Turfgrass Management

Preventing pests from invading a turf area starts with maintaining a healthy, vigorously growing stand of turfgrass plants. Pests usually take advantage of a turfgrass that is exposed to long periods of environmental stress, improper cultural practices or selection of the wrong turfgrass for the area. Pesticides alone will not guarantee a successful pest management program.

Turfgrass maintenance requires timely implementation and use of cultural practices and pesticides. Simply stated, it is the "how to" and "when to" of maintaining turfgrasses. Turfgrass maintenance requires a year-round commitment of care from the turf manager and a monetary commitment to provide the necessary funds for equipment and supplies from club, community or school organizations.

Turfgrass Selection

Turfgrass selection should be based on the environment, the intended use and expected management intensity. Check with a turfgrass specialist or extension agent to find out which grasses perform best in a given area. Blends and mixtures should be used whenever possible to insure good performance over a wide range of conditions. Cool-season grasses (bentgrass, bluegrass, ryegrass, fescue) are best established in the fall, whereas warm-season grasses (bermudagrass, zoysiagrass, centipedegrass, St. Augustinegrass) are best planted in late spring or early summer.

Use of improved, adapted, turf-type grasses, free of objectionable weed and crop content, is one of the best means of preventing pest activity. A number of cultivars have been released with improved tolerance to certain diseases such as leaf spot, rust, dollar spot and others. Several cultivars are also being marketed which claim resistance to certain insects. Insist on certified seed or sod to assure high genetic purity. Uncertified seed or sods frequently produce plants of low quality that are very difficult to manage.

Cultural Practices

Mowing

Mowing schedules should be based on the desired cutting height and amount of plant growth allowed between mowings. The growth rate will depend on the level of soil moisture, nutrients, temperature and sunlight. Since these factors fluctuate from week to week, it follows that plant growth also fluctuates. Therefore, the time to cut turfgrasses is at a point so that no more than 1/3 of the leaf area is removed at any one mowing. This means to maintain a turf at 1 inch, it should be cut when it reaches 1 1/2 inches **(Table 2.2.1)**. Scalping or removing too much of the leaf area in a single mowing can cause plant stress and reduces the aesthetic value of the area.

Table 2.2.1. Cutting height and amount of growth allowed so no more than 1/3 of the leaf area is removed.

Cutting height	Growth allowed	Maximum height allowed*
1/2	1/4	3/4
5/8	1/4	7/8
3/4	3/8	1 1/8
7/8	1/2	1 3/8
1	1/2	1 1/2
1 1/2	3/4	2 1/4
2	1	3
2 1/2	1 1/4	3 3/4
3	1 1/4	4 1/4

*Please note that these values are to be used as guidelines and illustrate how the growth allowed is a direct function of the desired cutting height (i.e., maximum height allowed = 3/2 x desired cutting height).

Reel-type mowers provide the best mowing quality if properly maintained and operated. Rotary mowers are more versatile but may not cut as "clean" as a reel-type mower. Flail mowers are generally not used for fine turf because they are not designed to provide a quality cut at 1 inch or below. They are best suited for roadsides and utility turfgrass areas that are infrequently mowed at cutting heights of 2 to 3 inches or more. 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, induces plant stress and destroys the aesthetic value of the area.

Irrigation

Irrigation is required to maintain soil moisture levels that support optimal turfgrass growth during periods of low or uneven rainfall. However, watering is one of the most often abused and misunderstood aspects of turfgrass culture. Frequent, shallow watering encourages shallow rooting, soil compaction, thatch accumulation, weed seed germination and disease development.

Irrigation frequency should be determined by the moisture needs of the turfgrass. It is difficult to schedule a definite irrigation frequency because of (1) dissimilar water holding capacities of different soil types, (2) weekly fluctuations in temperature, humidity and wind, 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 clay soils **(Figure 2.2.1)**. Therefore, more frequent applications of less water are required for turfgrass areas constructed on a sandy soil than those on a clay soil. Close mowing and increased applications of fertilizer accelerate growth and therefore increase the amount of water necessary for optimal turfgrass growth.

