America Isn’t Ready for the Lanternfly Invasion

A bizarre pest from Asia is spreading fast and putting billions of dollars’ worth of resources at risk.

By Andrew Zaleski; Bloomsburg Businessweek through the October 4, 2018 Landscape Architecture Magazine.

From the road heading east, the apple trees of Beekman Orchards unfold in waves, rising and falling on a sea of verdant grass. Behind them, basking in the June sunlight, are row upon row of pinot noir, riesling, and traminette grapes. It’s for the vineyard that I’ve driven to this 170-acre estate in Berks County, an hour and a half northwest of Philadelphia. Beekman Orchards is a fourth-generation family enterprise, now carefully stewarded by Calvin Beekman, a large 59-year-old man with a calm voice and meat-hook hands.

“I told one fella one time I don’t need to go to Atlantic City, because we’re the biggest gamblers there are,” he tells me outside his farmhouse. In 1999, Beekman planted the vineyard, 40 acres of red and white grapes that once brought in about a quarter-million dollars annually. On this day, several rows of vines in the middle of the patch are a lush green, close to the fruit-set stage. Mid-June is usually when clusters of grapes bloom, growing until harvest begins in mid-September. In the rows farther out, though, no clusters are visible, and the grape-shoot trunks are blackened, dead. Beekman gestures toward a set of riesling vines that went in just last year. “This row contains 140 plants,” he says. “I don’t think you can find 1 percent that’s viable.”

A third of his vineyard has suffered a similar fate. Another third is struggling. And the luxuriant middle third? It could be at risk, too. He points to the woodlands surrounding his farm and utters a word that’s been unnerving farmers, foresters, public officials, and entomologists alike: “lanternflies.”

The spotted lanternfly, *Lycorma delicatula*, is a mothlike insect about an inch long and a half-inch wide. Native to Southeast Asia, it was discovered in Berks County in 2014. Already it’s threatening to harm more plants and crops than even the brown marmorated stink bug, discovered in Pennsylvania around the turn of the century and now wreaking havoc in 43 states.

Beekman points to a patch of terrain where, last August, he counted 325 lanternflies in the span of a yard. Unlike the stink bug and the emerald ash borer, another invasive insect that arrived from Asia to the mid-Atlantic region, the lanternfly moves in hordes. Spot one lanternfly, and lurking nearby you’ll likely find hundreds, if not thousands. They can overwhelm a tree, coating it from root to leaf, feasting on sap before disgorging a glutinous substance that disrupts photosynthesis and kills plants. “You come outside,

and it's just swarms and swarms and swarms," Beekman says, describing the scene from last summer. "You probably would've had 20 of them crawl up you by now."

In 2017, Pennsylvania's lanternfly population soared, spreading across 4.5 million acres and prompting a quarantine that required businesses and residents to check outdoor items for bugs before moving them out of any of 13 affected counties. "We thought the stink bug was bad, because it feeds on a wide range of plants, can cause damage to different crops, and has a nuisance factor," says Emelie Swackhamer, a horticulturalist with Penn State University. "But the lanternfly, it's just much worse. It has this really broad feeding behavior, and that's unusual for an insect. And it threatens so many of our high-value commodities."

An adult lanternfly's wings are drab white with black spots and a bright red underside.
Photographer: Will Warasila for Bloomberg Businessweek

Quantifying or predicting the economic damage caused by invasive pests is difficult, but Beekman's tally of his farm's damages and expenses provides some insight into the danger: His 2017 losses, he estimates, were $100,000, with projected 2018 losses of $250,000. In June, the Pennsylvania Department of Agriculture suggested the spotted lanternfly might cause $18 billion in damage statewide. Posting on Facebook in mid-September, Penn State said the fly "could be the most destructive species in 150 years."

The state hasn't come up with industry-specific estimates, but the hardwood and fruit-growing industries are especially threatened. "This is our No. 1 concern," says Sarah Hall-Bagdonas of the Northern Tier Hardwood Association, which is hosting dozens of information sessions for lumber companies from Virginia to New York. In New York, forestry is a $13.1 billion industry that supports 42,000 jobs. In Virginia, it's a $21 billion business with 108,000 workers. In Pennsylvania: $19 billion and 66,000 employees. Hardwood companies working in any of the 13 quarantined counties now require a special permit from the state agriculture department proving that they can identify the lanternfly and have a plan to contain the bug, which is thought to hitch rides across state borders on the undercarriages of cars, trains, and 18-wheelers.

