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Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
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- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
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- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
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Lawn Management in Oklahoma

Dennis L. Martin
Turf Extension Specialist

David Hillock
Extension Consumer Horticulturist

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The home lawn is an integral part of the total landscape. It provides a setting for trees and ornamentals, as well as the home. The lawn also provides a setting for outdoor family activity. A well-maintained lawn increases the value of residential property.

Successful home-lawn management begins by growing a turfgrass adapted to the wide fluctuations in temperature and moisture found in Oklahoma. It should also be suited to your personal needs and interests, as well as to any physical or environmental limitations of the site, such as shade, no supplemental water, or poor soil conditions. For information about choosing a lawngrass, see Extension Fact Sheet HLA-6418, "Selecting a Lawn Grass for Oklahoma."

The best adapted turfgrass will perform only as well as the lawn-management practices it receives. Correct and timely fertilization, watering, mowing, and pest control (weeds, insects, and diseases) will ensure your turfgrass of obtaining its potential for quality and adaptation. This fact sheet was prepared to describe how to properly care for a lawn in Oklahoma.

Fertilization

Fertilization is important because it improves turfgrass density, color, and recuperative potential. A healthy, properly fertilized, dense turfgrass resists weed invasion and is able to better tolerate heat, cold, drought, and wear.

Fertilizer Elements

Turfgrass plants require nitrogen (N), phosphorus (P), potassium (K), and 10 other mineral elements in the root-zone soil. Each of these mineral elements is required for plant growth, but our concern over application of each differs because plants utilize them in variable amounts and most are normally found in sufficient amounts in native topsoils of Oklahoma. Applications of N-containing fertilizers are particularly important because 1) N is the nutrient required in greatest amounts, 2) the level of N within turfgrasses is correlated to plant quality (color and density) and vigor, and, 3) plant-available N is negligible in most topsoils of Oklahoma.

In addition, P and K are also required in relatively large quantities for healthy plant growth. However, their use in turf fertilization is not as frequent nor as much as N because plant requirements for them are smaller, they remain in most soils for a longer period of time, and it is common to find these nutrients at adequate levels within native topsoils of Oklahoma. Thus, P and K fertilizations should always be based on a soil test. Deficiencies should be corrected for optimal turfgrass growth. However, adding P and K above levels determined by a soil test is wasteful because there is little, if any, evidence that turfgrass quality is enhanced. Nitrogen, phosphorus, and potassium are always needed during turfgrass establishment, during the beginning of each growing season, and during periods when extra-hardy tissue development is needed.

Soil Test

The availability of mineral elements in the soil is influenced by soil pH (pH of 7 is neutral, below is acid, and above is alkaline). The 13 essential mineral elements are each most available at a certain pH. Between pH 6.0 and 6.5, all essential soil elements are adequately available for optimal turfgrass growth. A soil test is needed to determine soil pH and whether lime (to raise pH) or sulfur (to lower pH) applications are required.

The proper steps for determining N, P, K, and the level of other elements in the soil and pH by a soil test are listed below.

1. Follow a random pattern when sampling. Take about 10 to 15 cores from the established turfgrass area.
2. All cores should be taken at a consistent depth (3 to 4 inches). Discard thatch, leaves, and stems.
3. Place all samples in a container and mix thoroughly.
4. Remove a one-pint soil sample and take it to your County Extension office for soil-test analysis. Routine analysis will include N, P, and K soil levels and pH. The OSU soil laboratory or your county agent will write your fertilizer recommendations, based on your soil-test results.

For more information on soil testing, pick up a copy of Extension Leaflet 249, "Soil Testing, the Right First Step Towards Proper Care of Your Lawn and Garden," from your local county extension office.

Fertilizer Programs

The fertilization program diagrammed in Table 1 is designed for maximum turfgrass quality and maintenance for a bermudagrass lawn. It is assumed P, K, and pH levels are satisfactory, as determined by a soil test. In this program a total of 5 pounds of N are applied over 1000 ft.^{2} in one growing season, in five applications. Applications of a complete fertilizer in the spring to enhance root regeneration and one in the fall to enhance winter hardiness. Summer fertilizer applications are made with a straight N source.