Turfgrasses should be irrigated when they show the first visual symptoms of wilt that is characterized by "foot printing" and a blue-gray appearance. Water constitutes approximately 80 percent of the fresh weight of turfgrasses. When turfgrasses experience moisture stress, their leaves begin to curl and wilt. Thus, the leaves are slower to bounce back when stepped or driven on. Enough water should be applied to wet the soil to a 6-inch depth. This can be checked with a soil probe. If the turf area begins to puddle, stop irrigating and allow the water to soak into the soil. It may be necessary to repeat this cycle several times before irrigation to the proper depth is complete.

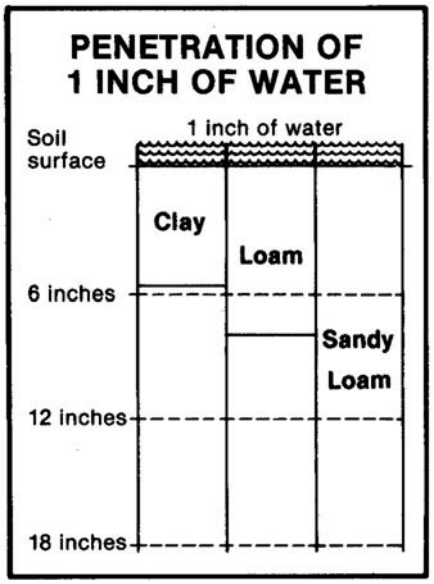

Figure 2.2.1. One inch of water will penetrate approximately 6 inches into clay soil and 18 inches into sandy loam soil.

Fertilization

Turfgrass plants require nitrogen (N), phosphorus (P), potassium (K) and 10 other mineral elements in available forms within the soil root-zone. Nitrogen fertilizers are particularly important because it is the nutrient required in greatest amounts by turfgrass (a healthy turfgrass plant is approximately 4% N, 0.5% P and 2% K, by dry weight).

Nitrogen applications are necessary because available nitrogen is negligible in most topsoils of Arkansas. The level of nitrogen within a turfgrass plant is correlated with plant color and vigor. However, excessive levels of nitrogen can lead to poor rooting, higher disease incidence and reduced tolerance to environmental stress, so it is best to maintain turfgrasses "just on the lean side." Phosphorus and potassium are also required in relatively large quantities for healthy plant growth. Applications of phosphorus and potassium are not needed as frequently as nitrogen because lower levels are required.

Sources of nitrogen that are quickly available, such as ammonium nitrate, ammonium sulfate or urea, are highly water soluble, cause a rapid but short-term growth response, have a high burn potential and have a low cost per unit nitrogen. Sources of nitrogen that are slowly available, such as ureaformaldehyde (UF, Nitroform), isobutylidine diurea (IBDU), sulfur-coated urea (SCU) and activated sewage sludge (Milorganite), generally produce a gradual long-term turfgrass response, have a low burn potential and have a moderate to high cost per unit nitrogen.

A complete fertilizer (one that contains nitrogen, phosphorus and potassium) may be necessary only once or twice a year, with the remaining applications consisting of a

nitrogen-only source. Fertilizer formulations having a grade similar to 12-4-8 or 24-8-16 provide mineral elements closer to actual plant needs than fertilizer formulations such as 10-10-10 or 10-20-10. Apply no more than 1 to 1 1/2 pounds of quickly available nitrogen per 1,000 square feet in a single application. Higher rates cause increased shoot growth without corresponding increases in turfgrass quality. Slowly available fertilizers have a longer residual response. Nutrients are released for a duration that is two to three times longer than quickly available fertilizers. Therefore, fewer applications at higher rates are needed for slowly available fertilizers.

The availability of plant nutrient elements in the soil is influenced by soil pH. These nutrient elements are available at specific pH levels **(Figure 2.2.2)**. Between pH 6.5 and 7.0, all essential elements are adequately available for optimal turfgrass growth. To economically maintain optimum soil fertility, a soil test determining pH and levels of available phosphorus and potassium is beneficial. Lime (to increase pH) or sulfur (to reduce pH) **should only** be applied when recommended by a soil test.

