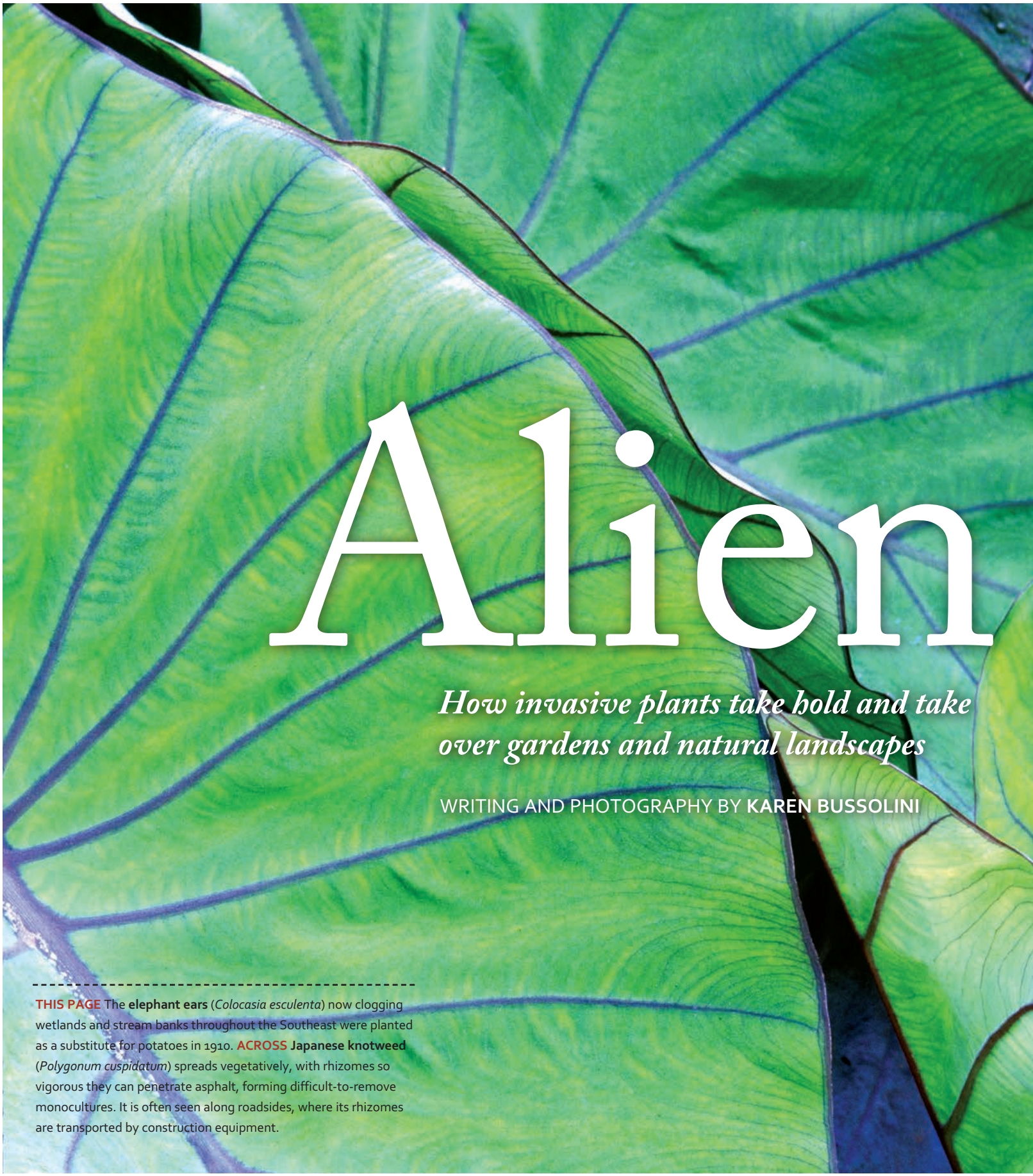
