



getting a grip on weeds

Preventive measures, physical controls, and alternative herbicides provide a winning strategy in the ongoing battle with weeds.

BY KRIS WETHERBEE

LET'S FACE IT. Weeds are continually present, popping up in lawns, ornamental beds and borders, vegetable patches, or in the cracks between stone paths and brick walkways. Weeds can disrupt the aesthetics of your overall landscape design and they vie with cultivated plants for available water, nutrients, sunlight, and space. And many compete with a vengeance. This can leave the population of desirable plants weakened, less productive, and more susceptible to disease.

The appearance of a few random weeds in the landscape is tolerable; after all, who needs perfection? And a few weeds may actually benefit your garden—some provide nectar and pollen and serve as alternate hosts for beneficial insects that help check populations of plant-consuming insects. But when weeds threaten a hostile takeover of your garden, it's time to consider your options for cracking down on the truly aggressive invaders.

Although some circumstances may require synthetic herbicides, they should always be viewed as a last resort. In addition to adding considerable costs to gardening, they can be counter-productive to a comprehensive weed control plan.

William Quarles, executive director of the Bio-Integral Resource Center (BIRC) in Berkeley, California, and managing editor of *The IPM Practitioner*, says that herbicides can create more problems when “either weeds become resistant or continued use changes the weed spectrum so that susceptible annual weeds are killed, and more difficult perennial weeds invade the area.” As a result, weeds may actually gain ground in your garden.

Fortunately, there are lots of preventive measures and ecologically-safe procedures that will help keep problem weeds under control. Using these methods in combination yields the best results. You rarely need an onslaught of toxic chemicals to make weeds



Self-sowing weeds, such as purslane, are very difficult to eradicate.

retreat if you have sound defense and a well-conceived attack plan.

THE NATURE OF WEEDS

In down-to-earth terms, a weed is simply any plant that is unwelcome, unattractive, or out of place. However, not all weeds are equal. It's important to distinguish between the occasional nuisance and a truly troublesome weed (for some of most problematic weeds by region, see the sidebar on page 23).

Any plant should be considered a wicked weed when it grows aggressively, reproduces prolifically, and easily displaces more desirable plants. Some, like bindweed (*Convolvulus arvensis*), are more invasive than others—and extremely difficult to eradicate. Self-sowers like purslane (*Portulaca oleracea*) dispense as many as 50,000 seeds in a single season. And some weed seeds, like those of ragweed (*Ambrosia artemisiifolia*) and black mustard (*Brassica nigra*) can remain viable in the soil for decades.

Weeds invade gardens in a variety of ways. Their seeds are spread by wind, water, or animals. Weed seeds, roots, and seedlings can gain entry via purchased plants, manures, soil, and the soil amendments that we bring into our gardens. No matter how they get there, the first step in developing a control strategy is to determine how they propagate.

Annual weeds like redroot pigweed (*Amaranthus retroflexus*), ragweed, and crabgrass (*Digitaria* spp.) produce massive amounts of seed. Crabgrass alone can set as many as 150,000 seeds in one year. It also

spreads by stolons—creeping horizontal stems that form roots and new plants along their length. Because annual weeds survive winter only as seed, if you prevent seed formation, you dramatically reduce next year's re-infestation. And most annual weeds are shallow-rooted, so they are fairly easy to remove by hand pulling or cultivation.

In addition to setting seeds, many perennial weeds multiply in other ways, complicating control measures. Some proliferate by bulbs, underground stems called rhizomes, or by stolons. Many die back to the ground in winter, but their roots persist from year to year so that, left unchecked, perennial weeds can become firmly established and difficult to eradicate.

