SPORTSFIELD MANAGEMENT

FEATURES

Shade Solutions

Managing turf in shady areas
By D.S. Gardner

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Compared to turfgrass grown in full sun, shaded turfgrass has: longer, thinner leaves; reduced leaf expansion; shoot growth favored over roots; reduced tillering; leaf changes that increase disease susceptibility; reduced tolerance to heat, cold, drought and wear; decreased visual quality; decreased stand density; and increased weed encroachment.
Images courtesy of David Gardner.

There is a demand for higher-quality sports playing surfaces, either to minimize the risk of player injury, or for aesthetic reasons. However, in some instances, the turfgrass may be shaded, either by trees if in an outdoor parks and recreation setting, or by stadium designs with semi or fully enclosed structures. Enhancing this problem is the fact that sports such as football are played in autumn, when available sunlight is reduced due to decreased daylight hours, increased cloud cover and lower sun angles.

Managing turfgrass that is growing under the shade cast by a tree or a structure can be difficult. The reason for this is that turfgrasses are adapted to and grow best in full sunlight. Trees reflect yellow, green and orange light and absorb red and blue light for photosynthesis. Since much of the sunlight is either reflected or used by the tree for photosynthesis, the amount of light reaching the ground under the tree can be as little as 5 percent of full sunlight. The quality of light is also different under trees. Far-red light passes through the leaf canopy to the surface below. As a result, there is a higher ratio of far-red to red light than what appears in full sunlight.

Turfgrass can sense changes in both light quality and quantity. This results in harmful changes to the plant as it alters its morphology and physiology in an attempt to find more light. Under artificial shade the problem is not as severe because the quality of light is not altered, but is still significant because the quantity of light is reduced. In addition, under shade there is an increase in relative humidity and a decrease in wind movement, which can increase disease pressure.

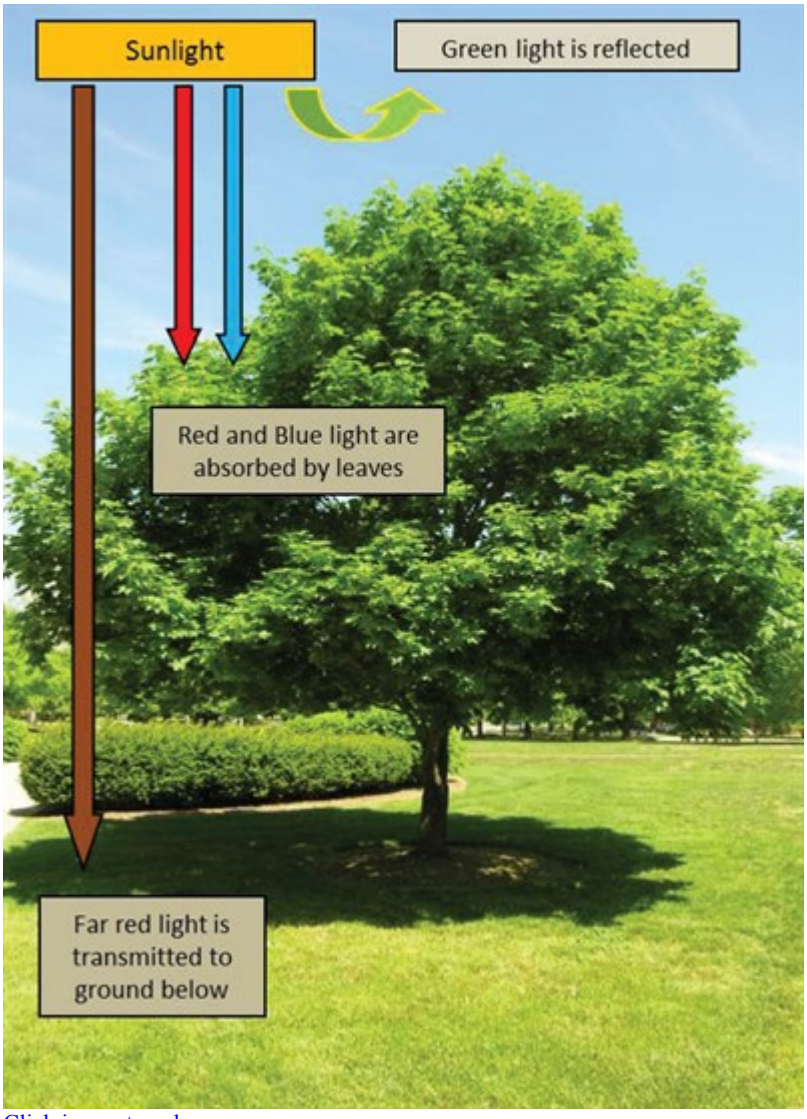
One option if the turfgrass is growing under trees is to attempt to improve the light environment in order to promote turfgrass growth. Both the intensity and duration of sunlight are important. In most cases, the length of time the plant receives sunlight is more important than the time of day that it occurs. Be aware that light intensity changes with season, latitude and time of day. Also be aware that as a tree grows, the size of the shade canopy and the density of the shade will

increase. Based on research conducted at The Ohio State University, you should selectively prune trees to increase exposure to full sunlight, not to decrease the level of shade. Canopy thinning alone will not solve most turfgrass growth problems. Selective tree removal may allow for increased air movement along with increased light.

