

WEED MANAGEMENT IN LAWNS

Integrated Pest Management for Homes, Gardens, and Landscapes

Weeds occur in every lawn, but they seldom become problems in well-managed, vigorously growing turfgrass. Proper site preparation and turfgrass selection before planting are essential to give a new lawn a healthy start. Once a lawn is established, poor maintenance practices that weaken it—such as improper irrigation, fertilization, or mowing—are the primary factors likely to predispose it to weed invasion. Activities that lead to compaction also contribute significantly to turfgrass stress, making it easier for weeds to invade.

An integrated weed management program can reduce most weed populations to tolerable levels and prevent large, unsightly weed patches. Total eradication of weeds is not a realistic or necessary goal for most lawns and park turfgrass; however, with proper maintenance a lawn can be practically free of weeds without the extensive use of chemicals. Refer to the *UC Guide to Healthy Lawns* (see REFERENCES) for detailed information about turfgrass management practices.

WEED IDENTIFICATION

Identifying weeds and knowing their life cycles are essential to management. Three general categories of weeds may be found in lawns: broadleaves, grasses, and sedges (Figure 1). Take care to distinguish weedy grasses from similar-looking lawn grass species.

The life cycle of weeds may be annual, biennial, or perennial. Annual weeds are commonly identified as either winter (cool-season) or summer (warm-season) annuals and survive only one season. If not controlled before they flower, they can produce seed that will sprout the following year or sometimes in the same growing season. In mild climates or in lawns that are influenced by microclimates, cool-season annuals



Figure 1. Broadleaves have wide leaves with veins branching out in different directions. Grasses have narrow leaves with parallel veins, arranged in sets of two. Stems are rounded or flattened. Sedges resemble grasses, but have leaves arranged in sets of three and stems that are triangular in cross-section.

may be found growing in summer (or year-round) and warm-season annuals may be found growing in winter (or year-round).

Biennial weeds survive for two growing seasons, reproducing vegetatively or by seed; however, seed is not produced until the second year. Perennial weeds survive for many years, and though they produce seeds, many primarily reproduce vegetatively by creeping stems (stolons and rhizomes), tubers, or fleshy roots. Perennial weeds are the hardest to control once established.

The most troublesome weed species in lawns are listed in Table 1. For additional weeds, see the *Turfgrass Weed Photo Gallery*.

WEED INVASION

Weeds often invade turfgrass that is over- or under-watered, improperly fertilized, improperly mowed, or highly compacted. Lawns that have been weakened by plant diseases or insect pests are also likely to become weedy because there is more open space for a weed to establish. Most weed invasions can be prevented with proper lawn maintenance and good preventive practices or remedied with overseeding. The most troublesome weed species that invade turfgrass are often associated with specific conditions (see Table 1). Identifying the weed species present may give an indication of the underlying problem responsible for the invasion

PEST NOTES

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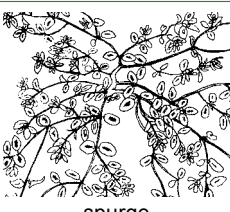


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Table 1. Special Weed Problems in Lawns and Their Associated Conditions.

	Weed species*	Associated conditions	Cultural management comments
ANNUAL GRASSES			
 <p>crabgrass</p>	annual bluegrass	overwatering; compacted soil	reduce irrigation; aerate
	crabgrass (smooth and large)	overwatering or frequent light watering; mowing too short	water longer and less often; check mowing height
	goosegrass	overwatering; compacted soil	reduce irrigation; aerate
PERENNIAL GRASSES			
 <p>bermudagrass</p>	bermudagrass	previous bermudagrass lawn or infestation; close mowing; sun and heat	remove plants before they spread; increase mowing height
	dallisgrass	overwatering; compacted soil	remove plants before they spread; reduce irrigation; aerate
ANNUAL BROADLEAVES			
 <p>spurge</p>	California burclover, black medic	low nitrogen fertility	remove plants and fertilize
	common knotweed	compacted soil	aerate
	spurges (spotted and prostrate)	closely mowed turfgrass with open areas; low nitrogen fertility	raise mowing height; remove plants before they spread
PERENNIAL BROADLEAVES			
 <p>plantain</p>	white clover	low nitrogen fertility	fertilize
	creeping woodsorrel	nearby sources of infestation	remove plants before they spread
	dandelion	poorly maintained thin areas or nearby sources of infestation	remove plants by hand; improve turfgrass management practices
	English daisy	moist areas of turfgrass mostly in cool coastal climates	keep turfgrass on dry side; improve turfgrass management practices
	plantains (buckhorn and broadleaf)	overwatering; compacted soil; poorly maintained open turfgrass areas; shaded areas in warm climates	reduce irrigation; aerate; improve turfgrass management practices
SEDGES			
 <p>green kyllinga</p>	green kyllinga	overwatering; poor drainage; sun and heat	irrigation
	nutsedge	overwatering; poor drainage; sun and heat; nearby infestation	reduce irrigation; remove plants before they spread