Table 1. Fertilization program for bermudagrass lawns.[1]

Date	*Elements*	*Pounds of N per 1000 ft.2*	*Fertilizer[2] (N-P_2O_5-K_2O)*	*Pounds fertilizer per 1000 ft.[2]*	*Pounds fertilizer per acre*
May 1	N+P+K	1.0	20-5-10	5.0	218
			15-5-10	6.7	292
			10-5-5	10.0	436
			10-20-10	10.0	436
June 1	N	1.0	ammonium nitrate (34-0-0)	3.0	131
			ammonium sulfate (20.5-0-0)	4.9	213
			urea (46-0-0)	2.2	96
			slow release N sources[3]		
			Milorganite (6-4-0)	16.7	727
			sulfur-coated urea (32-0-0)	3.1	135
July 1	N	1.0		—same as June 1—	
Aug 1	N	1.0		—same as June 1—	
Sept 1	N+P+K	1.0		—same as May 1—	

November - April: Based on a soil test, correct phosphorus and potassium deficiencies and extremely low or high soil pH.

[1] A moderate fertilization program for Arizona common, U-3, and Guymon bermudagrass and a maximum fertilization program for zoysiagrass and buffalograss would include fertilizer applications on May 1, July 1, and September 1.
[2] Always immediately water-in water-soluble, quickly available fertilizers.
[3] Apply slow-release fertilizers at a higher rate (2 to 3 pounds N per 1000 ft.^{2} per application) but use fewer fertilizer applications.

Good bermudagrass quality and lower amounts of mowing, dethatching, and watering can be achieved by reducing the number of summer N fertilizer applications. This is particularly true for the common-type bermudagrass cultivars and zoysiagrass. Fertilizations made prior to spring green-up are not as effective as those made two weeks following green-up. Fertilizer applications made after September 1 can stimulate lush fall growth, which hinders bermudagrass winterization and can sometimes lead to more severe Spring Deadspot Disease. Applications of water soluble, quickly available fertilizer of more than 1 pound N per 1000 ft.^{2} are not likely to enhance turf quality. Water soluble or quickly available fertilizer materials should always be immediately watered into the soil following application to keep them from burning turf foliage.

Slow-release fertilizers such as Scott's Turf Builder, Milorganite, and sulfur-coated urea should be seriously considered for summer fertilizations. They can be applied less frequently and at higher rates of N per 1000 ft.^{2} per application. A possible program would include a spring fertilization with a water soluble, quickly available complete fertilizer, a June fertilization with a slow-release fertilizer (2 to 3 pounds N per 1000 ft.^{2}), and an August fertilization with a slow-release fertilizer (2 to 3 pounds N per 1000 ft.^{2}). The August fertilization can also serve as the fall fertilization.

The cool-season turfgrasses, tall fescue, Kentucky bluegrass, and perennial ryegrass, do not need as much fertilizer as bermudagrass. A second difference is that the cool-season turfgrasses need most of their annual fertilizer in the fall, with small amounts in the spring, and very little if any during the summer. A fertilization program for tall fescue, Kentucky bluegrass, and perennial ryegrass is outlined in Table 2.

Fertilizers

A fertilizer with a 20-5-10 *grade* contains 20% N, 5% P_2O_5, and 10% K_2O by weight. A 100-pound sack of 20-5-10 fertilizer has 20, 5, and 10 pounds of N, P_2O_5 and K_2O, respectively. It would take 5 pounds of 20-5-10 fertilizer to obtain 1 pound of N (5 pounds 20-5-10 fertilizer x 20% N = 1 pound N). Ammonium nitrate is 34% N, so it would take 3 pounds of ammonium nitrate to give 1 pound of N. Fertilizers that contain N, P_2O_5, and K_2O are called *complete* fertilizers. Ammonium nitrate and urea are called straight N sources. Balanced fertilizers, having a *ratio* of 4-1-2 or 3-1-2, supply nutrients closest to actual plant needs; a 20-5-10 (4-1-2) source is usually a superior fertilizer compared to a 10-20-10 (1-2-1) source for lawn maintenance purposes.