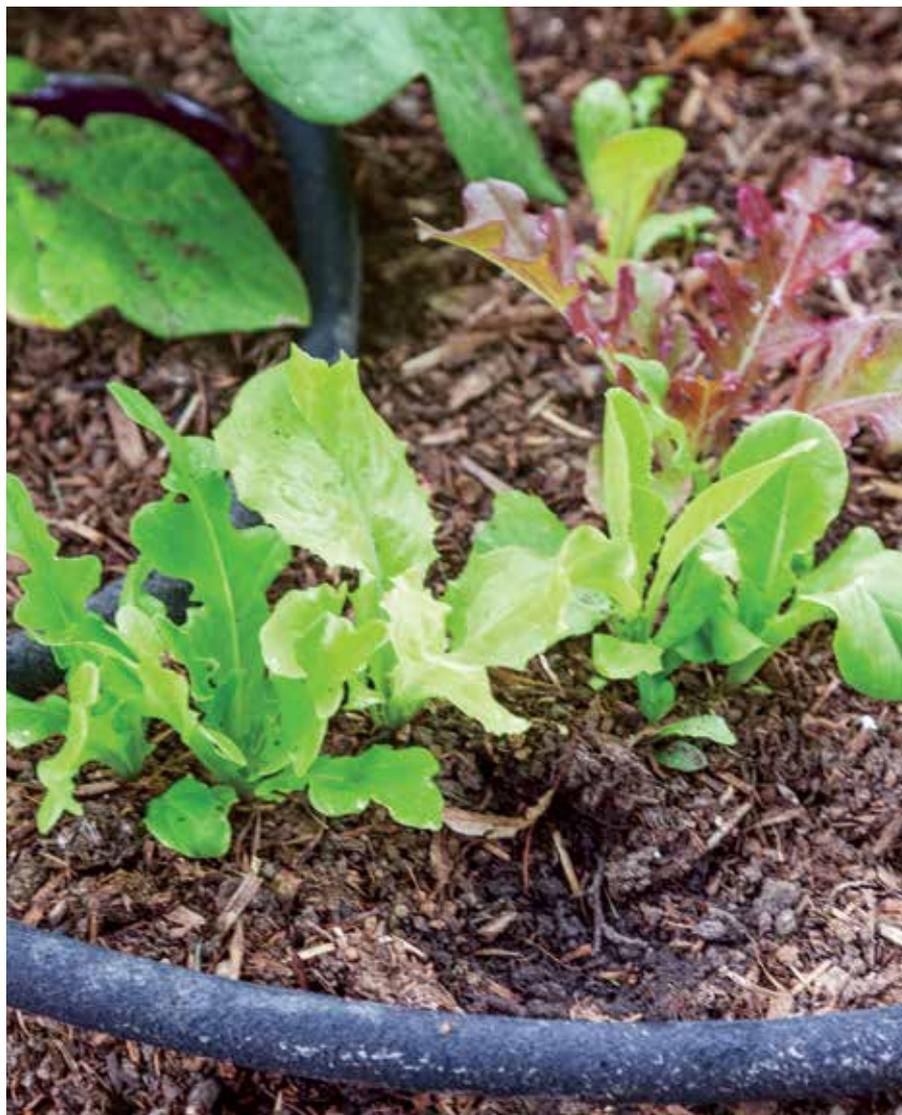
AN OUNCE OF PREVENTION

Whether weeds spread by seed or invade

beds and borders via rhizomes, runners, or roots, the best way to control them is to prevent them from ever gaining ground. Garden design and growing techniques aimed at tipping the balance in favor of desired plants are at the forefront of prevention.

Weeds are opportunistic. Because many adapt readily to less-than-ideal conditions, soil compaction, erratic watering, and improper cultivation favor weed development. But soil rich in organic matter and nutrients and a consistent water supply will foster strong, healthy garden plants that are capable of competing with the weeds. The key is to nurture the desired plants, not the weeds.

For example, overhead watering and sprinkler systems supply both weeds and plants with water. In contrast, drip irrigation and soaker hoses are much more restrictive in the area they cover, delivering



Use soaker hoses to target water only to desired plants, not weeds.

moisture right to the root zones of targeted garden plants rather than nearby weeds.

Improper cultivation can inadvertently multiply weeds. Rototilling brings up buried seeds to the top one to two inches of soil where most weed seeds germinate. It also chops roots, rhizomes, and stolons into tiny pieces that can generate new plants. Unless the sprouting weeds are pulled or killed with subsequent shallow cultivation, the weed presence increases.