*Pest Notes are available for all listed species except goosegrass and English daisy.

and suggest what can be done to reduce the weed infestation. For detailed information about the major weed species listed in Table 1, refer to the Pest Notes listed in REFERENCES.

WEED MANAGEMENT BEFORE PLANTING

Prepare Your Site

A healthy lawn begins with a properly prepared site. Before planting, remove existing vegetation and prepare the area for planting. If you expect annual weeds to be a problem, irrigate the site to allow weeds to germinate. Follow up with a shallow cultivation or an application of a nonselective herbicide (defined below) such as glyphosate or clove oil, and repeat this process until the area is free of weeds. This is important when planting with seed or sod.

Perennial weeds are harder to control than annuals. For perennials, dig out and remove as many as possible. Cultivate the soil to bring up buried propagules (stems, rhizomes, and tubers). It is best to do this when conditions are warm and dry so that the propagules will desiccate on the soil surface. Rake off and remove the propagules. If you have particularly troublesome weed problems, continue to work the soil without irrigating for several months to bring up new propagules. A few species such as field bindweed and purple nutsedge cannot be controlled in this manner. A nonselective, systemic herbicide such as glyphosate, applied when weeds are actively growing, can also be used to kill many difficult-to-control perennials, but repeat applications may be needed.

Soil solarization can be very effective at controlling many weed species prior to planting and is ideal for gardeners who want to avoid herbicide use. Once the area is rototilled, amended, and prepared for planting, place clear polyethylene plastic 1 to 2 mils (0.025-0.050 mm) thick over the moist soil surface, and cover the edges with soil to hold them in place. For best results, soil solarization must be carried out during the time of highest solar radiation—from June to August in inland California—and the tarps must remain

on the infested soil for 4 to 6 weeks. Solarization is less effective or ineffective in cooler coastal areas or in the shade. Many annual weeds can be controlled with this method; however, soil solarization is not as effective at controlling certain perennials such as field bindweed and nutsedge. Refer to Pest Notes: *Soil Solarization* for more information.

Many soils need to be amended with organic matter or nutrients. Amendments can improve drainage in clay soils or improve the water-holding capacity in sandy soils. The ability of soils to drain water and simultaneously hold enough water is extremely important in establishing the turfgrass root system and maintaining healthy lawns. Lawns thrive in soils with good drainage that allow the unrestricted flow of oxygen, nutrients, and water. When adding topsoil, make sure it is from a reputable source and that it is free of rocks, weed propagules such as rhizomes or tubers, and herbicide residues.

Select an Appropriate Turfgrass Species

Turfgrass species vary in their tolerance to extreme temperatures, shade, drought, and amount of wear. They are divided into two broad categories: cool-season and warm-season grasses, which reflect their temperature preference and periods of active growth.

Cool-season species such as tall fescue, perennial ryegrass, and Kentucky bluegrass thrive at 60-80°F and may become stressed or go into a semi-dormant state in periods of extreme cold or hot temperatures. They do best in northern and coastal California climates, although



Figure 2. Annual bluegrass, *Poa annua*.



Figure 3. Dallisgrass. (Inset: flowering head.)

there are cool-season grasses grown throughout California.

Warm-season grasses such as bermudagrass, buffalograss, kikuyugrass, St. Augustinegrass, and zoysiagrass grow best in southern California or Central Valley climates where summers are hot and dry and winters are relatively mild. These grasses go dormant during winter months when soil temperatures drop below 52°F and then green up in spring when soil temperatures rise.

In general, cool-season grasses are less drought-tolerant and require 25% more water than warm-season grasses grown in the same location. When planting a lawn, choose a species that best fits your specific conditions. Poorly adapted species are more susceptible to weed invasions and require more intense maintenance than well-adapted species. For more information refer to the publication *Turfgrass Selection for the Home Landscape*, listed in REFERENCES.