Irrigation

Watering is one of the most often misunderstood aspects of turfgrass culture. Often, watering on turf areas is too frequent and too light. Frequent, shallow watering encourages shallow rooting, soil compaction, thatch accumulation, and weed seed germination.

Ideally, turf should *not* be irrigated on a regular schedule but on one that is determined by need. An irrigation program cannot be developed to fit every location due to 1) dissimilar water holding capacities of different soil types found in Oklahoma, 2) weekly fluctuations in temperature, humidity, wind, and precipitation, and 3) the influence of management practices, such as mowing and fertilization on turfgrass water consumption. Sandy coarse-textured soils absorb water faster but retain less water than fine-textured soils like loams and clays. Thus, it takes less water to moisten sandy soil to a 6-inch depth than to moisten a clay soil to the same depth. This means more frequent applications of less water are required for turfgrasses growing on sandy soils. Lush, actively growing turfgrasses utilize more water than turfgrasses maintained on the "lean side."

The ideal time to water is when turfgrasses show the first visual symptoms of water need or wilt, characterized by

herbicide and fertilizer combinations. Normally, two to three spray applications, spaced 10 to 14 days apart, are required for effective weed control. *Nonselective* postemergence herbicides kill all actively growing plants. Examples include Roundup, Roundup Pro, GLYFOS, Kleenup, Finale, Diquat, and various "weed and grass killer" formulations.

Always read and follow all pesticide label instructions. For more detailed information on controlling weeds in turf with herbicides, see Extension Fact Sheet HLA-6601, "Broadleaf Weed Control for Lawns in Oklahoma."

Insect Control

Many kinds of insects or insect-like pests harbor in lawns. Most are more of a nuisance rather than actually causing serious damage to lawns. Occasionally, populations of grubs, armyworms, sod webworms, aphids, leafhoppers, and pillbugs become large enough to require control. Insecticides, including Diazinon, Dursban, Malathion, and Sevin, will generally control most of these insects. For a complete list of lawn insects and their control see Extension Fact Sheet EPP-7306, "Ornamental and Lawn Pest Control."

Disease Control

Turfgrasses vary in their susceptibility to disease. Bermudagrass is one of the most resistant grasses. The most serious diseases are fungal and include Brown Patch and Dollar Spot. Spring Dead Spot is also a serious problem in Oklahoma. These diseases, except Spring Dead Spot, can be controlled with any of a number of commercially available fungicides. The best defense against a lawn disease is to follow the basic principles of lawn maintenance outlined in this fact sheet. For a complete list of lawn diseases and their control, see Extension Fact sheet EPP-7637, "Home Lawn Disease Control Guide," Fact Sheet EPP-7658, "Dollar Spot on Turfgrass," and Fact Sheet HLA-6606 "Managing Large Patch of Zoysiagrass."

Lawn Maintenance Calendar for Bermudagrass Lawns

January - Soil test; postemergence winter weed control.

February - Soil test; correct phosphorus or potassium deficiencies or extreme pH levels; postemergence winter weed control; thatch removal the last part of this month.

March - Soil test; correct phosphorus or potassium deficiencies or extreme pH levels; postemergence winter weed control; thatch removal the beginning of this month. Preemergence summer annual grassy weed control the last part of this month.

April - Preemergence summer annual grassy weed control the first part of this month; cutworm, grub, and pillbug control as problems arise.

May - N, P, K fertilizer application; postemergence summer weed control; insect and disease control as problems arise; mowing. May is the best month to sprig, plug, or sod bermudagrass. Seed Arizona common and U-3 bermudagrass between May 1 and June 1. Do not apply preemergence herbicides in March or April on areas to be seeded.

June - N application; postemergence summer weed control; insect and disease control as problems arise; mowing; watering; aerification.

July - Same as June.

August - N application; sod webworm control as problems arise; watering; mowing; aerification.

September - N, P, K, fertilizer application; preemergence winter weed control by the middle of this month; watering; begin raising the height of cut. Overseed with perennial ryegrass in late September or October. Do not apply preemergence herbicides on areas to be overseeded after July 1.

October - Begin postemergence winter weed control the last part of this month.

