

Painting with invasive pigments

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In the abandoned lots of the Bushwick neighborhood of Brooklyn, NY, dandelion, black nightshade, and dozens of other weedy plants thrive. Although some see hotbeds of invasive species, artist and Brooklyn local Ellie Irons sees a vibrant urban ecosystem. She also sees the makings of a unique color palette.

Irons extracts pigments from these weeds—or as she calls them, “spontaneous urban plants”—and transforms them into watercolor paints. She then paints diagrams and maps out plant species. Through this Invasive Pigments project, her works detail the spread of plants on scales ranging from continents to city blocks. In *Asiatic Dayflower* (*C. communis*), 2012, for example, a global map shows splashes of blue extracted from petals marking the plant’s geographic range overlaid with delicately sketched leaves and stems depicting the species’ movement from Asia to Europe and eventually the United States. In *Asiatic Dayflower: Wildflower/Superweed*, 2014, she shows the distribution of the same plant on a single city block.

About one quarter of the weeds in Irons’ color palette are native to the northeastern United States. The rest are introduced, often highly invasive plants—some of which the city is actively working to eradicate from forested areas. Such efforts are undertaken for good reason; invasive species spread can devastate an ecosystem.

But Irons believes urban ecosystems are different. After all, many native plants couldn’t survive the harsh conditions. Where native plants fail, hardy weedy plants, she reasons, can step up to provide a wealth of ecosystem services—from stabilizing soil and reducing nutrient and stormwater runoff to cooling the air and providing food and habitat for animals.

As researchers grapple with how to view urban invasive species, Irons seeks to prompt a new perspective from city dwellers. “Become receptive to spots of color and splashes of leafy green,” she instructs in her handbook for painting with weeds. “Bend down, reach up, crouch, investigate. These plants are everywhere, but they are easy to miss if you’re not anticipating them.”

An Expanding Palette

Irons first experimented with mining pigments from algae she found growing in the bottom of a planter in her studio. “It was a beautiful color that I didn’t have in



Artist Ellie Irons creates watercolor paints by extracting pigments from weedy urban plants. In *Dot Cluster: Wild Plants Common in New York City*, 2016, she uses those paints to describe the community of plants growing across about 25 vacant lots in Brooklyn. Image courtesy of Ellie Irons.

my paint palette,” she says. Next was pokeweed with its lush green leaves and clusters of poisonous, purple berries. Irons turned the berry juice into paint and quickly went searching for more urban plants. “It just totally changed my lens for the urban environment,” she says. “Rather than focusing on concrete, trash, and gum, the things you see when you look at the sidewalk, I was looking at the inverse of that, all the greenery.”



At workshops, Irons shares the tools of her trade and encourages city dwellers to notice and even appreciate weedy urban plants. The species she works with include (top row, left to right) blossoms of Asiatic dayflower; medium-ripe berries of Asiatic bittersweet; blossoms of tall morning-glory; leaves, stems, and blossoms of galinsoga; and underripe berries of black nightshade. Image courtesy of Ellie Irons.

As she painted with weedy plant species, Irons also learned more about their histories and ecology and what it means for a species to be invasive. For regulatory purposes, the federal and many state governments designate a species as invasive if it is nonnative and “causes or is likely to cause economic or environmental harm, or harm to human, animal, or plant health.” (1) A nonnative plant is not necessarily invasive, and native plants, although typically not labeled invasive, can sometimes spread aggressively.

Irons noticed, for example, that the native poke-weed spreads prolifically—an observation that helped her dispense with notions of native plants as basically good and nonnative ones as bad. “If [weedy plants] can survive now in a city where we are already 10 degrees hotter than the surrounding area because of the heat island effect,” she says, “then we kind of need them.”

Irons creates paints following a traditional process, dating to late 18th-century Britain, that involves blending natural pigments, water, honey, and gum arabic, a commercially available tree sap, into portable cakes of paint (2). But where paint makers traditionally drew from a range of sources, including plants, animals, and minerals, Irons primarily uses weedy plants. Around 40 plants make up her local color palette, including blue from Asiatic dayflower petals, red-orange from ripe berries of bittersweet nightshade, and emerald green from dandelion leaves.

The search for plant pigments has taken Irons to multiple locales. While attending an artist-in-residence program at Rocky Mountain Biological Laboratory in Gothic, CO, she made paints from the plants in the meadow and created a series of color-grid paintings as a nod to the way researchers sample a landscape. There,

she worked with ecologist and conservation biologist Paul CaraDonna of the Chicago Botanic Garden and Northwestern University as he set up a series of 1-meter by 25-meter transects to capture fine-scale variations in plant community composition and pollinator visits.

