

Invasion of the Japanese stiltgrass: WVU biologist targets plant that wreaks havoc

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WVU plant biologist Craig Barrett studies Japanese stiltgrass along a walk on the Rail Trail a few miles south of the Downtown Morgantown campus. Credit: Scott Lituchy/West Virginia University

To the casual observer, Japanese stiltgrass appears as a harmless, leafy

green plant that blends into the majestic scenery of your weekend hike through the woods.

Plant biologists like Craig Barrett know better.

"I've visited sites to study endangered orchids in West Virginia over the past few years and I'd noticed Japanese stiltgrass creeping in and becoming a problem," said Barrett, assistant professor of plant evolutionary biology at West Virginia University. "So, in a way, you're mad at this thing and you want to study it. And there's plenty of it to study."

Japanese stiltgrass, or *Microstegium vimineum*, is anything but harmless in the United States. It's considered an [invasive species](#), which threaten biodiversity, negatively affect crops, restructure ecosystems, promote disease and damage infrastructure to the tune of \$120 billion annually in the U.S.

It is believed that Japanese stiltgrass was introduced into Tennessee around 1919 as it was used as a packing material in shipments of porcelain from China. It has since spread to at least 26 states throughout the East Coast, including West Virginia. Locally, in Morgantown, it can easily be spotted at the Core Arboretum and along the Rail Trail, Barrett said.

In hopes to ultimately ward off or stabilize these pesky, weedy invaders (since eradicating them altogether is improbable at this point), the National Science Foundation has awarded Barrett and a team of researchers a highly competitive Experimental Program to Stimulate Competitive Research grant. Barrett and his colleagues will receive \$2 million to understand how plants undergo [rapid evolution](#) to become invasive and provide insights into the management and prevention of invasive species.

Barrett will sequence a complete genome of Japanese stiltgrass and collaborate with Cynthia Huebner, an adjunct professor at the Davis College of Agriculture, Natural Resources and Design, in conducting a greenhouse experiment using seeds from specimens collected in the U.S. and Asia.



WVU plant biologist Craig Barrett holds an example of the invasive species Japanese stiltgrass. Credit: Scott Lituchy/West Virginia University

Genome sequencing means figuring out the DNA order within an organism. In some ways, it is like "decoding."

The goal of Barrett's project is to uncover the genomic basis of "invasive" traits using genome-wide sequencing methods and historical

collections. Invasive species are still poorly represented among plants with completely sequenced genomes.

"Sequencing a genome is easy nowadays," Barrett said. "The technology has changed so much in 10 years. We can easily go outside, collect plant material, grind it up in the lab and send it to the sequencer. The hard part is interpreting the data. That takes the most time."

One major element of a genome is called a [transposable element](#), a DNA sequence that changes its position by "jumping around and affecting the functions of other genes." A transposable element can alter the cell's genetic identity, drive changes in genome size, and change the way an organism interacts with its environment.

"The invasion of a new habitat, [climate change](#), or getting attacked by a pathogen are events that can set off a cascade of activity of transposable elements in the genome," Barrett said. "I'm interested in studying those responses both in the contemporary range and across time to see the changes in the abundance and diversity of the different transposable elements in the genome of this plant. Tracking this through time hasn't really been done before."

Results may indicate how rapid changes in the [genome](#) influence the spread of invasive species in new environments.

The project also involves scientists from the University of Louisiana at Lafayette, South Dakota State University, the University of Alabama-Tuscaloosa and Wichita State University. A different high-profile invasive species will be studied at each of those universities.

"We have a handle on the ecology of invasion," Barrett said. "But figuring out how these species are adapting to new environments seems to be the question right now. I'm interested in how [plants](#) change over

time both in terms of their genomes and physical features and how environmental factors might influence these changes."

Provided by West Virginia University

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