November - Soil test; postemergence winter weed control.

December - Same as November.

References: OSU Turfgrass Extension

Management
HLA-6418 Selecting a Lawngrass for Oklahoma
HLA-6419 Establishing a Lawn in Oklahoma
HLA-6420 Lawn Management in Oklahoma
HLA-6600 Turfgrass Management of Bermudagrass Football Fields
HLA-6604 Thatch Management in Lawns
CR - 6602 Performance of Tall Fescues at Stillwater, Oklahoma
L-249 Soil Testing, the Right First Step Toward Proper Care of Your Lawn and Garden
L-253 Don't Bag It Lawn Care Plan
Weed Control
HLA-6601 Broadleaf Weed Control for Lawns in Oklahoma
Disease Control
HLA-6606 Managing Large Patch of Zoysiagrass
HLA-7658 Dollar Spot of Turfgrass
Insect Control
HLA-7306 Ornamental and Lawn Pest Control

HLA - Horticulture and Landscape Architecture Fact Sheet
CR - Current Report
L - Leaflet

Table 2. Fertilization program for tall fescue, Kentucky bluegrass, and perennial ryegrass lawns.

Date	*Elements*	*Pounds of N per 1000 ft.²*	*Fertilizer¹ (N-P_2O_5-K_2O)*	*Pounds fertilizer per 1000 ft.²*	*Pounds fertilizer per acre*
Oct 1	N+P+K	1-1.5	20-5-10	5.0 - 7.5	218-327
			15-5-10	6.7 - 10.0	292-436
			10-5-5	10.0 - 15.0	436-653
			10-20-10	10.0 - 15.0	436-653
Dec 1	N	1-1.5	ammonium nitrate (33-0-0)	3.0 - 4.5	131-196
			ammonium sulfate (20.5-0-0)	4.9 - 7.3	213-318
			urea (45-0-0)	2.2 - 3.3	96-145
March 1	N	0.5-1	ammonium nitrate	1.5 - 3.0	65-131
			ammonium sulfate	2.5 - 4.9	109-213
			urea	1.1 - 2.2	48-96
May 12	N+P+K	0.5-1	20-5-10	2.5 - 5.0	109-218
			15-5-10	3.3 - 6.7	144-292
			10-5-5	5.0 - 10.0	218-436
			10-20-10	5.0 - 10.0	218-436

¹ Always immediately water-in water soluble, quickly available fertilizers.
² If available, always use a slow-release fertilizer in the spring and early summer.

"foot printing" and a blue-gray appearance. When turfgrasses experience moisture stress, their leaves begin to roll or fold and wilt. Thus, the leaves are slower to bounce back when stepped on. Enough water should be applied in one application to wet the soil to a 6-inch depth. This can be checked by probing the soil. After a few times you should develop a feel for the amount of time and water required for deep watering. If the area begins to puddle and run-off is occurring, stop irrigating and allow the water to soak into the soil. It may be necessary to repeat this cycle several times before proper irrigation is complete. Irrigating only when turfgrasses show the first visual symptoms of water need and then watering deep will encourage deep rooting. Early morning is an ideal time to irrigate.

Mowing

Table 3 presents turfgrass species commonly grown in Oklahoma and their seasonal cutting height. The warm-season turfgrasses are cut higher in the fall to provide insulation for low temperatures. When they are growing during the summer, they are cut lower to promote lateral spread and a "tight" turf. Cutting turfgrasses below their recommended height will discourage deep rooting. Cutting too low may cause the turf to thin, because it is less able to withstand heavy traffic and environmental stresses such as low soil moisture and extreme temperatures. Cutting bermudagrass above its recommended height may produce a stemmy turf, characterized by leaves being produced near the end of upright stems. This kind of turf is prone to scalping. Turfgrasses grown under shady conditions should always be maintained at a slightly higher cut in order to increase leaf area to compensate for lower light levels.

Ideally, turfgrasses should be mowed on a schedule that is based on the amount of plant growth between mowings. This will depend on the level of soil moisture, nutrients, and

Table 3. Mowing height of commonly grown turfgrasses in Oklahoma.

