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Home Lawns

A PART OF THE TEXAS A&M COLLEGE SYSTEM

THE AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS
TEXAS AGRICUTURAL EXTENSION SERVICE
J. E. HUTCHISON, DIRECTOR, COLLEGE STATION, TEXAS

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Home Lawns

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A BEAUTIFUL, WELL-KEPT LAWN adds to the material value of a home and is a basic requirement for an attractive yard. Properly established and well-kept turf gives an aspect of spaciousness, provides a cool, restful cover and prevents soil blowing and washing.

Fundamentals, such as the choice of adapted grasses, good drainage, proper watering, fertilizing and mowing, insure success in building and maintaining good turf.

This bulletin discusses the fundamentals in establishing and caring for turfed areas.

A grass turf for home lawns, parks, cemeteries, playgrounds, highway rights-of-way and industrial plants adds usefulness, value and beauty to the surroundings.

Seldom-used turf such as some lawns and parts of cemeteries require less water and fertilizer than intensively used areas such as football fields and playgrounds. Intensively used areas require more frequent aeration and heavier rates of fertilization than are discussed in this bulletin.

Turf Grasses for Texas

Very few of the 550 species of grass in Texas are suitable for turf. Turf grasses are not permitted to mature normally and produce seed. Food materials essential for growth and development of roots and stems are manufactured in the leaves; yet, through the growing season, the leaves are clipped one to two times a week. Only a few grasses are able to stand such treatment and still produce a desirable turf.

Choice of a turfgrass depends on the geographic location, the amount of water available for irrigation, the degree of shade present, the time and money the home owner is willing to spend for establishment and the kind of usage expected. Turf grasses are classified as to warm-season (growing in late spring, summer and early fall) and cool-season (growing in late fall, winter and early spring).

WARM-SEASON TURF GRASSES

Common Bermuda and St. Augustine are the most practical, widely used and recommended warm-season grasses for lawns. Buffalo is occasionally suggested for use in South and West Texas where irrigation is not available. Zoysia, centipede and carpet are other warm-season turf grasses.

Bermudagrass

Bermuda, *Cynodon dactylon,* is the turfgrass most widely adapted in Texas. It is a narrow-leaved, vigorous perennial, with both above-ground (stolons) and below-ground (rhizomes) creeping stems. It is drouth tolerant and spreads rapidly. Bermuda is resistant to most turf diseases. When properly managed, weeds are not a problem in Bermuda turf. It makes a dense turf when mowed as

needed at a height of 1 to 1½ inches. Bermuda must be fertilized to produce good turf. During extended drouth, water is needed to keep the grass green. In the drier regions, water is needed for the existence of Bermuda.

Bermuda as a turfgrass: (1) does not grow in shade; (2) turns brown after frost in the fall and, with continued low temperatures, does not become green until after the last spring freeze; and (3) is more of a nuisance than other turf grasses in flower beds and gardens because of the rhizomes. Although the leaves of Bermuda turn brown after frost, it tolerates low temperatures because the rhizomes produce new stems and leaves when growing conditions are favorable.

Common is the most practical Bermuda for the average home owner because seed and planting material are readily available and inexpensive. Hybrid forage-type Bermudas such as Coastal, Midland, Suwannee and No. 3 grow too rapidly and are too coarse for use on lawns or other turfed areas. Numerous other Bermudas have been selected or developed for general and special purposes. Seed are not available. These grasses must be established from sprigs or sod. Cost of the planting material, shipping costs and labor for planting make turf establishment expensive when these grasses are used on a home lawn.

GENERAL-PURPOSE Bermudas, other than Common, are African, Tiflawn, Texturf 10 (tested by Texas Agr. Exp. Sta. as T-47), T-22 and U-3.

African Bermuda, *Cynodon transvaalensis,* is lighter green, has finer leaves and stems and has slower growth than on Common Bermuda. It requires more water and fertilizer, is more susceptible to brown patch and is not as wear resistant as Common. The leaves usually are grouped near the ends of the stems. Close clipping removes most of the leaves and exposes the brown stems. Since the stems increase in length during the growing season, they eventually must be cut back to get leaf growth nearer the ground.

Tiflawn is an aggressive, disease-resistant hybrid Bermuda, developed at the Georgia Coastal Plain Experiment Station, Tifton, Georgia. It has about the same size leaves and stems as Common Bermuda and forms a dense turf when properly managed. This grass generally is considered for use on heavily used areas, such as football fields.

Texturf 10 and T-22 are strains of Common Bermuda selected and increased by the Texas Agricultural Experiment Station. Both are slightly coarser and slower to spread than Common and are more drouth and disease resistant. With proper management, they form dense, wear-resistant turf and are especially well suited for playgrounds, football fields and other such areas.

U-3 is a strain of Common Bermuda selected in Savannah, Georgia. U-3 has finer stems and leaves than Common Bermuda. The strain is cold tolerant, but not as wear resistant as Texturf 10, T-22 and Tiflawn.

SPECIAL-PURPOSE Bermudas—Texturf IF, Sunturf, Tiffine and Tifgreen—are finer textured and require more intensive management than the general-purpose types. They generally are used on golf greens, tees and similar situations.

Texturf IF (tested as T-35A) is a strain of Common Bermuda selected and increased by the Texas Agricultural Experiment Station.

Sunturf, *Cynodon magennisii,* was introduced from South Africa by the U. S. Department of Agriculture. It is a hybrid from a cross between Common and African Bermuda and is distinguished by its darker green color.

Tiffine is another hybrid with the same parentage as Sunturf. It has a medium green color and is aggressive. The grass was developed at the Georgia Coastal Plain Experiment Station.

Tifgreen was developed at the same Station from other Common and African Bermuda crosses. It is forest green and exceptionally low growing.

Table 1 lists methods that may be used to establish Bermuda.

St. Augustinegrass

St. Augustine, *Stenotaphrum secundatum,* is a broad-leaved perennial with stolons (runners) creeping on the surface. It is not as cold hardy as Bermuda and is best adapted east and south of Fort Worth. However, it grows satisfactorily east of a line from Vernon to Brady to Del Rio. This grass grows in shade and in open areas when adequate moisture and fertility are available. St. Augustine remains green after frosts that kill Bermuda above the ground.

St. Augustine forms a dense, thick turf, usually crowding out all other grasses and weeds if growing conditions are favorable. It should be cut at a height of 1 to 2 inches. It grows best in fertile, well-drained, sandy loam soils, adequately supplied with organic matter. Because the plant spreads from surface runners only, it is easily controlled in flower beds and gardens.

St. Augustine as a turfgrass: (1) is susceptible to certain diseases, notably large brown patch and leaf spot; (2) is more

susceptible to iron chlorosis than Bermuda; (3) is attacked by insects (chinch bugs and leafhoppers); (4) needs more water for survival than Bermuda; (5) will not survive at as low temperatures as will Bermuda or buffalo; and (6) is a broad-leaved, coarse-textured plant. St. Augustine does not produce live seeds; consequently, it must be established by planting sod or runners of other St. Augustine plants.