Preventing Thatch

Thatch is a layer of undecayed grass found between the soil and green leaves of the turf plant. Thatch occurs because as old turf plants age and die, they decompose into fine textured humus that becomes part of the soil surface. Some factors that favor thatch buildup are:

- Excessive growth from over fertilization.
- Overgrowth followed by severe cutting.
- Fungus disease.
- Conditions unfavorable to microorganisms that decompose dead turf plants.

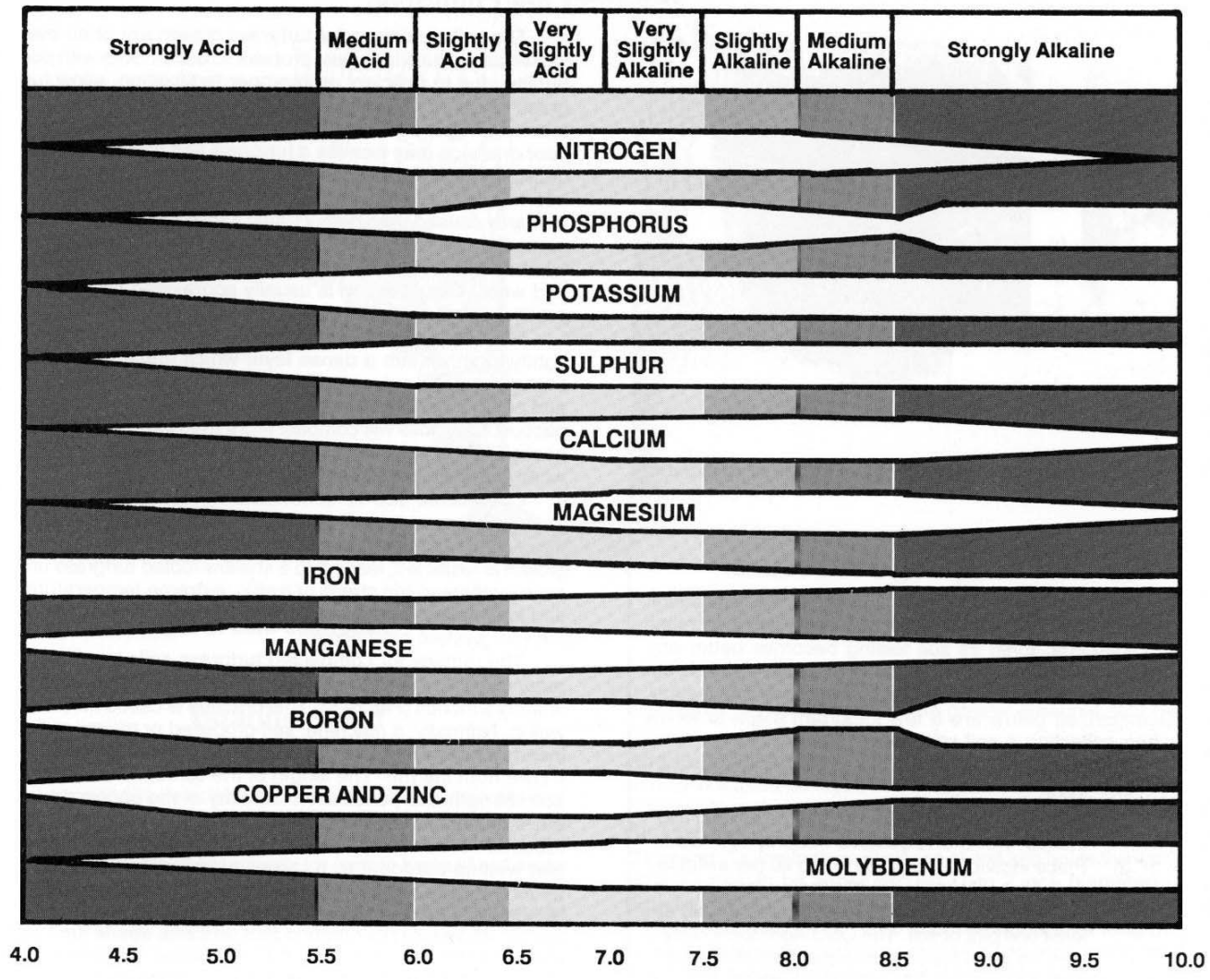

Figure 2.2.2. Nutrient availability as influenced by soil pH.