If your shade source is an artificial structure, the good news is that turfgrass tends to grow better under artificial shade than under tree shade; the bad news is that your options are somewhat limited for increasing the amount of time full sunlight is on the grass (after all, you cannot take down the structure). In rare instances you may be growing turf under a semitransparent plastic material or roof panels. Most of the materials used for this purpose do not selectively filter light, and thus the quantity of light is reduced but not the quality. In these situations selecting the right turfgrass and optimizing cultural practices is your best strategy.

Select the right turfgrass species or cultivar

There are several management strategies that can be altered to favor growth of turfgrass in the shade. However, first and foremost is to select a species or cultivar that is more tolerant of shaded conditions. Most research concludes that either tall fescue or fine fescues are considerably better adapted to shade than Kentucky bluegrass or perennial ryegrass. Turfgrass species and cultivar selection is the most likely determinant of successful turfgrass performance in shade. Shade tolerances vary among cultivars of the same species. For example, 'Diamond' zoysiagrass has excellent shade tolerance compared to other zoysiagrasses. When selecting a cultivar, special attention should be paid to other shade-related issues such as disease resistance. If using Kentucky bluegrass, for example, cultivars with increased disease resistance, especially to powdery mildew, will improve success in shade.



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Turfgrass, like most plants, can sense that it is growing under shade by sensing the relative amounts of red and far-red light. Shade results in many harmful changes to the plant as it alters its morphology and physiology in an attempt to find more light. Artificial shade will only decrease light quantity and not affect the ratio of red to far-red light. As a result, some turfgrasses are more tolerant of artificial shade conditions than of tree shade.

Managing turfgrass in shade

Differences in the morphology and physiology of a shaded grass, the shade microenvironment and different disease pressures mean that turfgrass should be managed differently in shade compared to turfgrass in full sun. There are several cultural practices that should be modified on shaded turfgrass. A general rule is to increase mowing height to the maximum recommended for the species. Longer leaves mean more leaf area for light interception. However, plant response to mowing height is more complex than this, and increasing height may also have a negative effect on turfgrass performance by increasing respiration, increasing shading within the turfgrass stand, decreasing leaf evaporation (thus increasing disease potential) and decreasing traffic tolerance. The bottom line is that while the rule to mow higher in shade is a good general rule, you should experiment a bit to find the optimum mowing height for your turf type and environment.

You should also reduce fertilizer rate to about one-half of normal in order to try to reduce excess leaf production. Leaves of shaded turfgrass naturally grow thinner and longer, and the addition of excess nitrogen will exacerbate this. Higher nitrogen levels can also lead to increased disease pressure. In addition, there has been little work done to compare the effects side-by-side of altering the source of nitrogen on shaded turfgrass quality. However, there is some evidence that different nitrogen sources can have an impact, and this may be worth experimenting with. We also know that increasing iron and magnesium fertility can have a positive effect on shade tolerance.

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Considerable differences exist in shade tolerance among cool-season turfgrass species. These photos were taken six years after establishment under 90 percent tree shade.

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Irrigate heavily but infrequently to reduce time that foliage is wet. You should closely monitor weed, insect and disease pressure. The turf is already under stress due to the shading and is more susceptible to pests, particularly diseases. This is because the increased relative humidity and decreased wind movement act to increase the amount of time that the leaf surface is wet. Also, most turfgrasses that lack shade tolerance have thinner cuticles, for example, or are otherwise unable to maintain the same morphological and physiological characteristics when grown under shade as in full sun, which increases disease susceptibility. Some diseases, such as powdery mildew (*Erysiphe graminis*) and rust (*Puccinia* sp.) that occur frequently on shaded cool-season turfgrass may require treatment with a fungicide in order to help maintain the turf

in adequate condition for play. Large temporary or permanently installed fans may improve air circulation near the turfgrass surface, remove surface water, and reduce turfgrass and soil temperatures.

When possible, you should carefully manage traffic on shaded turfgrass. Thinner cuticles, reduced lateral growth and more upright growth habit results in weaker plants that are less tolerant of traffic and wear. Traffic is a major stress to shaded turfgrasses, as plants are more prone to injury and have decreased recuperative potential. Of course this is not an option if you have a field that is shaded by a stadium structure. However, if you have a field under tree shade that is part of a large complex, recognize that it will not be capable of handling as many games as the fields in full sun.

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Plant growth regulators can increase stress tolerances. Gibberellic acid biosynthesis regulators, such as paclobutrazol, flurprimidol and trinexapac-ethyl, can be utilized to improve turfgrass quality in shade. They act to decrease leaf tissue elongation, which counteracts some turfgrass shade avoidance responses. Turfgrass quality can be improved because the stand is denser, has increased carbohydrate reserves and improved wear tolerance, while either maintaining or improving lateral growth.

In summary, managing shaded turfgrass is a challenge, because there are many harmful physiological and morphological changes that occur in the plant as it attempts to adapt to shade and gather more light. However, the selection of proper turfgrass species and cultivars and slight modifications to management practices can significantly improve the quality of shaded turfgrass

Dave Gardner is an associate professor in the Department of Horticulture and Crop Science at The Ohio State University. He teaches courses in turfgrass management, ornamental plant identification and statistics. His research focuses on turfgrass physiology and weed management.