Bitter Blue is a strain of St. Augustine used in some Southeastern states. It has not performed as well as the Common in tests at College Station.

See Table 1 for methods of establishing St. Augustine.

St. Augustine often is confused with carpetgrass, *Axonopus affinis*, and often is called "carpetgrass." The two are easily distinguished if the seedheads are examined. Seed heads of St. Augustine are single, short, flat, thick, corky stems (spikes). The seed are sunken into one side of this spike. Carpetgrass seedheads are long, slender, drooping stems that fork at the end into two and occasionally three branches (racemes), somewhat like crabgrass. Some evidence of these stems always is present, either growing or lying on the ground.

Vegetatively, the two grasses may be distinguished by the growth habit of the leaves. The leaves of St. Augustine arise from the collar at a quarter angle, while those of carpetgrass arise directly from the collar in a manner similar to most other grasses. Other differences between the two grasses are: (1) St. Augustine grows in shade; carpet does not; (2) St. Augustine will not live in low, wet areas; carpet thrives in such areas; and (3) St. Augustine must be established from plant material since it produces no live seed; carpet produces live seed. Carpetgrass is not used generally as a turfgrass and very few lawns of carpet are found in Texas.

Buffalograss

Buffalo, *Buchloe dactyloides*, is a low-growing, perennial plant native to South Central Texas and areas westward and northward. Buffalograss is one of the few species having separate male and female plants. Buffalo is cold, drouth and heat tolerant. It is recommended in dry regions where watering facilities are not available. Surface growth may take on a dry appearance during extended dry periods, but the roots are not easily injured. Mowing is not essential, but lawns mowed, fertilized lightly and watered are more attractive. Because the plant spreads from surface runners only, it is easily controlled in flower beds and gardens by cultivation.

Buffalo will not grow in shade. It thrives best on fertile, well-aerated, heavy soils. Buffalograss is not recommended in East Texas or in the Gulf Coast Prairie.

Buffalo as a lawngrass: (1) has a dry, unattractive appearance during periods of prolonged drouth and in late fall, winter and early spring; (2) is not aggressive and may

TABLE 1. TYPES OF PLANTING MATERIAL WITH METHODS, RATES, AND TIMES OF PLANTING FOR TURF GRASSES

Grass	Established from	Method of planting	Quantity per 1000 sq. ft.	Best planting season
Bermuda	Seed	Broadcast	½ to 1 lb.	Spring and early fall
	Sprigs	Sprig 6" apart in 12" rows	5 to 10 sq. ft. sod	
	Sod	Solid—lay as bricks	Same as area to be sodded	
St. Augustine	2" sod blocks or runners	2" blocks on 12" centers; runners planted on 12" centers	Sod blocks—30 sq. ft. of nursery sod Runners—3 to 6 sq. ft. of nursery sod	Spring and early summer
Buffalo	Treated seed	Broadcast	½ to ¾ lb.	Spring
	4" sod blocks	On 1½ to 2 ft. centers	25 to 50 sq. ft. of nursery sod	
Centipede	Shredded sod (sprigs) or 2" sod blocks	In 8" rows 12" apart	5 to 10 sq. ft. of nursery sod	Spring and early fall
Zoysia	Sprigs	Sprig 2" apart in 6" rows in a clean seedbed	40 to 45 sq. ft. of nursery sod	Spring and early summer
Ryegrass	Seed	Broadcast	6 to 8 lb.	Sept. to Nov.
Tall fescuegrass	Seed	Broadcast	6 to 8 lb.	Sept. to Nov.
Kentucky bluegrass	Seed	Broadcast	1½ to 2 lb.	Sept. to Nov.

be invaded by weeds and other faster growing grasses; and (3) will not tolerate shade. Attempts to maintain satisfactory turf outside its adaptive region have not been very successful.

Table 1 gives methods of establishment.

Zoysiagrass

Zoysia grasses are excellent for turf when they are established and properly managed. A good turf of zoysia is attractive and wear-resistant, is not invaded by weeds and other grasses during the growing season, and is subject to little damage from insects and diseases. Zoysia will form a good turf under good conditions in partial shade, but often will not in dense shade. It is less drouth tolerant than general-purpose Bermudas. Zoysia is slower growing than Bermuda and St. Augustine and may be mowed less frequently. However, it should be mowed nearly as often as a Bermuda lawn if a uniform, attractive appearance is desired. Because of the slow growth, it is not such a pest as Bermuda in flower beds.

The zoysia grasses usually are established by sprigging. A clean seedbed free of other growing plants is necessary for the most rapid establishment of a zoysia cover. A little competition from other grasses may mean that 3 or more years will be required to obtain a good zoysia turf. Sod plugs 2 inches in diameter planted on 12-inch centers often have taken 2 years to give a complete cover that Bermuda or St. Augustine would give in 3 months. Zoysia sprigged in a clean seedbed at the rate suggested in Table 1 should give a cover in one growing season with good growing conditions, if other grasses and weeds are kept out.

Japanese lawngrass, *Zoysia japonica,* was introduced from North Korea in 1930. The leaves are narrower than those of St. Augustine, but broader than Bermuda leaves.

MEYER zoysia is a fine-leaved selection of Japanese lawngrass. It forms a dense turf when completely established and has a desirable green color. The grass is cold tolerant enough to survive most Texas winters, but it turns brown after the first frost in the fall.

Manilagrass, *Zoysia matrella,* was introduced from Manila in 1911. It is finer leaved than Japanese lawngrass but less cold tolerant. Manilagrass is not recommended for use in Texas although it may be grown in the central and southern parts.

EMERALD zoysia is a hybrid between Japanese lawngrass and Mascarenegrass, *Zoysia tenuifolia.* It was developed at the Georgia Coastal Plain Experiment Station. Emerald is fine-leaved, dense-growing and dark green. It is reported to remain green after frost has caused other zoysias and Bermuda to turn brown, but it becomes dormant and brown after a hard freeze.

Zoysia as a turfgrass: (1) is slow to give a complete cover and is, therefore, more costly to establish than Bermuda and St. Augustine; (2) is less drouth tolerant than Common Bermuda; and (3) is recommended for lawn use only when the home owner is willing to do all the things necessary to establish and maintain a beautiful lawn.

Centipedegrass

Centipede, *Eremochloa ophiuroides,* is often called "Chinese lawngrass" and "lazy man's grass." It is a creeping, perennial grass with medium-width leaves. Only surface runners are produced, and it is easy to eradicate.

Centipede is intermediate between Bermuda and St. Augustine in many respects; it is more shade tolerant than Bermuda and less shade tolerant than St. Augustine. The width of leaf and, to a certain degree, the color are also intermediate between the other two species.

Centipedegrass browns off after the first frost, requires as much water as St. Augustine and will not survive low temperatures.