It is essential to choose a planting time that allows the turfgrass species to establish quickly and be competitive with weeds. Warm-season grasses should be planted from mid-spring to midsummer. Cool-season grasses should be planted in early spring or fall. Lawns will compete with weeds more effectively if established quickly. Lawns established from sod have few weed problems from the moment they are planted. Lawns planted from seed, stolons, or plugs can take up to 2 months to become established and are, therefore, more susceptible to weed invasions.

WEED MANAGEMENT IN NEWLY PLANTED LAWNS

Even if a planting site has been carefully prepared, some weeds will probably develop in a new lawn. Remove weeds by hand as they appear. This will prevent them from producing seed and extending the invasion. Properly timed irrigation, mowing, and fertilization can keep weeds under control. In the first few weeks after planting turfgrass roots are fairly short, extending only into the top few inches of soil. Water lightly to keep the root zone moist without saturating the soil. Once the turfgrass becomes established, encourage healthy root growth to deeper depths with deep, infrequent watering. Mow new lawns for the first time when their roots are firmly planted in the soil. Be sure the soil is fairly dry so that the young turfgrass is not torn from the ground.

WEED MANAGEMENT IN ESTABLISHED LAWNS

Irrigation

Many lawns are watered incorrectly. Poor irrigation practices can weaken turfgrass, allowing weeds to invade. Annual bluegrass (Figure 2), crabgrass, dallisgrass (Figure 3), and nutsedge (Figure 4) are just a few weed species that thrive in poorly irrigated lawns. To maintain a healthy lawn, uniform water coverage is needed. Sprinkler heads that are broken, obstructed, or set too low or too high may not reach all areas of the lawn and can result in dry or dead spots in an otherwise healthy turfgrass.

In general, deep, infrequent irrigation will encourage healthy root growth. Light, frequent watering is only required when the turfgrass has just been planted and the root system is developing. Watering established turfgrass lightly and frequently creates a shallow-rooted lawn, making it less durable and allowing shallow-rooted weeds such as crabgrass to get the competitive edge. Ideally, turfgrass should be irrigated deeply enough to penetrate the soil to a depth of 6 to 8 inches. Allow the soil to partially dry out between waterings.



Figure 4. Yellow nutsedge.

The top 1 to 2 inches of soil should be fairly dry before water is applied again.

Water requirements vary among turfgrass species and also vary depending on climate, time of year, and growing conditions. As a general rule, warm-season grasses only need to be watered once or twice a week. Cool-season grasses require more frequent watering, up to three times a week in hot weather. Turfgrass species growing in shade require less water than the same species growing in full sun.

Turfgrass growing on clay soils does not need to be watered as frequently as turfgrass growing on sandy soils, because clay soils retain water longer than sandy soils, and sandy soils drain water and dry out quickly. Low application rates and/or division of total irrigation time into 2 or more applications per day are sometimes needed on clay soils to allow water infiltration and prevent puddling and runoff.

For specific irrigation requirements for warm- and cool-season turfgrasses in various regions of California and at different sprinkler outputs, see the *UC Guide to Healthy Lawns* and the *Lawn Watering Guide for California*. Additional resources are *Managing Lawns in Shade*, *Managing Lawns on Heavy Soils*, and *Managing Turfgrasses During Drought*.

Mowing

Each turfgrass species has specific mowing-height requirements (see *Mowing Your Lawn and Grasscycling*). Mowing some grasses too short can weaken

the turfgrass and increase weed invasions.

Alternatively, if some grasses are not mowed short enough, the thatch layer can build up, reducing water penetration and weakening the turfgrass.

Mow grasses more frequently when they are actively growing. A standard guide is to remove no more than 1/3 of the leaf blade at each mowing. If too much is removed at one time, it can take some time for the grass to recover, giving weeds a chance to invade.

Lawns with weed invasions often appear uneven. Mow weedy lawns frequently enough to avoid this patchy appearance and prevent flower and weed seed formation. Be sure that mower blades are sharp enough so that the turfgrass is not damaged. For large areas, it is best to mow the least weedy section first and the weediest section last to avoid spreading weeds.

Washing the mower's deck and underside afterwards will remove weed seeds. The same applies if mowers are moved from weedy lawns to other lawns, to avoid transporting weed seeds and propagules. Avoid mowing lawns when the soil is wet, such as after rain or irrigation; moving a mower over wet soil can lead to compaction.

Fertilizing

To maintain a healthy lawn, follow fertilizing guidelines carefully. Begin a regular fertilization program approximately 6 weeks after planting. In general, lawns need to be fertilized about four times a year while they are actively growing, with no more than 1 pound of actual nitrogen per 1,000 square feet per application. See *Practical Lawn Fertilization* for requirements for specific turfgrass species.