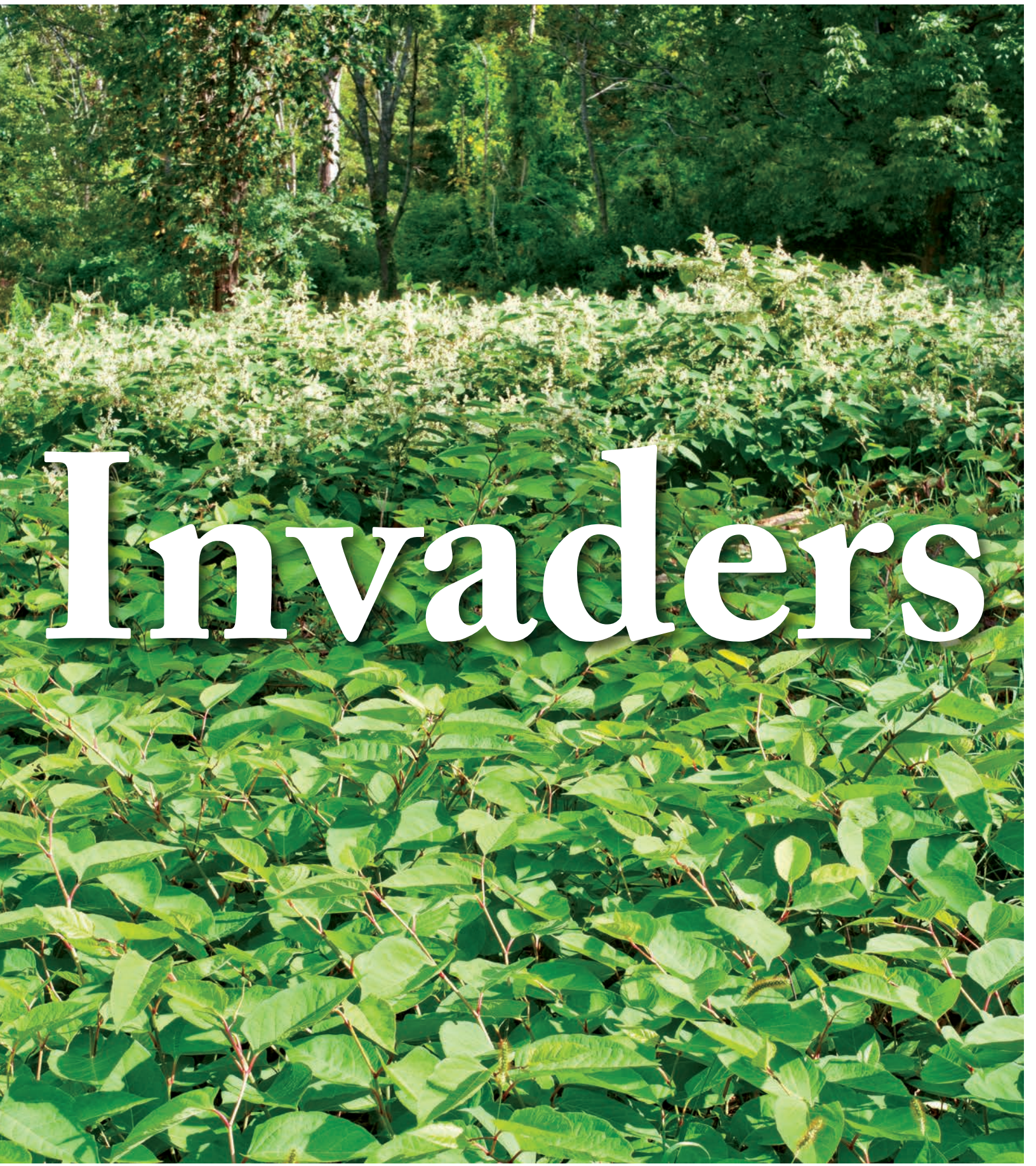