Rapid and excessive growth is the major cause of thatch because plant material is produced at a faster rate than decomposition can occur. Good cultural practices may not prevent thatch indefinitely but can retard its formation. Some of these practices include:

- Moderate and regular fertilization of the soil to maintain turf vigor without excessive growth.
- Regular mowing at the proper height to avoid plant stress.
- Deep, soaking irrigations during dry periods to encourage deep rooting.
- Vertical mowing annually before a new flush of growth.
- Aerification to improve water penetration and reduce compaction.

To determine if thatch is a problem, cut and lift several plugs two to three inches deep. Examine the profile of the plug. If thatch is present, it will appear as a distinct layer of felt-like material that is partially decomposed **(Figure 2.2.3)**.

Figure 2.2.3. A bermuda turf with heavy thatch accumulation.

A thatch layer in excess of 1/3 inch should be removed by a verticutter, power rake or dethatching machine. Cool-season species should have thatch removed in the fall and spring months. Warm-season species can be lightly dethatched before greenup in the late winter or early spring (before March 15) or heavily dethatched after the turf is completely green in late spring or early summer (May or June).

In severe situations, removal of thatch by mechanical means will also remove most of the green living grass. Moderate treatments over 2 to 3 years are more desirable than complete removal in a single operation.

Soil Sampling Procedure

The use of soil testing as a guide to the application of agricultural chemicals on turfgrass continues to increase in Arkansas. Even as soil testing becomes better and more widely used, getting a good soil sample stands out as a major factor affecting the usefulness of soil testing. Summarized below are a few important steps to follow when collecting a soil sample:

1. Follow a random pattern when sampling a turf area.
2. Individual sample depths should be at least 2 inches with the vegetative material removed.
3. Place individual samples (15 to 20 per area) in a clean container and mix thoroughly.
4. The test sample for the area should contain at least 1 pint of soil. Soil sample containers are provided free-of-charge through your county Extension office.

Core Cultivation

The soil conditions for turfgrass growth are often overlooked as a cause for a pest problem to occur. Soils with poor fertility due to deficient or improper fertilization allow turfgrass pests to invade an area. Even though the area is mowed, irrigated and fertilized properly, soil compaction or poor drainage may weaken a turfgrass and increase its susceptibility to turfgrass pests. Soil compaction causes poor internal soil aeration and water drainage **(Figure 2.2.4)**. It is primarily caused from heavy traffic and is more likely in soils containing clay. The end result is a turf area characterized by shallow-rooted plants that cannot withstand heavy use and wear. This situation is usually aggravated by irrigation practices that are too frequent and too light.

Soil compaction occurs when soil particles are pressed tightly together into a dense layer that impairs soil aeration and water movement. The centers of most football fields, and along sidewalks or cart paths, are areas prone to compaction. Clay soils will compact more than sandy soils. Compaction can occur quickly any time a turfgrass area is used when it is wet, particularly those constructed of clay.

Compacted soil is detrimental to the growth of turfgrasses because it impedes the