This February, U.S. Secretary of Agriculture Sonny Perdue announced that his department was committing $17.5 million to stem the lanternfly's spread. In a sense, it was already too late. The lanternfly had been spotted in New York a few months earlier and in Virginia weeks before. Three New Jersey counties are under quarantine after confirmed sightings in July. Delaware and Maryland are both on alert.

State and federal entomologists have recommended a few containment strategies, but they don't yet have a foolproof way to kill, or even count, the bug. If they can't find a solution, lanternflies could infest forests all along the Atlantic seaboard, giving communities from New England to Florida an intimate look at what Penn State entomologist Tom Baker calls "the weirdest, most pernicious insect I've ever seen."

A Pennsylvania State University researcher conducts an insecticide experiment.
Photographer: Will Warasila for Bloomberg Businessweek

Each **May**, lanternfly larvae hatch in groups of 30 to 50. The nymphs look like shiny, overgrown ticks, with black bodies and white spots. **Through July** they grow into fluttering adults, developing wings whose exterior is drab white with black spots, and whose underside is bright red. When folded, the wings resemble a cloak, draped over a yellow, potbellied abdomen marked by horizontal black bands. The adults flourish **through October**, with the females laying eggs starting in **late September and continuing sometimes into December**, provided temperatures are warm enough. Come spring, the cycle begins anew.

Adult lanternflies prefer to feed on *ailanthus altissima*, aka the tree of heaven, itself an invasive species that originated in China and was brought to the U.S., near Philadelphia, in the 1780s. Yet their palate and appetite are large: grapes, apples, cherries, peaches, plums, hops, birches, oaks, pines. Lanternflies don't eat the plants, but rather suck nutrient-rich sap from the trunks through their proboscides. The sticky substance they excrete after dining is called honeydew (no relation to the invasive melon overrunning your fruit salad). Honeydew spreads to nearby plants and just about anything else: your hair, your roof, your children's swing set, my windshield as I drive through quarantined areas. It also attracts other pests.

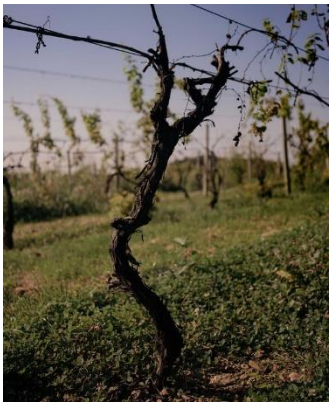
The lanternfly came to Pennsylvania's attention in September 2014, when a state game commission employee found an unrecognizable bug on his property in Berks County. He called the agriculture department, and two staff entomologists identified it as a species

native to Asia. They gave the bug its common name, a nod to its form, which resembles a Chinese lantern.

No one knows for sure where in Asia the spotted lanternfly came from or where its immigrant's tale took shape. Talk to folks in Berks County, and they'll tell you an egg mass arrived with a shipment for Rolling Rock Building Stone Inc., a specialty company about 6 miles from Beekman's farm that routinely imports from China and India. Rolling Rock's president, Gary Weller, says there's no evidence his property was the beachhead, though; he was surprised when state entomologists showed up, inspected his ailanthus stands and found them crawling with lanternflies. "It's something that's going to haunt me for many years," he says. "I would love to know where it came from, I really would."

Within months of the discovery, the state placed five townships under quarantine. Any person or business moving items such as logs, stones, outdoor equipment, or grapevines and other plants out of a quarantine zone now required a permit. "We have to inspect everything," says Beekman, whose farm is located in the first set of quarantined areas. "We're looking for egg masses, looking for insects, certifying that everything is free and clear."

At first invasive pests appear to cluster in defined areas, making containment seem manageable. But that's only because there are so few reported sightings, and they have little to no immediate economic impact. "What we see with a lot of new insect populations is a slow growth and then an exponential growth," says John Crowe, spotted lanternfly national policy manager at the U.S. Department of Agriculture. "They take footholds, and then they explode."



Lanternflies suck nutrient-rich sap from trunks through their proboscides, then excrete a sticky substance called honeydew that spreads easily and attracts other pests.