Centipede is adapted to sandy, well-drained soils in East, South and Central Texas. It is not recommended as a turfgrass in Texas, although it is used in the humid Southeastern States. Results with centipede have been erratic—some growers have been successful while others have failed. It requires fertilization for an attractive appearance, but is easily burned with fertilizer. Centipede is a low-quality pasture plant and should not be allowed to spread to pasture or cropland.

COOL-SEASON TURF GRASSES

Cool-season perennial grasses are used successfully as lawn grasses in the higher altitudes of Texas where irrigation is possible. No combination of cool-season and warm-season grasses so far has proved entirely satisfactory for maintaining a year-round green lawn. The most frequently used combination is established Bermuda overseeded with annual ryegrass.

Ryegrass

Lolium perenne is a perennial and *Lolium multiflorum* is an annual ryegrass. Most seed of these species are sold as domestic ryegrass —a mixture of the perennial and annual types. Relatively pure seed of annual ryegrass or perennial ryegrass may be purchased. Under Texas lawn conditions, both species act as annuals except in the Panhandle where perennial ryegrass, under proper watering and care, is a good, permanent lawngrass.

Ryegrass is a fine-leaved bunch grass (with no stolons or rhizomes). Unless properly fertilized it turns pale yellow. It is susceptible to rust, a disease that often destroys it in mid-spring.

Ryegrass is used as a winter cover on new lawns where the base grass has not been established. It is used occasionally to provide green color during winter on Bermuda lawns, but it should not be overseeded on other warm-season grasses. The Bermuda turf may be damaged unless good management is used in the spring, because ryegrass is very competitive for moisture and plant nutrients. When it is time for the Bermuda to start growth in the spring, the ryegrass should be kept clipped closely and the Bermuda fertilized as outlined under the management section.

Tall Fescuegrass

Alta and Kentucky 31 fescue, *Festuca elatior*, var. *arundinaceae*, are two strains of tall fescue. Alta was selected in Oregon and Kentucky 31 in Kentucky. They are tall-growing perennial bunch grasses. When seeded heavily and clipped short and regularly, they form a dense, coarse turf that is resistant to wear. They have a wide range of adaptation to soil conditions, but grow best on fertile, well-drained soils. They are moderately shade tolerant and drouth resistant. In North and West Texas where irrigation is possible, they may provide green turf throughout the year. Their use as a general lawngrass is still questionable, particularly where other species are adapted.

Table 1 gives recommended seeding dates and rates.

Kentucky Bluegrass

Kentucky Bluegrass, *Poa pratensis*, is a fine-leaved, creeping perennial lawngrass. It is widely used in the Northern States. In Texas it is used mainly in the Panhandle under irrigation. It thrives best under shady conditions and on soils high in calcium and phosphorus. Kentucky bluegrass is particularly susceptible to leaf spot diseases.

MERION is a new strain of bluegrass that shows some promise in bluegrass areas. It has shorter, wider leaves and can tolerate closer mowing. Merion carries some resistance to leaf spot, but is highly susceptible to a leaf rust.

Other Lawn Covers

Plants other than grasses are often recommended for lawns. Usually these plants are not nearly so satisfactory as the adapted turf grasses.

MONDO "GRASS," *Ophiopogon japonicus*, also known as lily-turf, snake's beard and blue-green Mondo grass, was introduced from China in 1906. It is not a grass but a low-growing evergreen perennial closely related to the lily-of-the-valley. The grass-like leaves are semi-rigid, 6 to 12 inches long, about ⅛ inch wide and tend to droop. The plants grow in tufts, are stemless and spread by means of underground stems and tuber-like roots.

This plant is not recommended as a lawn cover or turf. It is sometimes used as a ground cover where a grass cover cannot be grown satisfactorily and where a 6 to 12-inch high cover is acceptable. It is cold and shade tolerant, but will not tolerate mowing.

DICHONDRA, *Dichondra repens*, sometimes called ponyfoot, is used as a lawn cover on the west coast. It is not recommended for lawn use in Texas. This is a prostrate annual plant with nearly round leaves found as a weed in lawns in most sections of Texas. It does best in moist, shady areas and cannot withstand continued high temperatures in the open. The plant is easily damaged by foot traffic.

Establishment of a New Turf

Three distinct steps are necessary in the establishment of turf. One is the *preparation of the soil.* This involves grading, drainage, incorporation of organic matter, sand or loam, supplying adequate plant food and finally, seedbed preparation. Another is the *establishment* of the grass. The third step is the *care and maintenance* of the young grass during its development.

PREPARING THE SOIL

Soil is the foundation of the lawn. As with any structure, the end product is no better than the foundation upon which it is built. The first step in preparing a new turf area is to remove all debris, such as stones, lumber and trash.

In most instances, the character of the soil needs to be altered considerably. A sandy loam high in organic matter is considered most satisfactory for turf. If the original surface soil contains too much clay, a sandy topsoil should be added and mixed in; if the topsoil is too sandy, clay or loam may be added. Often coarse sand should be added to the soil. In all cases, organic matter should be added. This organic matter may be peat, compost, well-

decomposed gin trash, well-decomposed sawdust (preferably hardwood), leaf mold or similar material. Coarse sand and organic matter must be thoroughly mixed with the seedbed. This mixing can be done by repeated cultivating operations such as disking or plowing. Incorporation of these materials is essential to provide adequate aeration and drainage, water infiltration and improvement of the water-holding capacity. In addition, organic matter provides "life," tilth, and acts as a "store house" for plant nutrients. Such materials make soils more productive.

The area should be graded properly to provide surface drainage. The soil should slope gradually away from the house, walks and driveways. A fall of 1 foot in every 40 to 50 feet is adequate for drainage, provided no pockets or depressions exist. In some cases, artificial drainage outlets may be needed to take care of excess water.

If a considerable part of the lawn area needs to be filled, such as a depression or ditch, a loam soil high in organic matter should be used. If such soil is not readily available, sand, organic matter and clay may be mixed and used.

Terraces should be avoided if possible because of the difficulty of establishing and maintaining turf on terraces. On areas where a lot slopes steeply, retaining walls, rather than terraces, should be built. When trees are to remain in the lawn area, the soil should be graded gradually away from the trunk. Should a fill over 2 or 3 inches above the existing surface surrounding a tree be required, a retaining wall should be built to prevent covering the roots too deeply. This should be constructed at least 3 to 4 feet from the trunk.

Adding Plant Food or Fertilizer

East Texas soils normally are deficient in nitrogen, phosphorus, potassium and lime. Nitrogen and phosphorus are not adequate for good turf development in other parts of the State. Potassium may become a limiting factor in turf growth when adequate amounts of nitrogen and phosphorus are used in areas not normally deficient in potassium.

Fertilizer applications should be made at rates and in combinations suggested by soil tests.