Turfgrass	*May-August*	*September-April*
	— inches —	
Warm-Season		
Bermudagrass	0.5-0.75	1.0-1.25
Midiron		
Midfield		
Midlawn		
Tifway		
Tifway II		
Tifgreen		
Sunturf		
Arizona common	1.0-2.5	1.5-3.0
Cheyenne		
Jackpot		
Mirage		
Guymon		
U-3		
Sundevil		
Yuma		
Buffalograss	1.5-3.0	2.0-3.0
St. Augustinegrass	2.5	3.0
Zoysiagrass	0.5-0.75	1.0-1.25
Cool-Season		
Kentucky bluegrass	2.5	2.5
Perennial ryegrass	2.5	2.5
Tall fescue	3.0	2.5

temperature and the amount of sunlight. Since these conditions fluctuate from week to week, it follows that plant growth also fluctuates. Therefore, the ideal time to cut turfgrasses is at a point so that no more than about a third of the leaf area is removed at any one mowing. This means cutting U-3 bermudagrass at 1 inch each time it reaches 1.5 inches and cutting Tifgreen bermudagrass at 0.75 inch each time it reaches 1 inch.

It is preferable not to bag grass clippings since collecting clippings removes valuable nutrients from the lawn, grass clippings take up valuable space in the landfill and bagging clippings takes more time than mowing with a mulching mower. For more information on not bagging your grass clippings, pick up a copy of Extension Leaflet 253, "The Don't Bag It Lawn Care Program," at your local county extension office.

Regardless of the type of mower used, it is essential that mowing equipment be kept sharp and in good operating condition. Dull, improperly adjusted equipment bruises leaf tips, reduces growth, and causes a dull-cast appearance over the turf area due to frayed leaf blades.

Other mowing practices should include varying the mowing pattern throughout the growing season to distribute wear, reduce soil compaction, and improve turf appearance. Secondly, make turns on sidewalks and drives or make wide turns to avoid tearing the turf. Lastly, avoid mowing wet grass. It is harder to obtain a quality cut, clippings form clumps on the mower and turf, and disease organisms are more likely to be spread.

Thatch

Bermudagrass and zoysiagrass are particularly prone to developing an excessive (greater than 0.5 inch) layer of thatch. Thatch is undecomposed roots and stems. Excessive thatch accumulation is caused when the production of plant tissue exceeds its decomposition. This condition can be caused by excessive plant growth or during conditions when plant tissue decomposition is slow. Excessive thatch layers impede the movement of moisture, nutrients, and air into the root-zone soil. This condition leads to shallow root development, which may cause the turf to thin. Thatch formation is retarded through proper mowing, fertilization, watering, and responsible pesticide use.

Determine the thickness of the thatch layer in your lawn by examining a 3- to 4-inch deep plug. If thatch is thicker than 0.5 inch, a dethatching operation is in order. The best time to dethatch warm-season lawns of bermudagrass and zoysiagrass is prior to spring green-up. Dethatch tall fescue and bluegrass lawns in the early fall. Thatch layers are best removed by a dethatching machine or power rake. These machines may be hired or rented. For more information concerning thatch and its control, see Extension Fact Sheet HLA-6604, "Thatch Management in Lawns."

Aerification

Turfgrass plants absorb oxygen and emit carbon dioxide through root surfaces. An adequate amount of air space in the soil is needed to provide aeration and proper soil water movement into and through the soil. Due to heavy use, the upper 2 to 3 inches of soil may become compressed into a more dense, hard soil mass, restricting air and water movement. This is called soil compaction. Hard, tight, clay soils also impair the movement of air and water into and through the root-zone soil. In both situations, root growth is restricted, leading to a shallow-rooted turfgrass unable to withstand the stresses of traffic, extreme temperatures, and low moisture.