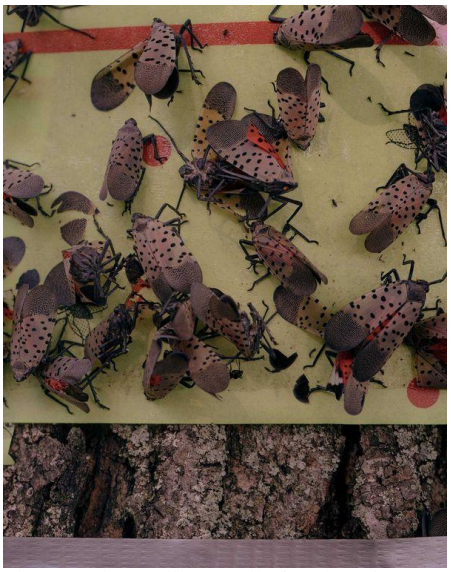
Photographer: Will Warasila for Bloomberg Businessweek

When the lanternfly explosion happened in the fall of 2017, the Pennsylvania Department of Agriculture confirmed infestations at 1,462 properties, primarily in the southeast of the state, up from 335 the year before. "They come into one area like locusts, beat the crap out of it, and then move on to another resource," says David

Biddinger, a Penn State entomologist who studies pest management in tree-fruit habitats.

The hardest-hit businesses so far have been grape and other fruit growers. Beekman is considering getting out of grapes entirely. “It costs about $15,000 to put in an acre of vineyard,” he says. “How do I come in here, tear it all out, and replant it? It’ll be three years until any production comes back.” Pre-lanternfly, he harvested 3 tons per acre of vineyard and sold the grapes for $2,000 a ton, grossing $240,000 a year. Were he to stop producing entirely for those three years, he’d lose that annual income, to say nothing of the risk that lanternflies will infest newly planted vines. Even the grapes that survive are an oenophile’s nightmare—one winemaker Beekman supplies told him that batches produced from bug-ridden riesling and traminette grapes are redolent of cabbage.

For the forestry industry, the economic hardships have thus far been less direct. So far the destruction has been limited, but the trees’ capacity as carriers has been hurting companies just the same. “Logs have to get inspected pretty heavily,” says Don Kellenberger, the owner of a small logging and land-clearing company in Berks County. “We have to spend more time, and there’s no extra money to do that. So it’s costing us more, and we’re getting paid the same.” Some tracts of land in the quarantine zone are so infested that companies won’t even harvest tree species that lanternflies generally ignore, lest they transport the insects into a new community or into their own sawmills.


Specimens caught in a lanternfly trap.
Photographer: Will Warasila for Bloomberg Businessweek

“This particular pest is such an excellent hitchhiker,” says Hall-Bagdonas, of the Northern Tier Hardwood Association. “It lays its eggs on anything flat. It’s adapting and doing different things every year.” Adult lanternflies, once thought to be better hoppers than flyers, have recently been observed winging between trees, for instance. “They were flying into headwinds and flying further distances than we thought they could,” Penn State’s Swackhamer says.

Long-distance travel is officials' biggest fear. Biddinger suspects it's only a matter of time until the 15,000 acres of juice grapes along the south shore of Lake Erie in northwestern Pennsylvania are hit. Once lanternflies finish feeding there, they might move to the 30,000 acres of juice grapes across the border in New York. Maryland and Delaware haven't been infested yet, but entomologists consider that more luck than anything else. The bugs have already hopped past Maryland to get to Virginia, where egg masses have been spotted by the hundreds; researchers' best guess is that a mass hitchhiked some 180 miles to get there. Even Michigan, with a combined 80,000 acres of blueberry and cherry crops, is eyeing the spread warily, Biddinger says.

The worst-case economic scenario for Pennsylvania, and the rest of the country, would be for the spotted lanternfly to overrun the Port of Philadelphia. The flat shipping containers there would make excellent larval grounds, which, combined with heavy shipping and trucking traffic, could help the bugs spread quickly to the south and west. Beekman points out, too, that the port isn't far from 30th Street Station, Philly's main passenger rail depot, visible from the hills of his vineyard. Ominously, in August parks officials found lanternflies in four urban locations, including Center City and the Horticulture Center at West Fairmount Park, a popular wedding venue close to the city's art museum.

"The bugs aren't good. They're moving," says Beekman. "You're going to see the spread of this is farther than anyone projected."

Researchers at Penn State's Berks County campus have tested various insecticides.
Photographer: Will Warasila for Bloomberg Businessweek

On a sweltering afternoon, Rick Hartlieb, a 10-year veteran of the Pennsylvania Bureau of Forestry, drives his pickup truck to a clearing on Gibraltar Hill, an area of William Penn State Forest about 35 minutes south of Beekman's grapevines. We park, exit, and walk over to a lone ailanthus covered with pockets of lanternflies: a few dozen here, a handful there, maybe 200 from trunk to canopy. Standing beside the tree, I feel a distinct misting sensation, then notice small droplets on my forearms. "That's the honeydew," Hartlieb says. I'm being barfed on by bugs.