Alien

How invasive plants take hold and take over gardens and natural landscapes

WRITING AND PHOTOGRAPHY BY **KAREN BUSSOLINI**

THIS PAGE The **elephant ears** (*Colocasia esculenta*) now clogging wetlands and stream banks throughout the Southeast were planted as a substitute for potatoes in 1910. **ACROSS** **Japanese knotweed** (*Polygonum cuspidatum*) spreads vegetatively, with rhizomes so vigorous they can penetrate asphalt, forming difficult-to-remove monocultures. It is often seen along roadsides, where its rhizomes are transported by construction equipment.



Invaders

Plants with celestial-sounding names

like "Tree of Heaven" and "Heavenly Bamboo" suggest a garden paradise. But in many parts of North America, these two invasive woody plants – *Ailanthus altissima* and *Nandina domestica* – are among the many bad actors that evoke a more diabolical place. By definition under federal Executive Order 13112, an invasive species is one that is non-native to the ecosystem under consideration "and whose introduction causes or is likely to cause economic or environmental harm or harm to human health."

The USDA's Invasive Species Information Center notes that human actions are the primary means of introduction. Invasive plants aren't simple garden thugs. They displace native plants in natural and untended areas and can alter growing conditions – available light, nutrients, soil hydrology and fire regime – and harm agricultural crops.

Think of any native ecosystem as a densely woven tapestry. Each element, from microbial life in the soil up to the treetops, is an integral part of a fabric woven with many complex patterns and connections. Organisms that evolved together have figured out how to coexist by using energy efficiently. They limit direct, exclusionary competition for the same resources by occupying diverse specialized niches, keep each other in check and interact in numerous ways, such as enabling nutrient exchange or trading food for seed dispersal.

Jerry Jenkins, director of the Northern Forest Atlas Project for the Wildlife Conservation Society, notes that invasive plants are more likely to take over land that has been farmed than poorer, undisturbed soils. Disturbance by tilling, construction equipment, snowplows, erosion, deer and invasive Asian earthworms (*Amynthas agrestis*) churning the soil, off-road vehicles, or even hordes of hikers – tears that fabric. Superb opportunists, invasives quickly fill vacant niches – a clumsy patch of monoculture in an intricate fabric. If unchecked, they degrade that fabric until it all comes unraveled.

HOW DO THEY DO IT?

Try to keep in mind, when faced with a backyard full of vine-choked trees and prickly, tick-harboring barberry, that alien invasive plants aren't inherently evil. They co-evolved – somewhere else – with diseases, herbivores and competitors keeping them in check. Released from those limitations, some become super-competitors. These aliens aren't usually eaten by local insects, which haven't had time to adapt to the plants' chemical defenses, and may not be prone to diseases in the new land. This impacts birds that depend upon protein-rich insects. In the race for space, native plants – slower, more specialized, and inhibited by local diseases and herbivores – are literally left in the dust. With invasion, complex and stable self-organized systems become simple, unstable and impoverished.

Certain traits give them an edge. They are often generalists that grow just about anywhere, are salt- or shade-tolerant, or are exceptionally resistant to drought or moisture, enabling them to to thrive in arid or riparian regions. Invasives grow fast and often seed like crazy. Many are self-pollinating and have a long flowering and seed-viability time. Mile-a-minute vine (*Polygonum perfoliatum*) can grow 6 inches a day, allowing a single plant to blanket an area 30 feet in diameter and produce more than 2,000 seeds that stay viable for five or six years.

Lightweight seeds disperse by wind or water. Berries exist solely to entice wildlife to eat them and spread their seed far and wide. Some invasives spread vegetatively. Nutgrass (*Cyperus rotundus*), for instance, forms a complex underground system of basal bulbs, rhizomes and tubers, any piece of which will regenerate. Golden bamboo (*Phyllostachys aurea*) spreads via tenacious woody rhizomes. Giant reed (*Arundo donax*) dominates warmer areas, where it blocks irrigation and navigation channels, suppressing and excluding lower-growing native plants.

CLOCKWISE FROM TOP: Fall foliage in the understory of deciduous woods reveals the extent of **barberry invasion** near the Appalachian Trail in Connecticut • **Multiflora rose hips** (*Rosa multiflora*). • A wetland overtaken by **purple loosestrife** (*Lythrum salicaria*), an ecosystem game changer.

How To Deal With Invasive Plants

INVASIVES ARE ADDRESSED – or not – in a patchwork of local, state and federal regulations, watchlists, laws, suggestions and voluntary actions by the nursery industry. Many prohibit noxious weeds from being sold or moved, but having them is legal.

An online search for invasive plants by state will bring up a wealth of reliable websites, as well as chatroom misinformation and vendors touting "fast-growing, pest-free" plants without mentioning invasiveness. The University of Georgia's Center for Invasive Species and Ecosystem Health, in cooperation with several other organizations, has the most comprehensive website, at www.invasive.org. The seeds of many bachelor's buttons, fennel and nasturtiums that charmingly self-sow in some gardens are prohibited from being shipped to certain states where they have legal status as invasive plants. Where there is no law, there is no prohibition, so buyer beware.

Prevention is the best cure. Soils imported from other sites can carry a wealth of propagules – plant parts and seeds – so do everything you can to use the soil you have. Bulk mulch can also be a big problem. Local sources seem like an environmentally sound recycling/carbon emission-reducing solution, but not if the mulch is made from grinding up yard waste, especially if delivery to the facility is unsupervised. You really don't want to find out the hard way that knotweed or bamboo rhizomes are in the mix. And if you are doing construction, your contractor will think you're crazy, but do insist that vehicles and equipment treads are cleaned before entering your property. These precautions will save a lot of big headaches.

