HOW TO GROW TURF IN THE SHADE

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Turfgrasses are sun-loving plants. Turfgrasses appeared to have evolved in full sun conditions over millions of years—their metabolism and growth habits are simply not adapted to life in shade. However, up to 25% of the turf acreage in the U.S. is grown at some level of shade, and much of the area is under shade stress. Not all shade is bad, however. Slight shading can actually provide for excellent turf growth during the summer. In full summer sun, high temperatures cause heat stress and photorespiration which decreases the turf's ability to fix carbon into sugars and other carbohydrates. As the amount of shade increases, however, turf growth is altered and the ability to withstand stresses greatly decreases. Poor turf results: soil is exposed, resulting in erosion, dust, nutrient runoff (especially phosphorus), and diminished property values. Proper management, though, can provide acceptable turf in all but the most severely shaded areas.

Turf fails in shaded areas for one or a combination of three reasons: 1) Insufficient light quality and quantity, 2) Diseases, 3) Tree root competition for water and nutrients. To maintain turf in a shaded area the turf manager must first understand the reason(s) why the turf fails.

Inadequate light

Lack of suitable light for desirable turfgrass growth is often the ultimate cause of poor growth in shade. Both light quality and light quantity are important. In shade, turf growth is weak and spindly, partially a result of the predominance of red light compared to blue light and the high proportion of far red light compared to red light. The imbalance of light wavelengths triggers hormonal imbalances within the turf. One of the hormones apparently produced in excessive amounts is gibberellic acid (GA). GA is responsible for cell (hence, shoot) elongation, and high concentrations result in weak, spindly turf growth. Light quantity is also critical. Without sufficient light energy to convert to chemical energy through the process of photosynthesis, turfgrass plants use stored energy reserves (carbohydrates). The vascular system also degenerates in shaded conditions, impairing the plant's ability to transport water, nutrients and carbohydrates. When growth rates are reduced due to lack of sunlight, the turf's ability to resist and recover from the ravages of traffic, disease, and insect problems are severely compromised. Most turfgrasses require a minimum of four hours of direct sunlight a day to survive; six hours minimum to thrive. Some species can survive tolerably well without direct sunlight but still require minimal amount of sunlight. Generally turf growth and quality will be poor if the area receives less than 30% sunlight on a daily basis.

Diseases

Diseases are often the ultimate reason for turf loss in the shade. Powdery mildew, a common disease of Kentucky bluegrass, does not kill the grass outright but may cover the leaves so densely sunlight is completely excluded and the turf dies from lack of photosynthesis. Other diseases such as Microdochium patch (*Microdochium nivale*) can fester and slowly infect large areas of turf, resulting in a slow loss of turf over time. Rust and leafspot diseases may also be more severe in slow growing turf in shaded conditions. The overriding factor for diseases in shaded conditions is an environment favorable to the disease organisms: relatively constant temperatures, moist and/or humid conditions. Most fungal pathogens require several hours of leaf wetness to provide sufficient spore germination and hyphal growth for plant infection. Shaded environments typically have little if any airflow and sunlight to dry leaf surfaces which increases disease pressure.

Tree root competition

Tree roots compete with turfgrass roots for water and nutrients. Shallow rooted trees such as silver maple can even compete with turf for space on the surface of the turf. Mowers and traffic can damage surface tree roots, facilitating diseases such as Armillarea root rot which eventually kill the tree. When part of a tree's root system becomes stressed, the extensive network of roots emanating from a single tree help ensure tree roots can obtain sufficient water and nutrients from other areas of the root zone. Conversely, turfgrass roots spread only a limited distance from the parent plant.

Tree roots also thrive deeper in the soil than turfgrass roots which provides a larger soil volume for moisture extraction. Tree roots are often longer lived than turfgrass roots, which may have a lifetime of weeks to months. Tree roots also often have symbiotic relationships with mycorrhizal fungi which greatly extend the effective surface area for moisture and nutrient absorption. Turfgrass roots usually do not have as extensive a mycorrhizal complex as tree roots.

Methods for Managing Turf in the Shade

Mowing. Avoid mowing turf too short in the shade. All species have optimum mowing heights. In shaded conditions, mow the turf towards the upper end of the optimal mowing height. For fine fescues, perennial ryegrass, and Kentucky bluegrass, mow at approximately 3". This will increase the leaf area available for photosynthesis and the extra leaf tissue will help protect the crowns of the turf from traffic. Always use the 1/3 Rule when mowing turf to avoid undue stress.

Irrigate deeply and infrequently. Shallow irrigation supplies water only to the upper few inches of soil. While this practice will adequately supply water to turfgrass roots, lack of moisture at lower depths will encourage tree roots to grow nearer to the surface and compete more directly with the turf. Avoid frequent irrigation (e.g., daily or several times each week) as this will prolong the period of leaf wetness and will likely increase disease severity. If fine fescues are the predominant species in the area they will rarely if ever require irrigation—natural rainfall will provide sufficient moisture.