A complete fertilizer should be plowed or spaded under to supply the plant nutrients needed for deep root development. Such a fertilizer of a 1-2-1 (10-20-10, 6-12-6) or 1-1-1 (8-8-8) ratio should be applied at a rate to supply 2 pounds of actual nitrogen per 1,000 square feet. This would be the equivalent of 20 pounds of 10-20-10, 34 pounds of 6-12-6 or 25 pounds of 8-8-8. A fertilizer containing no potash could be used on soils naturally high in potassium.

See Table 2 for fertilizer equivalents and rates.

In East Texas and on other acid soils, ground limestone should be added at the rate of 50 to 100 pounds per 1,000 square feet. When organic matter is added to the soil, 3 pounds of ammonium nitrate or 5 pounds of ammonium sulfate should be added per 1,000 square feet to aid in decomposing the organic material.

After coarse sand, organic material, lime and fertilizer have been mixed thoroughly with the soil, it should be harrowed, raked or otherwise smoothed. Then the seedbed should be watered thoroughly.

Final Grading

The last step in preparing the soil is the final grading (often called fine grading). Thorough watering will have melted clods and firmed the seedbed. Fine grading may be done on small lawns by hand raking. Large areas may be smoothed as much as possible by harrowing. The area should be raked free of large

TABLE 2. PERCENT NUTRIENTS IN VARIOUS COMMERCIAL FERTILIZERS AND RECOMMENDED RATES PER APPLICATION IN FALL AND SPRING FOR TURF

Fertilizer Grade[1]	Ratio of plant food elements	Percent[2] N	Percent[2] P_2O_5	Percent[2] K_2O	Amount to apply to get 2 lb. nitrogen per 1,000 sq. ft.[3]
8-8-8	1-1-1	8	8	8	25
6-12-6	1-2-1	6	12	6	34
10-20-10	1-2-1	10	20	10	20
10-5-5	2-1-1	10	5	5	20
6-10-4	3-5-2	6	10	4	34
12-9-6	4-3-2	12	9	6	17
16-20-0	4-5-0	16	20	0	16

[1]Other fertilizer materials are available and can be used. The amount needed to supply 2 pounds of nitrogen per 1,000 square feet from any fertilizer can be calculated in the following manner: the nitrogen content of the fertilizer divided into 100 gives the amount of fertilizer needed to supply 1 pound of nitrogen. Thus, doubling the figure gives the amount required to supply 2 pounds of nitrogen per 1,000 square feet. For example: in the case of 8-8-8, 8 into 100 equals 12.5; thus 12.5 pounds of 8-8-8 are required to supply 1 pound of nitrogen; 25 pounds are required to supply 2 pounds of nitrogen per 1,000 square feet.

[2]Or pounds of nutrients per 100 pounds of fertilizer.

[3]Length times width equals square feet. For example, an area 50 feet long and 20 feet wide contains 1,000 square feet.

clods and stones which may have worked to the surface. Depressions which showed up as a result of firming or settling the soil may be filled or high places worked down. Walks and driveways should be flush with the final lawn surface. The area is now ready for seeding, sprigging or sodding.

ESTABLISHING THE GRASSES

Whether the lawn should be seeded, sprigged or sodded will depend on the type of grass used and the rapidity of cover desired. Table 1 shows the type of material to be used, methods of planting, quantities needed and best seasons to plant.

Seeding

Seed for lawns should be of high quality and have a high percent germination and purity. This information is required by State law on all seed sold in lots over 10 pounds. Reputable seed dealers are always willing to aid in selecting the best seed possible.

Low-priced seed often are the most costly because they may have a low percent germination and purity. Purchase seed of one species only. A "lawn mixture" is not recommended. Seed mixtures usually are cheaper because they are diluted with useless grasses. One grass ultimately will dominate regardless of the number sown.

The use of small distributors is recommended but hand sowing of seed is satisfactory. Divide the seed into two equal parts, one to be broadcast as you walk back and forth in a given direction, the second to be sown as you walk at right angles to the first seeding. This method provides for better distribution of seed.

Following seeding, the area should be watered lightly and often enough to keep the surface moist until a good stand of grass is established. This will vary from 14 to 21 days, depending mainly on climatic conditions.

Sprigging

Sprigging is the setting of plants, runners, rhizomes or small sod blocks (2 to 4 inches square) in small holes or furrows. Plants, runners or rhizomes set in rows will give a quicker and more uniform cover than sod blocks or plugs.

Lawns should be sprigged in the spring, though they may be sprigged at any time during the growing season when adequate moisture is available. Sprigging must be used for establishing grasses which cannot be propagated by seed. The distance between sod blocks or sprigs should depend on the rapidity of growth and on how soon a cover is desired. Sprigs of Bermuda may be covered; those of other grasses should be only partially covered. Sod blocks or sprigs should be packed firmly into the soil. The soil should be smoothed after sprigging to give a smooth surface for mowing.

Sodding

Sodding is the laying of solid strips of sod. Because of the high cost involved, sodding is never recommended unless there is immediate need for complete coverage. When sodding is necessary, the strips of sod should be trimmed to a thickness of ¾ to 1 inch and cut in blocks 12 to 18 inches square. The sod should be laid like brick on a smooth surface that has been firmed by rolling. It should be free of footprints, stones, depressions and mounds. After the sod is laid, pack or tamp lightly and keep it moist until it is well rooted. After it has rooted, topdress it with a thoroughly mixed and screened (half-inch mesh) mixture of topsoil, sand and organic matter to fill all cracks completely.

CARE AFTER ESTABLISHMENT

Newly established turf areas should be watered. The waterings should be light and frequent enough to prevent the surface from drying. As the young seedlings develop, or as the sprigs or sod begin to take root and grow, the frequency of watering should be reduced and the amount applied at any given time increased. This permits the development of a deep root system and ultimately reduces the amount of water needed.

The height to mow will depend on the species planted. Newly turfed areas should be mowed as soon as the grass is 1½ to 2 inches high. Lawns should be clipped frequently enough to prevent removing more than ¾ to 1 inch of growth at any one mowing. Never more than 1 to 1½ inches of growth should be allowed between clippings. Only the tips of the leaves should be clipped, never the entire leaf or stem.

Newly established lawns are likely to become weedy before the area is covered with grass. Weeds should be controlled by frequent mowing. Controlled mowing, adequate fertilization and judicious use of water aid in reducing weed problems.

Where weed eradication is necessary, the safest, although more expensive, method is hand weeding. Use of chemicals for weed control is discussed on pages 12 and 13.

Management of Established Turf

After the lawn has been established properly, its success depends entirely on the management followed. Constant care and attention are necessary to maintain a good turf. Four major factors—feeding, watering, aerating and mowing—are involved in maintaining turf.

Although these factors are discussed separately, they are interrelated and cannot be separated in actual practice. No one factor is more important than another; proper attention to each is necessary if the best possible lawn is to be maintained. Inadequate attention to any one will result in a thin, unthrifty turf infested with weeds.