Thatch

Regular thatch removal will help keep your turfgrass healthy and competitive with weeds. Thatch is a layer of organic matter (stems, stolons, roots) that develops between the turfgrass blades and the soil surface. A thin layer of thatch is normal and even beneficial; it can help limit weed germination.

Some turfgrass species, particularly warm-season creeping grasses, develop thick thatch layers that can prevent the circulation of air, water, and nutrients in the soil. Generally, you should dethatch your lawn when the thatch layer is more than 1/2 inch thick. For some species, such as zoysiagrass, bermudagrass, or Kentucky bluegrass, this may mean dethatching every year. For other species, such as tall fescue, dethatching may only be needed every 5 years or not at all. Use a thatching rake on small lawns to loosen the layer of thatch. On creeping-type grass lawns, such as bermudagrass, use a verticutter or dethatcher to cut through the lawn to the soil surface.

Aeration

Heavy traffic can compact soil over time. Soil compaction restricts the flow of oxygen, water, and nutrients into the roots, causing the turfgrass to grow slowly and making it more susceptible to weed invasions. Alleviate soil compaction with regular aeration. Lawns on heavy clay soils or lawns with heavy foot or equipment traffic may need to be aerated several times a year while lawns with little activity may only need to be aerated once a year or less.

Aerators, sometimes called aerifiers, remove small cores of soil or create pores or channels in the rooting zone. A hand-held aerifier may be adequate on small lawns. For larger areas, machine-driven aerifiers are more practical and can be found at equipment rental businesses. Aerate when the turfgrass is actively growing. Be aware that aeration will leave temporary holes in the turf that will gradually fill in within a few weeks; however some weed seeds may



Figure 5. Creeping woodsorrel, *Oxalis corniculata*.



Figure 6. Mature dandelion, *Taraxacum officinale*.

germinate in the spaces during that time. Soil cores are usually left on the lawn surface and quickly break down with irrigation; however some soil cores may contain weed seeds. In lawns that are known to be weedy, a preemergence herbicide application should be considered following aeration.

Hand-weeding

Controlling occasional weeds by hand-pulling may be all that is necessary if you practice regular and proper maintenance procedures. Hand-weeding is particularly important for preventing infestations of creeping woodsorrel (oxalis) (Figure 5), nutsedge, dandelion (Figure 6), spurge, dallisgrass, and bermudagrass (Figure 7).

Remove weeds while they are still young and before they set seed or produce rhizomes or tubers. Remove small patches before they get large. Making this a regular habit will greatly reduce the number of weeds in your lawn. Be sure to remove the entire weed, including the root. A dandelion fork or fishtail weeder is useful for removing weeds with a thick taproot. Larger patches can be dug out and the holes filled with clean soil.

Herbicides

If your lawn is properly maintained, herbicides will generally not be necessary. When they are needed, use them as part of an integrated management program that includes good cultural maintenance practices. No single herbicide will control all lawn weeds, and not all herbicides can be used on all lawn species. You must identify your

weed problem(s) and turfgrass species before choosing an herbicide.

A few of the most serious lawn weeds, such as some perennial grasses, cannot be effectively controlled with herbicides without killing the turfgrass as well. The products mentioned here are primarily for residential lawns. Professional turf managers who are licensed pesticide applicators should also review the *UC IPM Pest Management Guidelines for Turf*.

Herbicides are classified in several ways:

- preemergence or postemergence
- contact or systemic
- selective or nonselective

Preemergence herbicides are applied before weeds emerge from the soil; they kill weed seedlings as they germinate and try to emerge. In lawns they are primarily used against annual grass weeds such as annual bluegrass and crabgrass, but there are also pre-emergence herbicides that are effective against many broadleaf weeds. Post-emergence herbicides are applied after weeds have emerged from the soil; they control actively growing weeds. Post-emergence herbicides may have either contact or systemic activity.

Contact herbicides cause localized injury where the chemical comes in contact with the plant and are most successful when applied to young weeds. Examples include diquat, carfentrazone, plant oils and herbicidal soaps. In contrast, systemic herbicides move within the plant, causing injury at additional sites in the plant and can control older weeds. Examples include glyphosate, quinclorac, triclopyr, or 2,4-D, dicamba,



Figure 7. Bermudagrass, *Cynodon dactylon*.

and mecoprop mixtures (active ingredients in many broadleaf weed killers).