Fertilize at half the normal rate. Real growth (increase in biomass) in the shade is substantially reduced compared to turf growth in sun conditions. In the shade, root mass and depth is diminished. Shoot growth may appear to be increased because excessive levels of gibberellic acid cause excessive cell elongation, but actually shoot, plant, and leaf density are decreased. Due to the diminished growth, turfgrass in the shade requires only about half the normal fertilization rate. For example, a Kentucky bluegrass turf in full sun may require 4 lbs nitrogen/1000 ft^2 each year, but the same turf in shade should only receive 2 lbs N/M/yr). Fertilization timing is the same, but the amounts applied should be half the normal rate (e.g., use ½ lb N/1000 ft^2 each application instead of 1 lb N/1000 ft^2). Secondly, fertilize the tree separately from the turf. Specialized fertilization soil injection systems can supply nutrients deep into the tree root zone, obviating the need for the turf roots to grow up into the upper soil crust.

Plant growth regulators. Plant growth regulators which inhibit gibberellic acid production can alter turf growth and metabolism in the shade to provide better turf density. While the proper rates and frequency of application are not known for all species (including fine fescues), research is making progress in this area. A greater problem is uniformity of application. Growth regulators need to be applied uniformly to a turf as missed or oversprayed areas are likely to be readily apparent. Most plant growth regulators are intended for spray application and this can be difficult to apply uniformly in landscaped settings. At least one granular product exists, though, which can be readily applied. The active ingredient is impregnated on fertilizer granules, so the turf is fertilized and growth is regulated with a single application.

Prevent traffic. The weakened structure and reduced growth rate do not allow the turf to recover readily, if at all, from damage resulting from continuous traffic. To maintain turf in the shade, reroute pathways, install fencing or other barriers. A single stranded fencing is best; chain link fencing may also suffice. Do not use solid fencing (wood, brick, etc.) and rows of hedges or shrubs as this will further reduce air movement and may block more sunlight from reaching the turf.

Plant shade tolerant varieties or species. Some turfgrasses are more efficient at capturing and using the energy from sunlight than other species or cultivars. Others are simply more disease resistant than others, leading to an apparent shade tolerance. Plant a mixture of fine fescues in dry shaded areas. These include creeping red, hard, and Chewings fescue. The typical planting rate is 4-5 lb/1000 ft^2. Planting at a lower rate will result in bare areas as these grasses will not fill in readily. Planting at a higher rate will cause too much interplant competition for resources (including light) and increase the disease severity. When soils are consistently moist, plant rough bluegrass (Poa trivialis) or Supina bluegrass (Poa supina). Both are stoloniferous species and may spread beyond the planted boundaries. Typical seeding rates for these species are only 1.5-2 lb/1000 ft^2. Supina bluegrass seed is expensive but the turf is dense and can help resist weed invasion. Small amounts (less than 30-50%) of Kentucky bluegrass may be planted with the recommended species but pure stands of Kentucky bluegrass should never be planted in the shade. While some Kentucky bluegrass cultivars are listed as shade tolerant, they are never as shade tolerant as the fine fescues, Supina, or rough bluegrasses. 'Nuglade' is one of the newer Kentucky bluegrass cultivars with some shade tolerance, due at least in part to improved resistance to powdery mildew disease. Perennial ryegrass should not exceed 15% of the seed mixture by weight because the ryegrass will germinate sooner than other grasses and prevent their establishment. As the ryegrass eventually dies out, the other species are likely to not be present and bare soil will result.

Prune tree branches to 10 ft or higher above ground. When all else fails and grass is still desired it may be necessary to remove tree branches. Pruning branches to provide at least 10 ft between the turf and the lowermost branches will significantly increase air movement and allow for better light penetration. When several trees are collectively shading an area, even pruning to a 10 ft height may not be sufficient. At this point, either consider removing one or more of the trees or plant shade tolerant groundcovers such as English ivy, lilies-of-the-valley, or other species. Planting turf only outside the drip line of the tree(s) will usually provide sufficient sunlight and air movement for good turf growth. Rows of shrubs or hedges, especially on the west side of a turf, can greatly reduce air movement and block sunlight. Selective or complete removal of the shrubs may be needed to successfully grow turf in an area.

Fungicides. Fungicides can help reduce disease damage but the underlying problems will persist unless the situation is changed (pruning, better turf species, improved irrigation practices, etc.). The financial and environmental cost of fungicide applications to home lawns is generally not warranted. Instead, correct the underlying problem using one or more of the strategies recommended.