FEEDING OR FERTILIZING

Proper lawngrass fertilization is often neglected by the home owner. Grass needs feeding just as do cotton, corn and cattle. Cost of the relatively small amounts of plant nutrients required for healthy, vigorous turf is small in comparison with the returns realized. When clippings are caught and removed from the lawn, an increased rate of fertilization will be necessary, since the clippings return some plant food to the soil when they decompose. If mowing is as frequent as it should be, there will be no need to catch the clippings.

Why Feeding Is Necessary

Plant food elements required in largest amounts by grass plants are nitrogen, phosphorus and potassium, but these must be applied in the right proportion to give satisfactory results. Nitrogen is the key element in turf production. It produces vegetative growth and gives the plant a deep green color. Phosphorus stimulates development of a good root system. Potassium affects the physiological processes of the plant. The three elements are necessary parts of all living plant tissue. Calcium is the structural component of cell walls and is essential in root development.

Many other elements play important roles in the nutrition of plants. When nitrogen, phosphorus and potassium are balanced properly, other elements necessary for plant growth usually are present in sufficient amounts to produce good turf.

Plant food deficiencies produce certain definite characteristics. Nitrogen deficiency causes stunted growth of the entire plant. The leaves are relatively small, thin and yellowish-green to yellow, frequently referred to as "firing." Careful examination shows yellow to brown color at the tip of the leaf and down to the midrib. The roots are stunted, but usually less than the tops. Nitrogen deficiency often is confused with lack of moisture. A moisture deficiency is indicated by wilting of the plants or curling of the leaves.

Phosphorus deficiency causes slow growth of the entire plant. The leaves are an unhealthy dark green and often irregularly distributed brown patches occur. The roots are stunted, but less so than the tops.

Potassium deficiency causes stunted growth; the entire plant eventually dries up and takes on a brownish color. The leaves appear dull green, sometimes yellow, and edges turn brown. Bronze-colored spots often develop and the tips are scorched. The older leaves are affected first.

Calcium deficiency causes stunted growth; the leaves become hard and stiff and mottled or brown spots are common. The roots are stubby, profusely branched and the growing tips usually die.

Iron deficiency causes pale, bleached leaves. This bleaching or yellowing is known as chlorosis and occurs on soils high in lime. When this condition is serious, it ruins the appearance of the lawn.

When lawns receive the proper kind and amount of plant food, they are healthy, green, thrifty and free of weeds. Weeds cannot compete with a well-fed and properly managed lawngrass. Much less water is required to maintain a beautiful green turf when adequate plant food is available.

Time and Rate of Fertilization

Knowing the proper time to feed your grass is just as important as knowing what to feed it. Turf requires frequent feedings to remain green and vigorous throughout the growing season. Turfed areas should receive an application of complete fertilizer in the spring and early fall.

The spring application on Bermuda, St. Augustine and zoysia should be made about the time the grass is beginning to grow. Fall applications of complete fertilizer should be made about 30 days before the average first frost date. Perennial ryegrass and bluegrass lawns should have these applications about September 1 to 15 and April 1 to 15. Generally a fertilizer with a 1-1-1 or a 2-1-1 ratio should be used and applied at a rate of 2 pounds

actual nitrogen per 1,000 square feet. See Table 2 for grades, ratios and rates of fertilizer application.

Bermuda, St. Augustine and zoysia lawns should receive 1 pound of actual nitrogen per 1,000 square feet every 30 to 40 days during the growing season. These applications of nitrogen, made between the spring and fall applications of complete fertilizer, will keep the lawngrass green and vigorous. See Table 3 for rates and frequency of application of nitrogen fertilizers. Cool-season perennials such as bluegrass usually do not require applications of nitrogen in addition to the complete fertilizer.

Chlorosis may be corrected by applying iron sulfate or iron chelate. Before these iron-bearing materials are applied, the home owner should be sure the pale color of the grass is not due to nitrogen deficiency. The most effective way to apply the iron is in a spray. Iron sulfate (copperas) may be applied at the rate of 3 ounces in 5 gallons of water per 1,000 square feet. One and one-half ounces of home detergent should be added to assure good leaf coverage. Repeat applications will likely be necessary at 4 to 6-week intervals. Chelated iron compounds may be applied in a spray according to the manufacturer's directions. The chelates are more effective in some cases and for slightly longer periods. Where chlorosis is not severe, 10 pounds of iron sulfate or 1 pound of chelated iron per 1,000 square feet applied alone as a dust or in mixture with fertilizer may correct the problem. Sprayers used to apply iron sprays should be cleaned thoroughly after use, because the iron-bearing materials are corrosive.

Types of Fertilizer

Plant food for turf should carry a high percentage of nitrogen with enough phosphorus and potassium to assure grass vigor and health. Grasses are heavy feeders on nitrogen; thus, on a yearly basis, more nitrogen than phosphorus and potassium must be supplied. A nutritional balance must be maintained between the three major elements. This is done by fall and spring feedings of a complete fertilizer in areas where potassium is not high, and by use of a fertilizer containing only nitrogen and phosphorus where potassium is high.

The root system develops during the fall and early spring. Deep and extensive root growth may be promoted by making plenty of nitrogen, phosphorus, potassium and calcium available during those seasons. Nitrogen applied separately during the growing season is

Figure 1. Proper fertilization is necessary for good turf. Use the proper grade of fertilizers in the right amounts at the proper time.

used in producing top growth and does not decrease the size and depth of the root system.

Choice of the type and grade of fertilizer material to use depends on the price, availability and ease of handling. Table 2 shows some grades and ratios and recommended rates of application of various grades of fertilizers.

Any complete fertilizer may be used for the spring and fall applications when used in the proper amount. Potash may be eliminated where the soils are naturally high in potassium.

Organic base fertilizers containing nitrogen, phosphorus and potassium are available. Such fertilizers usually contain both organic and inorganic sources of nitrogen, which are discussed below. They should be used at the same rate as inorganic fertilizers. Organic base fertilizers do not increase the organic matter content of the soil at usual rates. They usually cost more per pound of plant nutrients than the fertilizers containing no organic material. However, they do have the advantage of slower and more uniform nitrogen release.

The additional nitrogen to be applied between the fall and spring applications of complete fertilizer may be supplied from one of several sources, as shown in Table 3. Slowly decomposing (organic) sources of nitrogen such as processed sewage sludge or cottonseed meal, are more desirable than readily available or soluble (inorganic) sources, such as ammonium nitrate, ammonium sulfate and nitrate of soda. Organic type fertilizers usually cost more, but they become available more slowly, are available over a longer period of time and help avoid overstimulation. Inorganic types should be applied in smaller amounts and more frequently than organic types. The inorganic types are more likely to burn the grass.

Figure 2. Avoid topdressing established lawns with soil, except to fill depressions. Repeated topdressing with soil results in alternate layers of soil and stems. This increases water, disease and insect problems and makes maintenance of good turf difficult. Topdressing with manure stimulates turf grasses, but manure usually contains weed seed.