You can also design weeds out of your landscape by growing plants closer together. Close spacing creates a dense canopy of leaves that acts as a living mulch, shading the soil from sunlight so weed seeds are less likely to germinate. Starting your garden with transplants rather than sowing seeds is another useful strategy because the leafy shade develops more quickly.

When you're waiting for newly planted perennials to fill in, cover up the spaces between them with fast-growing annuals such as sweet alyssum (*Lobularia maritima*), garden verbena (*Verbena xhybrida*), or petu-

Top right: Applying a thick layer of organic mulch, such as shredded bark, can discourage many weed seeds from sprouting. Bottom right: Close planting in this border leaves less empty space for weeds to take hold.

nias. Maintaining a mow strip—a paved, brick, or stone surface—between lawns and beds and under fences helps prevent weed intrusion and reduces maintenance.

Applying organic mulch is another effective way to prevent weeds from popping up. A four-inch-thick layer of mulch makes it difficult for seeds to germinate, and the few seedlings that do manage to surface are easily pulled. Good sources include lawn clippings, shredded leaves, bark mulch, pine needles, aged sawdust, compost, nut or seed hulls, or even layers of newspaper or cardboard. One mulch material that I've been using for years in my own garden is sheep's wool. It's easy to spread and is quite dense, yet allows air, water, and nutrients to pass through to plant roots. Wool is also slow to decompose, but when it does, it serves as a great source of nitrogen and trace minerals.

Perennial weeds often push up through organic mulches, although sheep's wool is a good deterrent for most perennial weeds. Covering the ground first with a synthetic barrier followed by a thin one- to two-





Landscape fabric provides weed control in this herb garden containing basil and marigolds.

inch layer of mulch helps keep many perennial weeds under control. Thick plastic sheeting and landscape fabrics—available as spunbond, woven or non-woven materials—provide a great physical barrier to weeds. Unlike plastic, landscape fabrics allow water, air, and nutrients through.

Soil solarization is a great technique for weed control when breaking new ground, establishing new beds, or exclusively growing annual vegetables and flowers. The soil is cultivated to bring weed seeds to the point of germinating, then cooked so seeds die as they sprout. This is accomplished by rototilling (which brings weed seeds to the surface), watering thoroughly, then covering the area with three- to six-millimeter clear plastic sheeting that has been snugly secured around the edges. It takes at least four to six weeks to do a thorough job.

Corn gluten meal (CGM) is a protein-based, natural product that prevents root formation in germinating seeds. As a non-toxic pre-emergent herbicide, it is marketed under several names such as Espoma Organic Weed Preventer, WOW™, and Safe 'N Simple™. “It is more effective as a pre-emergent when incorporated into soil than when used as a topdressing,” says Quarles. It is non-selective, so don’t use it on a newly seeded lawn.

Timing can be tricky since CGM is only effective when applied before seeds germinate.

“The idea is to apply it, water it in a few weeks before annual weeds germinate, then let the area dry out so that the sprouting seeds will die due to lack of a root system,” explains Quarles. Applications vary somewhat among the CGM products, so follow the instructions on the label for best results.

CGM studies have supported its effectiveness in the Midwest. But Linda Chalker-Scott, a horticulturist and associate professor at Washington State University’s Puyallup Research and Extension Center, says that it doesn’t work as well in other



Pre-emergent weed-control products containing corn gluten meal are widely available.

Sources

Gardener's Supply Company, Burlington, VT. www.gardeners.com.

Gardens Alive, Lawrenceburg, IN. www.gardensalive.com.

Peaceful Valley Farm Supply, Grass Valley, CA. www.groworganic.com.

Planet Natural, Bozeman, MT. www.planetnatural.com/product/horticultural-vinegar.

Resources

Bio-Integral Resource Center (BIRC), Berkeley, CA. www.birc.org.

The Gardener's Guide to Common-Sense Pest Control by William Olkowski, Sheila Daar, and Helga Olkowski. Taunton Press, Newton, CT, 2013.

Solving Weed Problems by Peter Loewer. Lyons Press, Guilford, CT, 2001.