You can't control a plant without understanding its biology and replacing it with something. Tactics include physical removal, depletion of stored resources, smothering, burning and poisoning. If a flowering plant is prevented from flowering or pruned after flowering, it can't set seed. Annuals pulled up before flowering can be left to dry out and used as mulch or composted. If they're surrounded by desirable natives, it's even better to simply clip them at the base to avoid disturbing the soil, which only brings more seeds to light. Colonies of annuals like Japanese stiltgrass can be mowed repeatedly to prevent seed-set or cut very close to the ground with a string trimmer. Since there are likely seeds in the

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A life cycle out of sync aids invasion. Deciduous invasives tend to leaf out earlier than natives in spring, shading out the competition and hogging resources. They may remain green longer in fall or are evergreen, grabbing more energy by photosynthesizing longer. This enables formation of dense populations that deprive other plants of light, water and nutrients.

Some conduct chemical warfare or alter soil chemistry. Allelopathic plants exude substances that suppress growth or germination of other plants, affect soil biology and impact animal life. Their unpalatability to browsers increases herbivory on natives. Bernd Blossey, an experimental ecologist at Cornell University's Ecology and Management of Invasive Plants Program, found more damage to native plants where Japanese stiltgrass dominates a woodland because deer avoid the grass and eat whatever else emerges.

GAME CHANGERS

Invasives employing multiple strategies can become ecosystem changers. Wetland habitats throughout the country are compromised by the lovely perennial purple loosestrife (*Lythrum salicaria*). A prolific seeder (one plant can produce 2 million seeds a season), its built-up detritus alters water levels, impacts drainage and navigation channels, and blocks access to water's edge. Insects, birds and animals that depend on marsh plants are deprived of food and preferred habitat when loosestrife is on the loose; few make use of it.

A single biennial garlic mustard (*Alliaria petiolata*) plant, self- or insect-pollinated, can produce up to 7,900 seeds that are spread by wind, water, wildlife and people. The evergreen is allelopathic, suppressing nearby plants and crucial mycorrhizal fungi. Several butterfly species get the chemical signal to lay eggs on garlic mustard, but the hatched larvae die because they cannot eat the leaves – nor do other herbivores partake (although it is delectable to humans, which explains how it got here in the first place).

Cheatgrass (*Bromus tectorum*) got a foothold in overgrazed rangeland in the dry West. With its extremely flammable dry foliage, cheatgrass now covers millions of acres and has dramatically shortened the wildfire return interval (from decades to less than five years in southern Idaho). It quickly dominates burned sites and is able to switch from self- to cross-pollinating, producing plants with hybrid vigor. It increases soil temperatures and disrupts water and nutrient cycles on a scale large enough to stand out in satellite data.

Where invasives come from matters. The temperate Pacific Northwest is plagued by English ivy and Scotch broom, from similar climates. Fly into Seattle when broom's abloom and you'll see masses of yellow from the air. But in coastal Massachusetts, although broom seeds along roadsides, it is widely sold and not listed as invasive in most places. Gardeners complain that it's not reliably hardy.

LOOKING FOR TROUBLE

It's easy to simply not see the problem. Scientists call it "plant blindness." Damon Waitt, former Wildflower Center senior

CLOCKWISE FROM TOP LEFT: When **periwinkle** (*Vinca minor*), a ubiquitous low-maintenance groundcover, escapes from the garden or is dumped with garden debris, it spreads throughout woodlands by stolons. • For one week per year, **multiflora roses** boast masses of dainty blossoms that suffuse the early summer air with a heady cinnamon-rose scent – and are a thorny nightmare overtaking fields, woodlands and wetlands the rest of the year • **Japanese knotweed** is able to weave its way through a stone wall, as it did here. • **Purple loosestrife** is attractive to bees, which enable cross-pollination with garden varieties erroneously marketed as sterile cultivars.

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soil seedbank, covering with cardboard or wood chips and planting a cover crop will diminish reseeding.