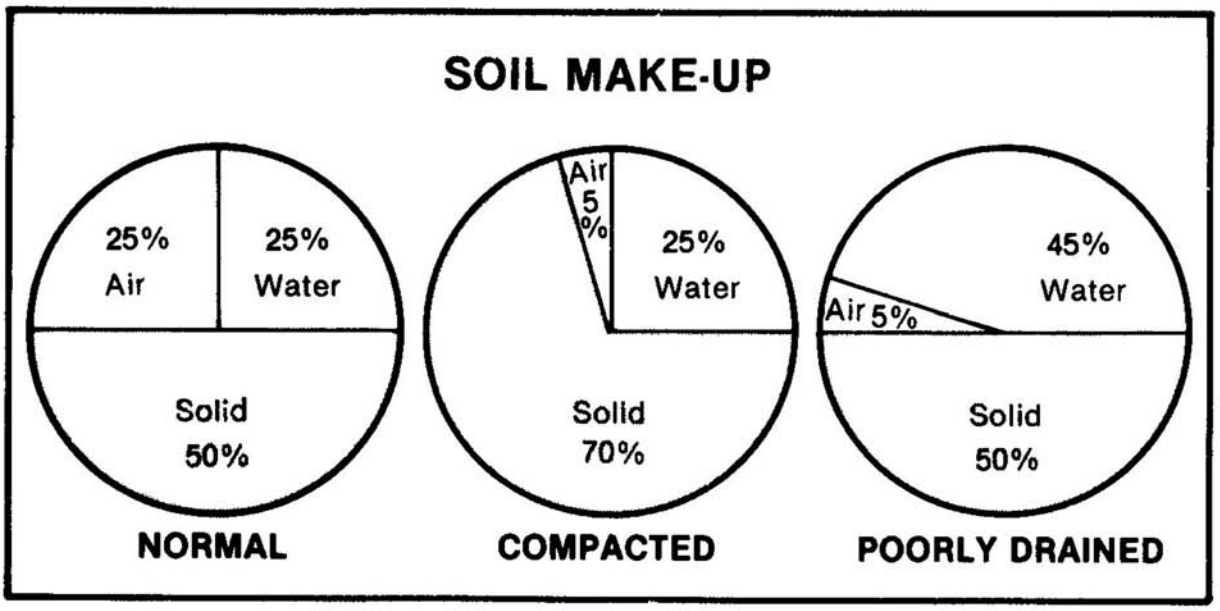

Figure 2.2.4. "Normal soil" contains 50 percent soil material, 25 percent air and 25 percent water. Compacted soil has too little air space, and poor drainage occurs when the soil holds too much water.

entry and movement of air, water and nutrients into and within the root-zone soil. Root growth is restricted, leading to a shallow-rooted turfgrass unable to withstand the stress of traffic, extreme temperatures and low moisture. In severe cases of compaction, death of the root system may occur.

The remedy for compacted turfgrass soils involves the removal of 1/4- to 3/4-inch diameter cores to a depth of approximately 3 inches **(Figure 2.2.5)**. This practice is called core cultivation. Normally, a machine, self-propelled or tractor-pulled, 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 reduction of soil compaction. Adding weight to the machine and wetting the top 4 to 6 inches of soil 1 to 2 days prior to core cultivation will aid in the penetration of metal tines or spoons.

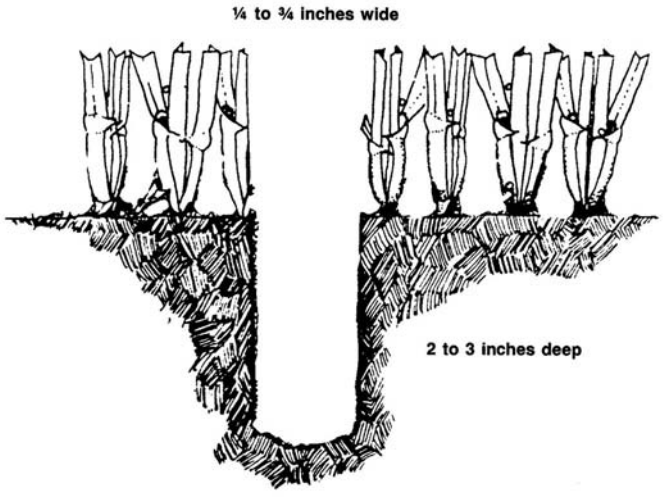

Figure 2.2.5. Example of core cultivation.

Establishment

Site Selection and Preparation

Proper site selection and preparation can help prevent the development of future problems. Good soil and surface drainage can help reduce disease and weed problems. Soil mixtures developed specifically for certain types of turf areas can aid soil drainage, prevent soil compaction and provide an environment favorable for good growth. Wise tree removal can limit shade and tree root competition as well as reduce environmental conditions favorable for pest development. Certain diseases such as Pythium blight are more likely to occur where trees or dense undergrowth impedes air movement.