Selective herbicides kill target weeds without damaging desirable turfgrass species. They are toxic to only certain plants or weeds. For example, 2,4-D selectively kills only broadleaf plants and not grasses; fluazifop selectively kills only grasses and not broadleaf plants.

Nonselective herbicides kill all or most vegetation including turfgrass. They should only be used prior to planting a lawn, during renovation, or as spot treatments. Examples of nonselective postemergence herbicides include diquat (a contact herbicide), plant oils (contact herbicides), and glyphosate (a systemic herbicide).

The herbicide you choose will depend on the types of weeds you are trying to control and the tolerance of your turfgrass species. Table 2 lists some common herbicides and brand names labeled for use on residential turfgrass lawns or for turfgrass renovation and highlights the types of weeds or special weed problems they control.

Table 2. Examples of Herbicides Available for Use in Residential Lawns.*

A. Selective Preemergence Herbicides (<i>Herbicides applied before weeds emerge</i>).			
Common Name	Sample trade name(s)	Readily available to home gardeners	Comments
benefin + oryzalin	Green Light Amaze Grass & Weed Preventer 3	yes	controls grasses and some broadleaves on warm-season turfgrass species and tall fescue (with some restrictions)
	XL 2G	no	
benefin + trifluralin	Team 2G	no	controls grasses and some broadleaves; has extended grass control; has some turfgrass species restrictions
bensulide	Betasan 7G	no	controls many grasses (primarily annual bluegrass) and some broadleaves (e.g., henbit); exclude children and pets until treatment area has been thoroughly sprinkler-irrigated
dithiopyr	Crabgrass & weed preventer (many brands – often combined with fertilizer)	yes	controls many grasses and broadleaves (e.g., oxalis, spurge); (has postemergence activity on young crabgrass); safe for most turfgrass species
	Dimension	no	
ethofumesate	Poa Constrictor	no	primarily used in annual bluegrass management, but also controls other grass and broadleaf weeds; some turfgrass species restrictions
indaziflam	Bayer Specticle	yes	controls annual grasses and many broadleaves (with some postemergence activity on young weeds); has some turfgrass species restrictions
isoxaben	Bayer Season Long Weed Control for Lawns	yes	controls broadleaves (e.g., oxalis, spurge) and has very minimal activity on grasses; has some turfgrass species restrictions
	Gallery	no	
mesotrione	Scotts Turf Builder Starter Food for New Grass Plus Weed Preventer	yes	controls grass weeds and yellow nutsedge in newly seeded lawns; several turfgrass species restrictions
	Tenacity	no	
metolachlor	Pennant Magnum	no	controls yellow nutsedge, some grasses, and some broadleaves; for use on warm-season turfgrass species only
oryzalin	Monterey Weed Impede	yes	controls grasses and some broadleaves; for use on warm-season turfgrass species and tall fescue (with some restrictions)
	Surflan	no	
pendimethalin	Scotts Halts Crabgrass Preventer	yes	controls grasses (very effective on crabgrass) and some broadleaves; has some turfgrass species restrictions; often included with fertilizers
	Pendulum	no	
prodiamine	Sta-Green Crab-ExPlus with Lawn Fertilizer	yes	controls grasses (very effective on annual bluegrass and crabgrass) and some broadleaves; has some turfgrass species restrictions and may thin grass
	Barricade	no	
siduron	Combined with starter fertilizer products	yes	used in new or newly renovated cool-season lawns to suppress warm-season grass weeds; not for use on warm-season turfgrass species
	Tupersan	no	

*These are example trade names and not all trade names are listed. Trade names and registrations change frequently. Not all listed products may currently be registered. Although herbicide products containing fertilizers are available, they are not included. Pest Notes on individual weeds outline specific herbicides that effectively control them. For more details on herbicide products available to professionals, see UC IPM Pest Management Guidelines: Turfgrass—Weeds.