Table 3 shows the amount of nitrogen carried in each source. Cost of the actual amount of nitrogen contained should be considered carefully. For example, one could afford to pay twice as much for a sack of ammonium nitrate, which contains 33.5 percent nitrogen, as for a sack of nitrate of soda which contains 16 percent nitrogen.

TABLE 3. PERCENT NITROGEN IN VARIOUS FERTILIZERS AND RECOMMENDED RATES FOR TURF, AFTER A SPRING APPLICATION OF A COMPLETE FERTILIZER, OR NITROGEN AND PHOSPHATE, AND UNTIL TIME FOR FALL APPLICATION

Material	Percent[1]			Amount to apply per 1,000 sq. ft.	Frequency of application
	N	P_2O_5	K_2O		
Cottonseed meal	6	2	TR	15 lb.	Every 40 to 50 days
Processed sewage sludge					
Milorganite	6	3	0	15 lb.	Every 40 to 60 days
Hou-actinite	6	3	0	15 lb.	Every 40 to 60 days
Ammonium nitrate	33.5	0	0	3 lb.	Every 30 days
Ammonium sulfate	21	0	0	5 lb.	Every 30 days
Nitrate of soda	16	0	0	6 lb.	Every 30 days
Urea compounds					
Urea	45	0	0	2 lb.	Every 30 days
Urea formaldehyde	38	0	0	2 lb.	Every 40 to 60 days

[1]or pounds of nitrogen in 100 pounds of fertilizer.

Application of Fertilizer

Fertilizer may be distributed by hand or with a fertilizer distributor. Distribute it evenly, and avoid skips and overlapping. Skips and overlaps result in light and dark streaks across the lawn. To get even distribution, divide the fertilizer into two equal lots. Apply one lot lengthwise and the other crosswise of the area as described under seeding.

Fertilizer should not be applied when grass is wet because of the danger of burning the grass. Generally the fertilizer should be washed off the grass and into the soil, because it cannot be used by the plants until dissolved.

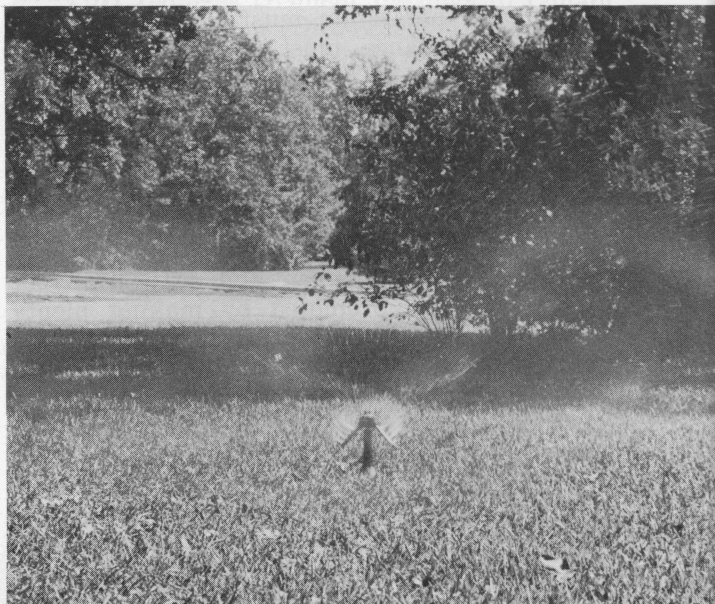
WATERING

Watering is the maintenance practice that most often is done incorrectly. Lawns should never be watered until the grass shows a definite need. Grass suffering from lack of moisture takes on a definite sheen and the plants wilt and curl. When this occurs, the lawn should be soaked thoroughly to a depth of 6 inches or more. Soaking the lawn until topsoil and subsoil moisture meet would be ideal. Apply water only as fast as the soil can absorb it. Light sprinklings are never recommended except during excessively hot spells following a prolonged period of heavy rainfall. Light daily sprinklings during this time reduce scalding.

Deep watering of 6 inches or more encourages development of a deep root system capable of utilizing more efficiently the nutrients available deep in the soil.

Light frequent sprinklings produce shallow, weak root systems which encourage weed invasion. Shallow rooting does not allow efficient utilization of plant food or moisture in

Figure 3. Do not water your lawn until the grass shows the need. Then soak the soil to a depth of 6 inches or more, or until the topsoil and subsoil moisture meet.



the soil. Disease incidence is more likely to be severe under conditions which produce shallow rooting. Light sprinklings continued over a long period may make the maintenance of a good lawn prohibitive. Water the lawn for a healthy root system during excessively dry periods in the winter, because the root system is still alive.

AERATION

A soil in good physical condition for plant growth is a mixture of soil solids, water and air. The solid particles of soil, under best conditions, adhere to each other with organic matter to form granules. The solid portion should constitute about 50 percent of the volume of soil, and the remaining 50 percent would be the pore space. Air and water should occupy the pore space in equal proportions. A soil is said to be properly aerated when this condition exists.

Soil compaction is a major turf problem where the turf is subject to wear. This condition may be corrected by aerification, making small holes in the topsoil. This may be done with a hand-aerifier, such as shown in Figure 5, with a hollow-tined fork or with a four-pronged spading fork. Implements that remove small plugs are best. Power-driven machines are available for use on large areas, such as golf courses and atheltic fields.

Aerifying the soil is a means of loosening the soil to allow: (1) air (oxygen) to get into the soil, which is essential for root development; (2) water to move into and through the soil; and (3) the soil to hold more water. It also prevents compaction which in turn prevents soil erosion and plant food loss through surface runoff. Eliminating the compacted

Figure 4. Frequent shallow sprinklings often do more harm than good. This encourages weak grass with a shallow root system that permits weed invasion, drouth damage and inefficient use of water and plant nutrients.

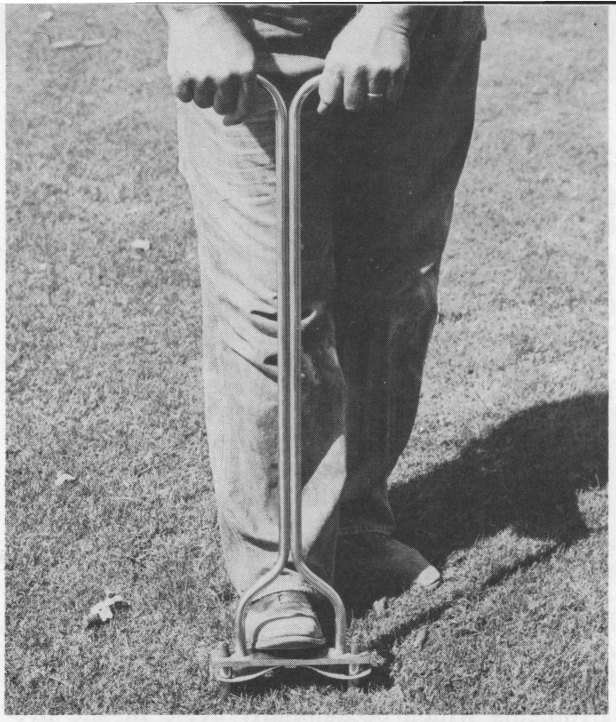


Figure 5. Heavily used turf areas should be aerified as necessary to open the soil surface to allow water and air penetration. Turf will thin out as the soil becomes more compacted. The best tool for the home lawn is a hand aerifier, shown above, or a hollow-tined spading fork, which allows removal of plugs of soil. A four-pronged spading fork may be used.

condition is necessary for proper air-water relationships which make for vigorous, healthy turf that is resistant to disease and drouth. Frequently used parts of the lawn should be aerated as often as necessary to keep the soil in a good physical condition.