Weedless Gardening by Lee Reich. Workman Publishing, New York, NY, 2001.

climate zones, such as those found in the western part of the country. “Areas with wet springs have no luck with CGM,” says Chalker-Scott. She notes there are other environmentally safe treatments that are often more effective for controlling weeds, such as sub-irrigation, mulch, and soil solarization. “I recommend deep layers of arborist wood chip mulch,” adds Chalker-Scott.

A POUND OF CURE

When weed prevention has slipped through the cracks, or too many weeds have grown through the cracks, it’s time to take action. Hand-weeding is always easier and more productive when the ground is moist, and cultivating or surface hoeing is best when the ground is somewhat dry so any seedlings left on top of the soil are less likely to re-root.

Hoeing effectively dispatches young annual weeds and tiny, newly germinated seedlings. Some hoes slice just below the surface, while other hoes—commonly called stirrup or scuffle hoes—scrape over the surface. Regardless of type, keep the blade sharpened for efficient use. Annual weeds with strong root systems will likely require repeated hoeing.

COMMON WEEDING MISTAKES

- Leaving bare soil uncovered. Whenever there is bare soil coupled with moderate soil temperatures, you've got the makings for an invasion.
- Using raw animal manure or hay. Hay and most animals manures contain weed seeds and should be thoroughly composted in a hot pile (160 degrees Fahrenheit) before use. Horse manure is best avoided altogether.
- Applying fertilizer improperly. When you fertilize the entire bed rather than the specific plant, you also feed neighboring weeds.
- Pulling weeds and leaving them on the soil. Flowering annual weeds like purslane can continue to develop and disperse their seeds. Perennial weeds can easily re-root or grow new plants from pieces of root that break off.
- Delaying action. Don't let annual weeds go to seed or allow perennial weeds to become established before dealing with them. —K.W.



For more effective weeding, be sure to dig out and dispose of the roots of the unwanted plant.

For weeds with persistent roots, the entire plant should be removed, so a shovel or mechanical weeder are the tools of choice. Mechanical weeders are equipped with long handles that allow you to stand while pulling out weeds. The sharp prongs grip the weed, extracting the plant and its roots as you pull it out of the ground. A shovel or spading fork work best for perennials that spread, such as bindweed or Canada thistle. Be sure to get as many of the roots and runners as possible.

Pulling weeds by hand is another option. Use a trowel, hand fork, or a weed-pulling tool with a forked end to dig under the roots, especially for perennials. Dispose of vegetative parts of weeds in a compost pile because they can re-sprout if left on the soil surface. Discard weeds that have gone to seed elsewhere, so you don't risk contaminating your compost.

Or, how about putting weeds under fire? Weed flaming works by heating plant cells so they rupture, causing the plant to die within a few hours, although they may not actually look dead for a couple of days. Young plants are most susceptible to this scorching technique. A single two- to three-second pass with the flamer usually kills small broad-leaf annuals; perennial weeds may require

repeated treatments. Flamers are excellent for weeding along fences, in cracks between pavers, and around trees and shrubs. Use with care, though, and *never* in a bed covered with organic mulch that could catch fire.

Weeds can also be killed with water—boiling water, that is. Applied with a teakettle to invading vegetation that crops up between bricks and pavers, it is both effective and inexpensive.

If you opt for an herbicide, there are several low- and non-toxic choices. These are non-selective, killing any plants on which they are sprayed. They do not have a residual effect.

Soap-based herbicides are combinations of fatty acids and salts; they are best applied when temperatures are above 70 degrees Fahrenheit. Household grade vinegar (five percent acetic acid) will control many weeds and is great to use between pavers and bricks. Quarles suggests that “best effects are seen when weeds are small, and if it is applied in sunny conditions, where heat will help desiccate the weeds.”

Products with a higher concentration of acetic acid, such as Natural Horticultural Vinegar, are even more effective. “Higher concentrations of acetic acid can burn skin

and eyes and can be a hazard if not handled properly,” warns Quarles.

Other alternative herbicides are based on clove oil (eugenol), cinnamon oil, citrus oil (or d-limonene), and citric acid. Products such as BurnOut include a combination of citric acid and clove oil. Avenger Weed Killer contains d-limonene, a component of citrus oil. Most control both annual and perennial weeds, though they are best when used on young, actively growing weeds; repeated applications may be needed.