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Table 2. (continued) Examples of Herbicides Available for Use in Residential Lawns.*

B. Selective Postemergence Herbicides (Herbicides applied after weeds emerge).			
Common Name	Sample trade name(s)	Readily available to home gardeners	Comments
mixtures of 2,4-D, dicamba, and mecoprop (MCP)	Trimec Lawn Weed Killer	yes	many brand names and formulations available; combines 3 active ingredients and controls most broadleaves (weak on oxalis); dicamba products may harm ornamentals if roots are in lawn or drift occurs
	Spectracide Weed Stop	yes	
	Ortho Weed B Gon Weed Killer for Lawns products	yes	
	Bayer Southern Weed Killer	yes	
mixtures of 2,4-D, 2,4-DP, dicamba, MCP, carfentrazone, quinclorac	Bayer All in One Weed & Crabgrass Killer	yes	many brand names and formulations available; combines 2-4 active ingredients and controls most broadleaves and some weedy grasses; dicamba products may harm ornamentals if roots are in lawn or drift occurs
	Gordon's Speed-Zone Lawn Weed Killer	yes	
	Monterey Crab-E-Rad Plus	yes	
	Ortho Weed B Gon Weed Killer products	yes	
	Spectracide Weed Stop for Lawns plus Crabgrass Killer	yes	
fenoxaprop-p-ethyl	Bayer Advanced Bermudagrass Control for Lawns Ready-to-Spray	yes	also controls crabgrass
fluazifop	Fusilade II, Ornamec	no	although this herbicide kills most grasses it can be used to suppress bermudagrass growing in tall fescue
halosulfuron	Sedgehammer, Monterey Nutgrass Killer II	yes	effective on sedges and green kyllinga
penoxsulam	Sapphire	no	suppresses nutsedges and green kyllinga; also effective on English Lawn Daisy and white clover
quinclorac	available combined with other broadleaf weed herbicides	yes	selectively removes some weedy grasses and broadleaves from many established turfgrasses; some turfgrass species restrictions
	Drive XLR8	no	
sulfentrazone	Ortho Nutsedge Killer for Lawns	yes	effective on yellow and purple nutsedge, green kyllinga, and several hard to control broadleaves such as curly dock, knotweed, plantain, spurge, wild garlic, wild onion, woodsorrel (oxalis)
	Dismiss	no	
sulfosulfuron	Certainty	no	used to selectively remove cool-season grasses (bluegrasses, fescues, ryegrasses) from warm-season turfgrass species; controls nutsedges and green kyllinga; effective on burweed, dandelion, white clover, wild garlic, and other broadleaves
triclopyr	Monterey Turflon Ester	yes	controls broadleaves (especially clover, oxalis) and suppresses bermudagrass and kikuyugrass in cool-season lawns; not for use on warm-season turfgrass species; do not apply around trees or shrubs because injury may result
	Turflon	no	
triclopyr + MCPA + dicamba	Monterey Spurge Power	yes	controls a broader spectrum of broadleaves (e.g., spurge, wild violet, dandelion); not for use on warm-season turfgrass species; dicamba products may harm ornamentals if roots are in lawn or drift occurs
	Ortho Weed B Gon Weed Killer for Lawns products	yes	

C. Nonselective Herbicides for Use in Turfgrass Renovation (Will kill existing lawn and plants).	
Common Name	Sample trade name(s)
diquat	Spectracide Grass and Weed Killer, Reward
diquat + fluazifop + dicamba	Spectracide Weed & Grass Killer
glufosinate	Finale Herbicide
glyphosate	Roundup, Kleenup, Remuda and many other brand names
glyphosate + imazapyr	vegetation killers are available from most companies
plant acids and plant oils	several organic weed and grass killers

*These are example trade names and not all trade names are listed. Trade names and registrations change frequently. Not all listed products may currently be registered. Although herbicide products containing fertilizers are available, they are not included. Pest Notes on individual weeds outline specific herbicides that effectively control them. For more details on herbicide products available to professionals, see UC IPM Pest Management Guidelines: Turfgrass—Weeds.

Please note that some of the pesticides mentioned here are available for professional use only, but can be applied on residential lawns.

Herbicides for Broadleaf Weeds. The easiest weeds to control in grass lawns are annual broadleaves. Many products are available and formulated for specific weeds or for use on specific turfgrass species. Generally these weed killers are postemergence systemic herbicides containing combinations of two or three active ingredients, such as dicamba, mecoprop, or 2,4-D, and are very effective in controlling numerous broadleaf weeds without damage to grass lawns. Triclopyr is also an effective broadleaf herbicide but will cause injury to bermudagrass lawns and other stoloniferous turfgrass; it is safe to use on most cool-season turfgrasses such as bluegrass, ryegrass, and tall fescue lawns. Newer herbicides carfentrazone and quinclorac also have broadleaf weed activity and are often formulated with the other broadleaf herbicides to increase the speed or spectrum of weed control.