“I was really interested to see how Paul and the other scientists were drawing grids onto the meadows they were working with to give themselves boundaries,” says Irons. “I hadn’t thought about how I had already been doing that because of the grid-based nature of the city.” She didn’t stick to a scientific sampling regimen—the blocks of each color are placed according to aesthetic appeal. But the overall effect is a collection of squares that tells the story of what a meadow is made from.

A Question of Place

Telling that story for an urban plant community depends in part on how one views the weedy inhabitants that people helped introduce—and those perspectives often have nuance. In the early 2000s, artist and journalist Patterson Clark began volunteering with the National Park Service to remove invasive plants from Rock Creek Park in the Washington, DC, area. But he didn’t like the hostility he felt toward the plants. “I wanted to shift my attitude so that it was more of a positive approach rather than eradication,” he says. So he began thinking of his weeding as harvesting for his art, which entails fashioning invasive plants into paper, wood cuts, intricate wooden sculptures, and paints. Clark’s work has appeared in art shows across the country and was recently on display as part of the group exhibit “Into the Weeds” at the North Dakota Museum of Art.

But more often, cities don't look kindly on the weedy invaders. In New York City, 15 gardeners work in natural areas across the urban landscape to remove invasive plants, including many of the species in Irons' color palette. "Stormwater management, reduction of the urban heat island effect, air purification—all of these standard benefits are the greatest in mature forests," says Kristen King, the Director of Natural Areas Restoration & Management at NYC Department of Parks & Recreation, who manages the effort. "Invasive species literally physically threaten that forest structure." According to King, oriental bittersweet vines can take down native trees. But she concedes that a vacant lot in a formerly industrial area such as Bushwick may not lend itself to reestablishing native plants, with the notable exceptions of hardy natives such as willow and poplar trees.

So, do invasive plants in these more urban communities provide ecosystem services the same as or better than native plants would? "They might," says urban ecologist Timon McPhearson, director of the Urban Systems Lab at The New School, and lead author of a study analyzing the vegetative land cover of about 1,500 New York City vacant lots. He found that urban plants are providing key services, such as stormwater mitigation, air pollution removal, and carbon sequestration (3). "One reasonable hypothesis is that if invasive species can grow faster, reproduce faster, spread faster, they might be critical for providing climate adaptation related to ecosystem services that we care about like stormwater absorption and cooling the city."

McPhearson would like to see more research into how the traits of specific species—whether native or not—affect ecosystem services in cities. Few researchers have studied, for example, the effect of nonnative species on carbon dioxide sequestration, air quality, and nutrient cycling in cities, as noted in a recent review (4).

But even if nonnative plants prove to be valuable in urban settings, invasive nonnatives can spread from cities into more natural areas where they threaten biodiversity. Noting that some of the species in Irons' artwork were originally introduced into cities, biologist Sara Kuebbing, a postdoctoral fellow at the Yale School of Forestry & Environmental Studies, worries about the adverse effects of celebrating such plants. "It's important that the public understand why we need to do something about invasive species," she says.

Irons acknowledges the downside—especially if invading plants reduce ecosystem complexity. But she maintains that, at least in some settings, invasive plants are innocuous. Her work "takes the commonplace, or what might even be considered noxious, and gives it a value," says Jennifer McGregor of Wave Hill, a public garden and cultural center in the Bronx. McGregor included Irons' paintings in a 2013 exhibit called "Drawn to Nature."

As Irons works outside in vacant lots, people stop and ask her tough questions. "I get to have these more in-depth conversations about what it means to think about an ecosystem as pristine or not pristine, as made up of desirable natives versus undesirable invaders," Irons says. "I am always trying to trouble that binary."

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- 1 Executive Office of the President (2016) Safeguarding the nation from the impacts of invasive species. Available at <https://www.federalregister.gov/documents/2016/12/08/2016-29519/safeguarding-the-nation-from-the-impacts-of-invasive-species>. Accessed December 1, 2017.
 - 2 Finlay V (2002) *Color: A Natural History of the Palette* (Random House Trade Paperbacks, New York).
 - 3 McPhearson T, Kremer P, Hamstead ZA (2013) Mapping ecosystem services in New York City: Applying a social-ecological approach in urban vacant land. *Ecosyst Serv* 5:11–26.
 - 4 Potgieter LJ, et al. (2017) Alien plants as mediators of ecosystem services and disservices in urban systems: A global review. *Biol Invasions*, 10.1007/s10530-017-1589-8.