“Iron chelates can be effective for lawn weed control,” says Quarles. Sold under brand names such as Iron XI™ and Fiesta, they target a wide range of broadleaf weeds without injuring grass, as long as they are used according to directions.

You'll never win the war against weeds. However, with a good offense and a backup defensive plan in hand, you'll be well equipped to win the important battles and then simply manage the rest. 

Kris Wetherbee battles weeds organically in her garden in Oakland, Oregon. This is an updated version of her original article, which was published in the January/February 2006 issue of this magazine.

North America's Problem Weeds by Region

NORTHEAST

According to Andy Senesac, a weed science specialist at Cornell University Cooperative Extension in Ithaca, New York, pigweed (*Amaranthus* spp.), lambsquarters (*Chenopodium album*), and purslane (*Portulaca oleracea*) are among the most troublesome weeds in the Northeast. "Hand-pulling pigweed and lambsquarters in mid- to late spring, when plants are young, is an effective control method," says Senesac. "For purslane, wait until the plants are the size of a saucer plate, when they are easier to grab and fully pull from the ground. Be sure to remove all the roots; otherwise, it can easily regenerate." Both lambsquarters and purslane are edible, so you can consider adding the young leaves to salads.



Equisetum arvense

WEST

Horsetail (*Equisetum arvense*) and morning glory or bindweed (*Convolvulus arvensis*) are the two worst garden weeds in the West, according to Marianne Binetti, a garden writer and lecturer in Enumclaw, Washington. "I cut them off at ground level whenever I see them," she says. "It takes about three cuts to starve out those roots." [Editor's note: As a last resort, the herbicide dichlobenil will kill horsetail, but it should be used with extreme caution and never applied near food crops.]



Convolvulus arvensis

MOUNTAIN REGION/GREAT PLAINS

"*Convolvulus arvensis* is undeniably the most universal and pernicious of weeds in many gardens," says Panayoti Kelaidis, director of outreach at the Denver Botanic Gardens. "It doesn't seem to be killed outright by herbicides; it just retreats a bit, then comes back with a vengeance." Contact herbicides such as glyphosate may help quell bad infestations, says Kelaidis, but he urges gardeners to follow label directions carefully if they use such products.

Kelaidis also rates several thistles high on the noxious list: "Scotch-type thistles (*Onopordum acanthium*, etc.) can be eliminated with diligent weed-



Cyperus esculentus

ing because they are biennial," he says. "Get them before they bloom. Bull and Canada thistles, especially *Cirsium arvense*, spread rapidly from rhizomes and are harder to eliminate."

SOUTHEAST

"Nutsedge (*Cyperus esculentus*) was a terrible problem when I gardened in northern Florida, and I see it as a major problem in many other southern areas," says Richard Bir, a retired horticulturist formerly with North Carolina State University. "I'm not sure it will ever be eradicated completely from my garden, but if I pull it whenever I see it, it generally stays under control in the vegetable garden, and mulching plus pulling it works well in the flower borders."

SOUTHWEST

"Six-week grass (*Schismus barbatus*), London rocket (*Sisymbrium irio*), and spurge (*Euphorbia* spp.) are the worst weeds here," says Mary Irish, a Texas-based writer and lecturer specializing in native plants. "Hand-pulling is my preferred method to eradicate them. I also advise people to at least get rid of the flower before it sets seed to try to hold down future generations." Irish also recommends using full strength, white vinegar on weeds in hard-to-reach places such as between stepping stones or along pavement edges.

MIDWEST

"Goutweed (*Aegopodium podagraria*) and creeping bellflower (*Campanula rapunculooides*) both have an underground network of stems, and once they get into a garden they're quite difficult to remove," says Ed Hasselkus, emeritus professor of horticulture, University of Wisconsin, Madison. Hasselkus says hand-digging is the most effective means of control. "Don't pull them up, because you won't get all the roots; *Campanula* has a carrotlike root that has lots of storage capacity and can easily resprout."

—AHS staff