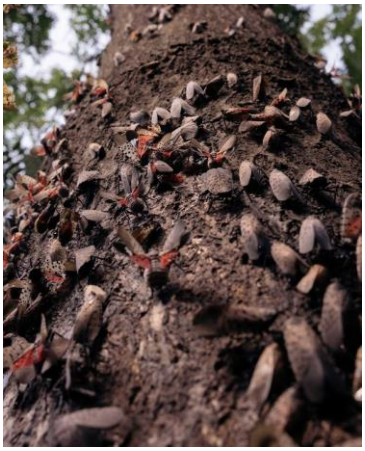
I soon see that some of the lanternflies aren't moving. They've been killed, Hartlieb explains, by a chemical called dinotefuran. The insecticide is classified as a systemic, which means it's sprayed onto trees and absorbed into the plant, ready to be sucked out

by unwitting lanternflies. Hartlieb and his colleagues have sprayed about 50 trees in this area, part of a pilot project funded by the state and designed to produce a measurable lanternfly reduction before next spring, when a new generation spawns. Biddinger is running a similar trial on a plot of farmland adjacent to Penn State's Berks County campus, spraying potted peach trees and grapevines with various insecticides, including dinotefuran.

Systemics proved effective in killing the stink bug when it made its way to Pennsylvania, but the chemicals are costly, and combating an entire species requires a lot of spraying. For the forestry industry, the hope is that a single treatment of a spray such as dinotefuran will last a year; determining the chemical's persistence is one aim of Hartlieb's pilot. "The important thing is we're trying. Hopefully doing something is better than doing nothing," he says.

For farmers, multiple sprays would be required over a single growing season, delicately timed to be sure food is both pest- and pesticide-free. Don't spray often enough, and crops will be destroyed or infested; spray too often or too close to harvest time, and they'll be covered with chemicals. Applying chemical insecticides to fruit could also kill other species, such as wild bees, which tree-fruit growers rely on for pollination.

A large chunk of the $17.5 million the USDA has committed to combating the lanternfly will be spent in Pennsylvania, in addition to $3 million set aside in the state's most recent budget. Some of this money will be dedicated to creating more effective counting methods, some to assessing economic damage. The USDA and the state are also paying to apply insecticides on ailanthus trees near rail lines and on "trap trees"—designated killing grounds—in the quarantine zone. "The idea is we have to expand the area where we have this kind of treatment and then sustain it for a couple years," says Ruth Welliver, director of Pennsylvania's Bureau of Plant Industry.



The lanternfly moves in hordes, unlike other invasive insects such as the stink bug and emerald ash borer.
Photographer: Will Warasila for Bloomberg Businessweek

Researchers would love to introduce a predatory species that could end the infestation—in China, a parasitic wasp kills the majority of lanternfly eggs. But biological control is a

fraught business, a lesson entomologists learned when they tried to contain gypsy moths that invaded New England and the mid-Atlantic in the early 1900s. “They brought in a fly that prefers to attack about 300 native butterflies and moths over gypsy moths,” Biddinger says. “So now there’s a very long quarantine process to bring in a biocontrol agent from another country.”

For the moment, that leaves hypervigilance and scorched-earth gardening. Swackhamer, who works out of a Penn State office in quarantined Montgomery County, is spearheading Pennsylvania’s public education program. Humans are also excellent carriers, so she encourages people to inspect each other, their bags, and their cars if they’re traveling through affected counties. Should you spot an **egg mass—a challenge, since they resemble splotches of mud—the prescribed remedy is to scrape it into a plastic bag filled with hand sanitizer, using a credit card or something similarly thin. Don’t scrape too hard, though, or the eggs are liable to scatter.**

Weller has resorted to chopping down and burning virtually all the ailanthuses on Rolling Rock Building Stone’s 600-acre property. He says he’s seeing results: “Other years you could hardly count the lanternflies, there were so many. This year there are very few.”

As for Beekman’s grapes, he’s been spraying them with a systemic called imidacloprid, which is known to be effective on other sucking insects, such as moths and beetles. Compared with last year, he says, he’s seen fewer lanternfly nymphs on the borders of his vineyard.

That sounds like a promising sign, until we walk up to the woods at the southern edge. At the base of a tree, he crouches down and gingerly lifts up a piece of foliage: Walking along the stem are two lanternfly nymphs, not more than a few weeks old. Above us, on the underside of an ailanthus branch hanging high above our heads, Beekman points out six egg masses. Soon they’ll hatch and mature into a swarm.

“There could be 400 lanternfly eggs in that little section,” he says. “They’ll figure out how to survive.”