SRS's website ([tinyurl.com/s7tu4kab](https://tinyurl.com/s7tu4kab)); it appears here with the station's permission.

## TinyURL: Short Links

Ever wonder why *The Forestry Source* often prints so many website addresses that begin with [tinyurl.com](https://tinyurl.com/)? In short, TinyURL LLC offers a free service that lets you turn long website addresses into short (tiny) ones. For example, the address for the *Forestry Source* on the SAF web site is 149 characters long. A Tiny URL link to the same page is [tinyurl.com/ydc34tbp](https://tinyurl.com/ydc34tbp), only 20 characters. That's much easier to type. The URL in TinyURL's name is the acronym for uniform resource locator, which is Internet lingo for a website address.





## IN THIS ISSUE

### Lab-Grown Wood

Scientists at the Massachusetts Institute of Technology (MIT) have taken the first steps toward growing wood and wood products without trees, like growing meat without animals. “Lab-grown wood products could be a game changer for forests and the forest-based sector. Although in its infancy, it is worth monitoring to avoid being blindsided by rapid, surprising, and disruptive change in the future.” writes futurist David N. Bengston. See [page 10](#).

### Predictions for 2021

“It would be an understatement to say that 2020 was a long, strange year. While my annual predictions for the forest industry didn’t entirely miss the mark, I couldn’t possibly have anticipated the ever-unfolding developments associated with the covid-19 pandemic,” writes Forest2Market’s Pete Stewart. What does he see for the remainder of 2021? See [page 12](#).

### Impacts of Disturbances

How do weather, insects, and diseases impact forests? US Forest Service scientists recently led a research synthesis focused on catastrophic weather-related disturbances, insects, and disease—events that can dramatically change forest composition and structure. Learn about their findings on [page 13](#).

### Book Review: *Ecological Silviculture*

A look at a new book, *Ecological Silviculture: Foundations and Applications*, by SAF members Brian J. Palik, Anthony W. D’Amato, Jerry F. Franklin, and K. Norman Johnson. [Page 15](#).

### Boots on the Ground

The iPhone XS Max may not be the newest of smartphones, but Donn Downey loves his. “This thing just feels right, and the large screen is so much more useful,” he writes. “In an Otterbox Defender case, it has exceptionally solid hand feel with round grippy rubber edges. It’s easier to handle and control in the woods, and it fits in all my pants pockets.” [Page 16](#).

## DEPARTMENTS

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## Baskett Center Research: Oak Regeneration and Burn Boxes

By Andrea Watts

Twitter can be a dumpster fire or a seemingly unending network of forestry research, observations, and, of course, tree pictures. When @MOsilviculture tweeted a picture of a prescribed burn study underway at the Baskett Wildlife Research and Education Center, I wanted to learn more than what could be conveyed in the 280-character limit.

@MOsilviculture is the Twitter handle of SAF member Ben Knapp, an associate professor of silviculture at the University of Missouri School of Natural Resources, and chair of SAF’s D2 Silviculture Working Group. He’s also the superintendent of the 2,266-acre Baskett Wildlife Research and Education Center (the Center), a position he’s held since 2015.

“[The Center] is the primary site for our forestry and natural resources students to do labs and get hands-on experience,” said Knapp. “A lot of what we do here, even though it is a research center, is student-focused with experimental learning, such as opportunities to mark timber and trap wildlife.”

The Center’s website describes its location as “in the Ozark border region of south-central Missouri, an ecologically important transitional zone.” [Although unfamiliar with the regions of Missouri, I recognize the term *Ozarks* because that’s where Laura Ingalls Wilder’s Rocky Ridge Farm was located.]

What follows is my conversation with Knapp condensed and edited for clarity.



A prescribed burn in a shortleaf pine stand at the Baskett Wildlife Research and Education Center in Missouri. Photo courtesy of Ben Knapp.

### What are the different forest types in Missouri, and what are current forest management challenges?

There’s a pretty wide diversity of forest types within the state. A lot of the upland forested areas are oak-hickory forests. Oak is a dominant genus here; white oak, in particular, is really abundant.

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## Arizona Utility Enlists Residential Customers to Invest in Forest Thinning

By Steve Wilent



The 2019 Woodbury Fire burned 123,875 acres in one of three watersheds that provide water to the Phoenix, Arizona, metropolitan area. Photo: SRP.

For the Salt River Project, or SRP, the main supplier of water to the Phoenix, Arizona, metropolitan area, healthy forests are crucial to the sustainability of that supply. Most of the city’s water originates in forested watersheds totaling 8.3 million acres in northern and eastern Arizona. Snow and rain in these watersheds are captured in SRP reservoirs and delivered to Phoenix and surrounding

communities in the Valley of the Sun—“the Valley,” as the area is called by locals—for use by residences and businesses, which collectively use 800,000 acre-feet annually from the Salt River, Verde River, and Cragin watersheds. SRP also produces power for more than one million customers in the metropolitan area.

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## Reforestation Opportunity: 133 Million Acres

By Steve Wilent

How much land in the US might be reforested? According to the Reforestation Hub website, the answer is 133 million acres.

The hub, a project of two nonprofits, The Nature Conservancy (TNC) and American Forests, “reveals how reforesting the United States could absorb an additional 333 million metric tons of carbon per year—equivalent to the carbon emissions from all of the passenger vehicles in California, Texas, and New York combined (72 million vehicles).” So states a February 9 press release announcing the launch of the site, [reforestationhub.org](#).

The data behind the hub come from a paper published on December 18, 2020, in the journal *One Earth*, “Lower Cost and More Feasible Options to Restore Forest Cover in the Contiguous United States for Climate Mitigation,” by Susan Cook-Patton and 11 other authors. Cook-Patton is a senior forest restoration scientist at The Nature Conservancy. The full text is available at [tinyurl.com/1wrwrux](https://tinyurl.com/1wrwrux).

On the hub, the 133 million acres of potential reforestation are broken down by land cover type: floodplains, forest, marginal cropland, grassy areas, pasture, post-burn, shrub, streamside buffers, and biodiversity corridors. Data are provided at national, state, and county levels. The

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