Soil amendments (sand, organic matter, etc.) to improve drainage as well as fertilizer and lime are best incorporated prior to seeding. The type and quantity of amendments should be determined from chemical and physical soil tests. Soil test results are only as good as the sample submitted; therefore, care should be taken to insure that each sample is representative of each site. Amendments should be evenly spread and thoroughly incorporated to be most effective and to eliminate a future nonuniform appearance of the turf.

Methods

Depending on the cultivar and species, turfgrasses can be seeded or vegetatively propagated by sodding, plugging, sprigging or stolonizing.

The methods of turfgrass establishment are briefly described below.

Seeding: Broadcasting clean, pest-free seed uniformly across an area is an important first step. The seed should be gently incorporated into the surface soil (1/8 to 1/4 inch) and rolled and pressed into the soil to establish good seed/soil contact. Keep area moist for at least the first 10 to 14 days by frequent, gentle, daily waterings. One week after the seedlings have emerged, start watering with greater amounts, less frequently.

Sodding: The turf area is established with slabs or rolls of sod. Sod should be layed in a brickwork arrangement. Roll the area to make good sod/soil contact. Keep the area moist for several weeks until grass is well rooted.

Plugging: Transplant small pieces of sod into holes the same size. Plugs can be either circular (1- to 2-inch diameter) or square (1- to 2- inch square) and are usually planted on 6- to 12-inch centers. Roll the area after planting with a weighted roller to establish good soil contact. Keep area moist until the plugs are well rooted and beginning to spread.

Sprigging: Fresh sprigs are runners with two to four nodes (joints). Plant the sprigs on 6-inch centers or in rows that are 12 inches apart with 4 to 8 inches between each sprig. Leave about one-quarter of each sprig above ground after planting. Roll the area to make good sod/soil contact. Keep area moist until the sprigs are well rooted and beginning to spread.

Stolonizing (broadcast sprigging): Broadcast stolons over the area to be established. Press them into the ground with a light disc and/or cover them with one-quarter inch of soil or similar material. Roll the area to make good sod/soil contact. Keep area moist until the stolons are well rooted and beginning to spread.

Summary

A pest problem often results from improper selection or management of turfgrasses. The following is a brief checklist of cultural practices that affect turf vigor and pest invasion.

Seed and sod: Insect-, disease- and weed-free seed or sod is one of the first steps in pest control. Many turf areas have pest problems because the pests were present in the seed or sod or were not removed from the planting bed before seeding, sprigging or sodding.

Improper mowing: Mowing too short and not mowing often enough thins the turf, allowing weeds to get started. Mowing with a dull or improperly sharpened blade will damage and weaken a turfgrass. Mowing at the recommended height and proper frequency will encourage vigorous, dense, competitive turf.

Improper watering: Frequent and shallow watering encourages weed seed germination, disease, thatch and a shallow-rooted turf that is unable to compete with pests. Watering helps a turfgrass survive drought periods and maintain vigorous growth. Water turfgrasses when they show signs of wilt and then water to wet the soil to a depth of 6 inches or more.

Improper fertilizing: Fertilizing too much, too little or at the wrong time may benefit pests more than the grass. Fertilization programs that furnish turfgrasses with essential elements throughout the growing season tend to discourage pests through competition by a vigorous, healthy turf.

Compacted soil: Soil compaction is a hidden stress on the turfgrass root system. The reduction in available oxygen lowers the ability of the turfgrass to compete effectively with pests. Clay and silt soils are especially prone to compaction.

Poor drainage: The oxygen supply is depleted in poorly drained areas. Pests become a problem in these areas, especially those that thrive in waterlogged soils.

Wrong turfgrass: The wrong turfgrass for the location will gradually decline and be invaded by pests. Turfgrasses that are poorly adapted to the intended area or use cannot be expected to adequately compete with pests.

Environmental stress: Pests often take over a lawn after it has been weakened and thinned from stress caused by the weather. Allowing a turf to become stressed for extended periods is an open invitation for pest problems.

Thatch: Excessive thatch causes shallow-rooted grass and contributes to insect and disease problems, which are followed by weed invasion. Thatch also reduces the effectiveness of some soil-applied pesticides.