MOWING

Improper mowing is responsible for the deterioration of many lawns. Mowing too close encourages thinning of the turf and shallow rooting, resulting in lowered resistance to drouth, diseases and invasion by weeds. Clipping too high results in many of the same problems. Mowing too close also allows excessive soil drying and baking and heat damage to grass during the summer.

The leaves not only produce the desired green color, but they are necessary for the manufacture of food required by the entire plant. When too much of the leaves are clipped off, the entire plant suffers. Removing 2 inches or more at one mowing is a severe shock to the turfgrass. The grass should be mowed often enough that not more than 1 inch of the leaf tip is removed at any one clipping.

Creeping types of grasses can withstand closer mowing than bunch types. Bermuda should be mowed at a height of 1 to 1½ inches; St. Augustine, buffalo, zoysia, bluegrass and ryegrass, 1½ to 2 inches. Many home owners want a dense mat of turf on their lawns, but such a buildup of stems and leaves (thatch)

eventually leads to trouble. This is especially true with St. Augustine and the dense, close-growing strains of Bermuda. Mowing these grasses too high for a long period results in thatch buildup. The thatch acts as insulation; new roots from stems must penetrate it to get into the soil, and it increases the disease hazard.

Proper mowing requires a sharp, well-adjusted lawn mower. The mower should be sharp enough to cut the tips of the leaves and not bruise or crush them. Both the cutting edge of the bedknife and the reel should be sharp. Time spent picking up stones and sticks before mowing is well spent. Regular check-ups on the adjustments of the reel and bedknife are necessary. The reel should be set firmly, yet not too closely, against the bedknife. The height of the bedknife should be determined by placing the mower on a flat surface and adjusting the set screws so that each end of the bedknife is exactly the desired height.

Occasional Turf Problems

The choice of the proper turfgrass, establishment of a new turf and management of established turf are major considerations. Problems which occasionally arise in the production of turf include weed, disease and insect control, clover in turf and renovation of old lawns.

WEED CONTROL

Proper turfgrass management is the best means of controlling weeds. When the right grass is used and properly established, fertilized, mowed and watered, weeds are rarely a problem. If the lawngrass thins out and weeds invade the turf, the management practices followed should be studied and faulty ones corrected. When weeds are eliminated with chemicals or by hand, the lawn management should be improved to allow production of a turf thrifty enough to resist invasion by weeds. Extension Service Leaflet 425, *Chemical Weed Control in Lawns,* gives full details on the use of chemicals for the control of lawn weeds.

Crabgrass, Dallisgrass, goosegrass, sandbur and other summer-growing weedy grasses in Bermudagrass turf may be controlled with disodium methylarsonate or with amine methylarsonate. These materials are most effective if they are applied to the weedy grasses when they are in the seedling or young stages and growing actively. Temporary browning or yellowing will occur when these materials are applied to Bermuda, but the discoloration will disappear in 7 to 14 days. St. Augustinegrass is severely burned or killed by these materials. Treated areas should not be mowed or watered within 48 hours after application. Retreatment or spot treatment often is necessary for good control.

Both materials are applied in water as a spray or mop to wet the stems and leaves of the weedy grasses. Table 4 shows the types of materials available and the concentration of each to use. A liquid detergent should be used with either chemical at the rate of 1 teaspoon per gallon of water. These chemicals are poisonous.

The above-ground parts of Dallisgrass and other summer growing weedy grasses may be killed by wetting the leaves and stems with naphtha. This material is used for spot treatment only as it will kill lawn grasses to which it is applied. However, bare spots left by naphtha treatment will be filled in by new growth in a few weeks. These oils are explosive and will blister the skin covered by saturated clothing.

Endothal may be used for easy-to-kill, broad-leaved weeds such as burclover, henbit, oxalis and annual grasses such as rescue, ryegrass and annual bluegrass. Use 3 to 4 tablespoons of endothal per gallon of water for the weeds and 6 to 7 tablespoons for the grasses. Use 1 teaspoon of liquid household detergent per gallon of water. Apply the mixture as a spray or mop when the weeds are small to thoroughly wet the leaves and stems of the weeds.

Endothal should be applied when the permanent grass is dormant and should not be used on ryegrass or bluegrass. Endothal is toxic to all warm-blooded animals when taken internally. Avoid prolonged contact with skin and keep out of reach of children and pets.

Figure 6. Proper fertilization, watering and mowing is the best means of weed control in lawns. The well-managed lawn on the right has no weeds, while the one on the left is severely infested.

Dock, dandelions, aster and other such weeds may be controlled with 2,4-D. Use 2 tablespoons of the amine form of 2,4-D per gallon of water, provided its strength is 4 pounds of acid equivalent per gallon of concentrate. The effect of 2,4-D and other phenoxy compounds on St. Augustinegrass has not been studied.

Follow directions on the container for mixing 2,4-D formulations that do not contain the 4 pounds of acid per gallon. Use a household detergent or commercial wetting agent at the rate of 1 teaspoon of liquid or 3 tablespoons of dry material per gallon of water.

Apply the 2,4-D solution as a mop or with a sprinkler can to thoroughly wet the leaves of weeds. Some weeds will begin dying within 48 hours, others may require 2 weeks to show the effects. Broad-leaved annual weeds that are susceptible to 2,4-D can be killed with one application. Weeds less susceptible, especially some perennials, may require retreatment.

Caution: Use only the amine form of 2,4-D. The ester forms are more volatile and more likely to damage desirable plants. Never apply 2,4-D under pressure; the drifting mist can cause severe damage to desirable shrubs, flowers and trees. Containers used to mix or carry 2,4-D solutions should not be used to apply other materials to flowers, shrubs or trees. Do not apply 2,4-D when the temperature is below 50 or above 90 degrees F.

DISEASE CONTROL

Properly managed lawns are less likely to be attacked by disease. If they are attacked, they are likely to recover more rapidly than are poorly managed lawns. When diseases occur on lawngrass, recommended chemicals should be applied as directed by the manufacturer. Thorough application of the chemicals is necessary for good control. Some of the chemicals are poisonous and should be handled accordingly.