The remedy for compacted soils or hard, tight, clay soils involves the removal of 0.5- to 1-inch diameter cores to a depth of at least 2 inches. This practice is called core *cultivation* or *aerification*. Normally, a machine inserts a hollow metal tine or spoon into the soil and extracts a core from the turf. The length of the cores will vary due to soil strength and penetration capacity of the coring device, but they should be at least 2 inches in length for effective aeration. Adding weight to the machine and wetting the upper 4 to 6 inches of soil one to two days prior to core cultivation will aid in the penetration of metal tines or spoons. At least two passes should usually be made with the coring unit for each cultivation. Cores displaced on the surface should be allowed to dry, then chopped with a rotary mower. Proper eye and ear protection as well as a dust mask may be necessary when chopping up cores with a rotary mower. Incorporate the soil back into turf by hand raking with a garden rake or dragging a flexible steel door mat or piece of chain-link fence over the area.

Many lawns in Oklahoma would benefit from one or two core cultivations each year to improve the movement of air and water into the root-zone soil. Core cultivation also reduces excessive thatch layers. The best time to core cultivate is during periods of active plant growth. Core cultivate warm-season turfgrasses just prior to green-up in late winter or early spring and core cultivate cool-season turfgrasses early in the fall.

Overseeding Warm-Season Turfgrasses

Perennial ryegrass can be planted into warm-season turfgrasses in late September and October to produce a green turf cover from October through April. Annual ryegrass is best used for temporary soil stabilization of bare ground during the fall and winter when conditions are unfavorable for establishment of warm-season turfgrasses. Remember that overseeding warm-season grasses for winter color will result in more lawn maintenance being required through the winter. This maintenance will include additional mowing, fertilization and watering during dry winters.

The proper steps in overseeding your bermudagrass, zoysiagrass, or buffalograss lawn are listed below.

1. A successful overseeding operation with perennial ryegrass is timed so that competition with actively growing warm-season turfgrasses is not a problem. Wait until growth is slowed by fall cool weather. On the other hand, if perennial ryegrass is planted too late, after November 1, cold conditions will hinder or possibly prevent its germination and growth.
2. Mow your lawn relatively short (1 inch) and remove all clippings and other debris. This operation will ensure proper light conditions for germination and growth of seedlings.
3. Always buy fresh, quality seed of recommended cultivars. Preliminary research findings at OSU indicate several perennial ryegrass cultivars have promise for Oklahoma conditions. The recommended overseeding rate for winter color in home lawns and other similar turfgrass areas is 10 to 20 pounds of seed per 1000 ft.^{2} or 435 to 870 pounds of seed per acre. Areas receiving heavy traffic should be seeded at the higher rate. Seed may be hand broadcast, spread with a drop (gravity) spreader or broadcast with a cyclone seeder. Divide the recommended amount of seed into two equal portions and spread each portion in a different direction to ensure proper coverage. If it is available, buy fungicide-treated seed to prevent possible *Pythium* disease attacks. Do not apply preemergence herbicides after July 1 in areas to be overseeded.
4. Work seed into the soil by hand raking or dragging a flexible steel door mat over the area to ensure proper seed-soil moisture contact. Sand may be added over the area (1/8- to 1/4-inch layer) after this operation (optional).
5. During the first seven to ten days after seeding, the upper soil surface (1 inch) should be kept moist. This will require light waterings, sometimes 3-4 times per day.
6. Fertilize to maintain ryegrass color and vigor but do not force feed. Apply a water soluble, complete fertilizer during establishment at a rate of 0.5 to 1 pound N per 1000 ft.^{2}. Additional fertilizations can be made with straight N sources at a rate of 0.5 pound N per 1000 ft.^{2} per application every three to four weeks. However, do not fertilize after March 1 to allow the perennial ryegrass to "go out" and the warm-season turf to "come in" in the spring. Other methods of favoring warm-season turf growth in April and May include close mowing (0.5 to 1 inch) and watering only when it is absolutely necessary.
7. Begin mowing perennial ryegrass at a 2.5-inch cutting height when it reaches that height.

Weed Control

Weeds interfere with the beauty and function of turfgrass areas. However, a small number of weeds in a lawn is tolerable. Weeds may indicate the turfgrass community has been weakened by some environmental condition, pests, and/or improper maintenance activities. A healthy turfgrass is the best defense against weed infestation. Herbicides are important tools for controlling weeds in turf, but repeated severe occurrence of weeds may reflect underlying problems that are not correctable with herbicides. The first step in weed control is a management program that produces a dense, vigorous, healthy turf of an adapted turfgrass variety by mowing, watering, and fertilizing properly. Severe insect and disease attacks create openings in turf coverage that will allow weed invasion. These problems should be controlled as they arise.