Blooming garlic mustard will ripen seed even if uprooted, but cutting bloom stalks at the base as they flower (string trimmers can handle big populations) disrupts their life cycle. It's tempting to try to pull berrying vines like bittersweet and porcelainberry down from trees, but they're usually too intertwined; just cutting them before they can fruit will at least prevent another year's reproductive success. When digging out shrubs and vines, make sure to tamp down disturbed soil and cover with leaf litter or plant something and monitor for subsequent seed germination.

Plants that invade by vegetative means are especially difficult to eliminate. Tilling just increases them, as they sprout anew from broken pieces. Repeated cutting or mowing over time can be effective in depleting underground resources, especially if combined with smothering. Vigorously resprouting shrubs like barberry and honeysuckle can be cut back and allowed to expend some energy resprouting. Then it's time to hit them with a high-powered propane torch (on a damp day with a hose standing by), or stems can be cut a second time and painted with herbicide. Shrubs will resprout if cut neatly but rarely do when ground down to soil level and smashed to smithereens by a low-impact, high-precision forest mower. And of course you can try just digging them up, but you'll have to keep at it. Always try the least-toxic method first – targeted application of the correct systemic herbicide is sometimes the only way, but herbicides aren't for amateurs.

Timing is important. Noticing and taking care of invasive plants when they are tiny saves a lot of work. Small plants can be pulled, doused with organic (non-systemic) vinegar-based herbicides or burned with a torch. Mow annuals or biennials too early and they will rebloom. Woody plants translocate their resources down into the roots in fall, so that's the time to try to knock them back, especially if you use systemic herbicides. Herbaceous plants use a lot of energy bursting forth in spring, so tackle them then. And proper disposal is a must; those propagules – seeds and vegetative parts – will reproduce if you toss them on the compost or over the back fence, so dispose in a landfill or burn them.

Spring and fall are good times to notice what doesn't belong – those invasive plants that leaf out earlier or stay in leaf later than the natives. And as the Texas Invasives website advises, "If you don't know it, don't grow it."

CLOCKWISE FROM TOP: **Norway maples** (*Acer platanoides*) form dense stands that shade out other plants and are easy to distinguish from native maples in autumn, as their yellow leaves are last to fall. • Several **Asian honeysuckles** (*Lonicera* spp.) trick birds into spreading their seeds by offering sweet berries. When migrating birds consume honeysuckle berries, they're like runners trying to fuel a marathon by eating jellybeans – the sugars can't sustain the journey. • Highly fertile genotypes of **mugwort** (*Artemisia vulgaris*) seed aggressively along roadsides and waste places in many parts of the country.

Citizen Watch

AS A PARTNER IN THE Invaders of Texas program, the Wildflower Center trains citizen-scientists throughout the state to identify and report invasive plants. At texasinvasives.org, the program outlines several steps that gardeners, hikers and boaters should take to avoid spreading invasive species throughout and outside of their regions. Other regional programs exist nationwide that also train citizen-scientists and educate people about specific actions to take or not take that are relevant in their areas.

director and botanist who is now the director of the North Carolina Botanic Garden and a member of the National Invasive Species Advisory Committee, observes, "For a lot of people, plants are the green backdrop to life. When driving down the highway, they're unable to distinguish between what's supposed to be there and what isn't." Gardeners, homeowners, birders and others who enjoy the outdoors play an important role by being "plant aware."

New plants and new genotypes pop up all the time, but we notice the pretty ones first. When showy flowering plants that look like something from a garden suddenly show up in a stream corridor, they probably are from a garden and will keep moving downstream. We don't catch on so fast with "background" roadside plants like mugwort (*Artemisia vulgaris*), although once we "see" them, they're everywhere. Widely reported to be infertile in the U.S., it began proliferating out of the blue in western Connecticut yards and byways in recent years, showing its seeds to be fertile indeed.

Roadways, rail lines, pipelines, and other disturbed and neglected places on public and private land are corridors for invasion. Budgets seldom allow for effective maintenance, and access can be difficult, denied or dangerous, which is why organizations with resources, volunteer labor and credibility are so important.

Justin Bush, with Washington's King County Noxious Weed Control program, says, "When it comes to invasives, success requires a commitment to maintain and follow up over time – you're not going to eliminate it all in one pass. There's likely a seedbank or an opening that allowed for invasion in the first place."

As for those openings – fill them with the thoughtfully chosen regionally native plants that belong there, hold their ground, and invisibly restore the threads and patterns of a precious native tapestry. ❁

Karen Bussolini is an eco-friendly garden coach, garden photographer and widely traveled speaker who can spot an invasive at 65 mph.