Broadleaf herbicides and their combinations are also effective against perennial broadleaves, although more than one application may be necessary. Be aware that many postemergence broadleaf herbicides are prone to drift in the air and may contact desirable plants, especially when applications are made in windy conditions. Also be aware that certain postemergence broadleaf herbicides, such as dicamba and triclopyr, can be absorbed by tree roots growing in lawns and may cause tree injury if applied too close to the tree drip line. Always consult the herbicide label for specific application details and precautions.

Herbicides for Grass Weeds. Annual grasses such as crabgrass, foxtail, and annual bluegrass can be effectively controlled in established lawns with common preemergence herbicides such as benefin, bensulide, dithiopyr, oryzalin, pendimethalin, and prodiamine. Dimethenamid-p, ethofumesate, and indaziflam are preemergence herbicides used to control a narrower range of weeds in specific turfgrass species.

The key to success for all preemergence herbicides is to apply the herbicide 2 to

3 weeks prior to weed germination. Pre-emergence herbicides work best when the soil is moist but the turf is dry at the time of application, and when thoroughly watered into the lawn as soon as possible after application. It may take three applications per year (early fall, late winter and mid-spring) to clean up a heavy weed infestation, but herbicides should not be needed year after year, if cultural practices are modified to favor the turfgrass. Be aware that overseeding or reseeding lawns may not be possible for several weeks or months after applying a preemergence herbicide.

It is much more difficult to control weedy grasses growing in established lawns with postemergence herbicides. Products containing quinclorac are available to homeowners and reduce crabgrass, foxtails, and barnyardgrass infestations but not as effectively as preemergence herbicides, and several applications are needed in summer and in subsequent years. Professional applicators may use ethofumesate (a preemergence herbicide with some postemergence activity), foramsulfuron, and sulfosulfuron to selectively remove grass weeds from turfgrass lawns, but applications are rare in residential lawns and more common in highly managed golf courses and commercial turfgrass.

Some perennial grasses, such as bermudagrass, dallisgrass, or knotgrass growing in a tall fescue lawn, are extremely difficult to control. Frequently a nonselective systemic herbicide such as glyphosate, or the grass-selective systemic herbicide fluzifop are needed. Make spot treatments because these herbicides will kill turfgrass as well. They must be applied when weeds are actively growing and are most successful when applied in early fall before the weedy grass goes into dormancy. Bermudagrass growing in a tall fescue lawn can also be suppressed with repeated applications of triclopyr, fenoxaprop, or fluzifop. See the product labels for specific directions.

Herbicides for Broadleaf and Grass Weeds. Some preemergence herbicides for use in lawns will effectively control specific weeds (both grasses and broad-

leaves) as indicated on their label. It is very important to identify the weeds to be controlled and understand the time of year they most often germinate. When applying preemergence herbicides, apply them after any aerating and/or dethatching; otherwise, the herbicides will be removed from the soil with the cores or the thatch and the herbicide activity will be decreased.

Herbicides for Sedges. Sedges, such as yellow and purple nutsedge and green kyllinga, can be killed with spot treatments of a nonselective systemic postemergence herbicide such as glyphosate. Alternatively, two applications of the selective postemergence herbicides halosulfuron, sulfentrazone, or sulfosulfuron effectively remove sedges from lawns.

Green kyllinga seed is highly viable and contributes to the spread of this sedge. Most preemergence herbicides effectively prevent kyllinga seedling emergence. Yellow and purple nutsedge are spread primarily by tubers. No preemergence herbicides kill nutsedge tubers in cool-season turfgrass. In warm-season lawns, dimethenamid-p has activity on nutsedges and green kyllinga, and metolachlor is registered for control of yellow nutsedge (and its tubers). Both of these products are for professional use only.

Herbicides for Newly Seeded Lawns. Special care should be taken when applying herbicides on newly seeded lawns because of the sensitivity of seedling plants. Among the preemergence herbicides, only mesotrione and siduron can be used on newly seeded or established cool-season turfgrass for control of broadleaf seedlings and warm-season grass weeds such as crabgrass, foxtails, and barnyardgrass. Mesotrione is combined with a starter fertilizer to be used at planting and is available to home gardeners. Siduron should not be used on warm-season turfgrass species and can only be used by a professional applicator. Postemergence herbicides selective for broadleaf weeds can be used once the turfgrass has produced several tillers and has been mowed two or three times.

Weed and Feed Products. Some fertilizer products contain either preemergence or postemergence herbicides (or both)

for weed control (usually crabgrass prevention or broadleaf weed control). Use these combination products only when the lawn has a known weed problem and not every time you fertilize. Herbicides should only be applied when you have observed high numbers of weeds and are sure treatment is necessary. With preemergence products, this means relying upon weed populations observed last season. Be sure the active ingredient in the product is one that will control the weed species causing your problems and also that the timing of the application is right. There is no point in applying preemergence herbicides after the majority of target weeds have emerged.