Weeds

Annual weeds complete their life cycle in one growing season. They come back each year from seed. Crabgrass, goosegrass, foxtail, and sandbur are *summer annual grassy weeds*. Knotweed and spurge are *summer annual broadleaf weeds*. For summer annual weed control with herbicides, apply either a preemergence herbicide two weeks prior to germination (crabgrass and foxtails are effectively controlled with preemergence herbicides and their germination can range from late March to early May, depending on location and year) or by the application of postemergence herbicides soon after their emergence (May and June) when weeds are young and actively growing. Postemergence control of summer grassy weeds is with organic arsenicals (AMA, DSMA, MSMA, Crabgrass Killer Formula II, etc.) and postemergence control of summer broadleaf weeds is with 2,4-D, dicamba, and MCPP combinations (Trimec, 33-Plus, etc.). The organic arsenicals are safe on bermudagrass and Kentucky bluegrass; whereas, 2,4-D, dicamba, and MCPP combinations are safe on bermudagrass, Kentucky bluegrass, centipede- grass, perennial ryegrass, tall fescue, and zoysiagrass.

Annual bluegrass, rescuegrass, cheat, and downy brome are *winter annual grassy weeds*. Chickweed and henbit are *winter annual broadleaf weeds*. For winter annual weed control with herbicides, apply a preemergent herbicide two weeks prior to germination (winter weeds begin germination in late August to early September, if moisture is available; annual bluegrass and chickweed are effectively controlled with preemergence herbicides) or soon after their emergence (October and November) when weeds are young and actively growing. Portrait or Gallery provides good preemergence control of winter annual broadleaf weeds but no control of winter annual grasses weeds. Some preemergence herbicides control both winter annual grasses and broadleaves. Postemergence control of winter broadleaf weeds in bermudagrass, Kentucky bluegrass, centipedegrass, perennial ryegrass, tall fescue and zoysiagrass is with 2,4-D, dicamba, and MCPP combinations applied in October and November. A second option for control of winter annual weeds involves the application of Roundup when the bermudagrass is fully dormant (usually January or early February).

Perennial weeds have the capacity to reproduce by underground vegetative parts such as rhizomes, nutlets, and bulbs. Generally, perennial weeds are more difficult to control than annual weeds because of their ability to "come back" from underground plant parts. Dallisgrass, dandelion, clover, and nutsedge are perennial weeds. Control Dallisgrass in bermudagrass and Kentucky bluegrass in May and June with postemergence applications of organic arsenicals. Yellow nutsedge can be partially controlled in bermudagrass and zoysiagrass by applying Pennant preemergence herbicide in late March-early April prior to germination of dormant nutlets. Control yellow nutsedge in June with postemergence applications of organic arsenicals (in bermudagrass, Kentucky bluegrass) or Basagran T/O (in bluegrass, fescue, bermudagrass, centipedegrass, zoysiagrass, ryegrass, and St. Augustine- grass). Control dandelions and clover in bermudagrass, Kentucky bluegrass, centipedegrass, perennial ryegrass, tall fescue, and zoysiagrass in October and November with 2,4-D, Banvel, and MCPP combinations.

Herbicides

Preemergence herbicides are effective in controlling crabgrass, foxtails, annual bluegrass, chickweed, and a few other selected grassy and broadleaf weeds, depending on the applied herbicide. All must be applied prior to germination and "washed" into the root-zone soil where weed seeds are located. Common preemergence herbicides include Balan, Dimension, Betasan, XL, Surflan, Team, Hault, Haults, Barricade, Dacthal, and various herbicide and fertilizer combinations.

Postemergence herbicides are applied following weed emergence when they are young and actively growing. Most are foliar absorbed, so they must remain on weed foliage for 24 to 48 hours following application. Selective postemergence herbicides kill target weeds without injuring desirable plants when applied at recommended rates. Examples include, 2,4-D, dicamba, MCPP, DSMA, MSMA, AMA, and various