Brownpatch is a fungus disease that often attacks St. Augustine and Bermudagrass. Brownpatch occurs as irregularly shaped brown areas, usually circular, 4 to 48 inches in diameter. The patches may run together on severely infested turf so that no circular areas are evident. The fungus is active on the outer borders of the affected area, giving the grass a blue, water-soaked appearance. This ring of affected grass is often called a "smoke-ring." As the disease spreads, the dark areas turn light brown.

The disease may be controlled by spraying the affected and immediate surrounding areas thoroughly with a fungicide containing PCNB (pentachloronitrobenzene), which has proved most effective of materials tested. Fungicides with PCNB include Terraclor, Acti-dione RZ, and Ortho Lawn Disease Control. These materials should be applied as soon as the disease appears at the rate recommended by the manufacturer in 15 to 25 gallons of water per 1000 square feet. This amount of water is necessary to get the chemical down to the soil level, assure good control and to prevent temporary discoloration of the grass. Repeat applications are often necessary.

Brownpatch may be prevented in areas where it usually occurs by spraying those areas a short time before the disease normally appears. The fungicides mentioned for control are effective for this purpose. Others which have been effective are Tersan, Kromad, and Ortho Lawn and Turf Fungicide.

Slime mold is a black or grayish encrustation on grass leaves that can be scraped off as a powdery mass. The grass is not harmed by the spore masses, but the material may be washed off with water applied as a spray under 20 to 30 pounds pressure.

Gray leaf mold sometimes appears on Bermudagrass that has suffered from lack of moisture in midsummer. It is caused by *Helminthosporium* fungi that appear to attack

TABLE 4. SPRAYS FOR CONTROLLING DALLISGRASS, CRABGRASS, GOOSEGRASS AND SANDBUR

Chemical	Percent active ingredient	Amount to add to 1 gallon of water for spot treating	Amount to use in 2 to 4 gallons of water to treat 1,000 square feet
Disodium methyl-arsonate liquid formulations[1]	20.5	14 to 16 tablespoons. Apply to wet stems and leaves thoroughly	1 pint
Disodium methyl-arsonate, soluble or wettable powders[2]	50-98	5 to 7 tablespoons. Apply to wet stems and leaves thoroughly	10 to 14[5] ounces
Disodium methyl-arsonate, granular[3]	6	Follow manufacturer's directions	
Amine methyl-arsonate liquid formulation[4]	16	12 to 14 tablespoons. Apply to wet stems and leaves thoroughly	12 to 14 ounces

[1]Sold under trade name, Weedone Liquid Crabgrass Killer.

[2]Sold under trade names, Methar; Artox; Di-Met; Crab-E-Rad; Weedone Crabgrass Killer; and Penn-Chem DSMA.

[3]Sold under trade name, Clout.

[4]Sold under trade names, Ortho Crabgrass Killer; Artox; Crab-E-Rad; and Penn-Chem AMA.

[5]Reduce to 4 to 8 ounces for Crabgrass.

only drouth-weakened grass. Therefore, the disease may be prevented by proper watering.

Fairy ring is a ring of dark green growth of grass caused by a fungus growth in the soil. Occasionally the fungus produces mushrooms that appear around the edge of the fairy ring. As the fungus grows outward, it dries out the soil, sometimes so completely the grass is killed. With outward growth, the fungus root structure inside the ring dies and releases nitrogen, causing the dark green grass growth around the circle. The fungus is difficult to kill because of its depth. The drying effect can be offset by opening the soil as deeply as possible with a spade and soaking the area thoroughly. Two ounces of household detergent per 5 gallons of water will help considerably in wetting the soil.

Leaf spot diseases often attack bluegrass, St. Augustine and sometimes Bermuda. These diseases are first noticeable on bluegrass when small brown spots appear on the leaves. The spots enlarge and become straw-colored or white with dark brown to black borders. In severe attacks, the crowns of the plants may be invaded which results in withered leaves and death of the plants. Cool, wet weather in the spring favors infection by the fungus. The grass may be weakened by the infection during this period, but the damage shows in hot weather as the weakened plant parts die. Avoid excessive nitrogen applications and close mowing during the cool, wet periods of April and May. If severe infection occurred the previous summer, spray the lawn during the spring infection period with Actidone, Special Semesan or PMAS. These materials should be applied according to the directions on the container.

INSECT CONTROL

Some insects infesting lawns are webworms, armyworms, cutworms, wireworms, white grubs, leafhoppers, false chinch bugs, ants, chiggers (redbugs), ticks and crickets. Dusts or sprays containing one or more of the following are effective for controlling most lawn insects: chlordane, dieldrin, DDT, toxaphene, malathion, aldrin, heptachlor and lindane. Directions for applying, as given on the manufacturer's labels, should be followed. For specific turfgrass insect control recommendations, see L-199, "Texas Guide for Controlling Insects on Ornamental Plants."

Rhodesgrass scale often damages turf. Sprays of malathion and parathion offer fairly effective control of this insect. These materials should be applied in 5 gallons of water per 1,000 square feet or 200 gallons of water per acre at sufficient pressure to force the spray into the turf. Follow directions in the dilution chart above for mixing sprays.

TABLE 5. DILUTION CHART FOR RHODESGRASS SCALE SPRAYS

Material	Amount needed to make spray of: 200 gal.	5 gal.
Malathion 50% emulsion concentrate	1 qt.	1½ tbsp.
Malathion 25% wettable powder	5 lb.	3 tbsp.
Parathion 25% emulsion concentrate	1 qt.	1½ tbsp.
Parathion 25% wettable powder	2 lb.	1⅓ tbsp.

Two or more spray applications at 7-day intervals may be necessary to obtain control. The addition of a small amount of a suitable wetting agent such as a home detergent will increase the effectiveness of the spray.

Caution: All insecticides are poisons and precautions given on the labels should be followed strictly. Parathion is a highly toxic material and should not be applied with hand equipment. In most instances, the average home owner should employ an experienced operator if parathion is used. Malathion can be used safely if reasonable precautions are followed.

CLOVER IN TURF

Clover is not recommended for use on turf areas. The tender growth stains clothing, is easily injured by trampling and shades grass in the spring. Generally it does not persist during the summer. The presence of volunteer clover indicates nitrogen deficiency and soil compaction.

Although clover is not recommended, it provides some green color in lawns during the winter and early spring before permanent lawn grasses begin growth. If clovers are not removed from the lawn area they should be kept under control by frequent mowing.

RENOVATING OLD LAWNS

Renovation becomes necessary when the old turf is run down, weedy and in a generally undesirable condition, or when a new species is to be introduced.

Steps to follow in renovating lawns include mowing the entire area closely, applying weed control chemicals as needed, then aerating, disking, plowing or in some manner loosening the surface. The area should be fertilized, leveled and the turf re-established. Very often, unless a new species is to be introduced, sufficient plants from the old sod are present to form a desirable sod. Try to ascertain the cause for the deterioration of the old sod; then correct and avoid the trouble on the new lawn.

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