Other Weed Control Products. Corn gluten meal is a fine yellow powder that is a waste product left over from the processing of corn and is often marketed for weed control. It has high nitrogen content and can be top-dressed onto established turfgrass. Research conducted in the midwest suggests that repeated applications of corn gluten meal may prevent the emergence of some weeds, but the research results are not consistent.

In experiments conducted on California lawns, corn gluten meal did not provide satisfactory weed control. However, corn gluten meal may help in weed management because its high nitrogen content acts as a fertilizer, which makes the turfgrass more competitive with weeds. Additionally it may act as a mulch to suppress weed germination. It is the combination of these factors that make corn gluten meal successful in a dense turf with a low density of annual weeds. Corn gluten meal has no effect on already emerged weeds.

Herbicide Success Tips. Lawn and garden companies market their own brand names of herbicides. These trade names are so numerous and change so often that they cannot all be listed in this publication. Shop for herbicides by looking for the common name or active ingredient that appears on the label in small print under the title "Ingredients." Unlike brand names, common names for active ingredients do not change from company to company. Different products will vary in the percentages of

active ingredients they contain. Some products are formulated as ready-to-use to allow for the convenience of no mixing, others as granules, and many others as higher-concentration liquid sprays that require mixing with water.

Follow all label directions carefully and only apply herbicides at the time of year and at the rates recommended. Be sure the herbicide is effective against the weed you are trying to control and that it is recommended for your type of lawn. Improper use could injure or kill desirable turfgrass or other plants in the landscape.

Remember that many broadleaf weed herbicides are prone to drift or can be injurious to shallow tree roots growing in the lawn, so exercise proper caution. Do not apply herbicides under hot, dry, or windy conditions as they could injure turfgrass or nearby ornamentals.

If you are applying preemergence herbicides, remember that you cannot reseed desirable turfgrass species for several weeks or months after application. If you are applying preemergence herbicides, apply them after any aerating or dethatching; otherwise, the herbicides will be removed from the soil with the cores or thatch and the uniform herbicide barrier on the soil surface will be disturbed.

RENOVATING LAWNS

Before renovating your lawn, identify the reasons why the lawn became weedy. Were you growing the right turfgrass species for your area? Did you follow recommended irrigation, fertilization, and mowing practices? Did you have good drainage? Before you replant, correct the problems that allowed weeds to invade your lawn previously. Use good management practices on your lawn to reduce new weed invasions.

If weeds have completely taken over a small area of your lawn, you may want to consider a partial renovation. Dig out the affected area, remove and destroy weeds, and work the soil with a garden rake to break up clods and remove weed debris. Add soil amendments and starter fertilizer and then level and firm the site. Irrigate and patch the soil with sod, seed, stolons, or plugs and irrigate again.

If your lawn is primarily weeds, a complete renovation may be necessary. The first step in a complete renovation is to kill and remove the existing turfgrass and weeds. There are a few ways to remove a lawn. For instance, you can dig out the turfgrass and weeds, prepare the site for planting, and then solarize the soil. Alternatively, you can rototill the old lawn and rake up the old turfgrass and weeds. You will need to repeat the tilling and raking until all of the debris is gone.

Another method is to apply a nonselective herbicide such as glyphosate to kill the existing lawn and weeds, remove all the plant material you can, and work the soil until debris is gone. Once the old lawn is removed, prepare the site (as discussed earlier), and plant the new lawn. For more information on lawn renovation, see the *UC Guide to Healthy Lawns*.

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ILLUSTRATIONS: Figure 1: Dicot Weeds. 1988. T.J. Hafliker and M. Wolf. Basel, Switzerland: Ciba-Geigy. Grass Weeds. 1980. E. Hafliker and H. Scholz. Basel, Switzerland: Ciba-Geigy. Monocot Weeds. 1982. U. Kuhn; L. Hanet-Ahti; R. Faden; F. Speta. Basel, Switzerland: Ciba-Geigy. Figures 2–5 and 7: Jack Kelly Clark. Figure 6: Gerald and Buff Corsi, © 2014 California Academy of Sciences.

Pest Notes are available at ipm.ucanr.edu.



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To simplify information, trade names of products have been used. No endorsement of named products is intended, nor is criticism implied of similar products that are not mentioned.

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