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Turfgrass Management in Shade

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Maintaining a lawn in the shade of trees, shrubs, and structures is a challenging task to both homeowners and turf professionals. Most turfgrasses require 4 to 5 hours of full sun, or an entire day of filtered light. Reduction of light results in reduced photosynthesis (a plant's incorporation of atmospheric carbon dioxide into carbohydrates) and therefore in reduced carbohydrate production. When carbohydrate production drops below a certain level, development of roots, stolons, and rhizomes is curtailed and turfgrass deteriorates. Trees with dense canopies, such as oak, maple, carob, magnolia, olive, and conifers are most likely to create problems of reduced light for turfgrasses.

In addition to light stress, turfgrasses grown in shady sites are also stressed from:

1. Restricted air movement which causes turf to remain wet for long periods-especially after irrigation, rain, or dew fall. This increased moisture can create an environment that supports disease development.

2. Shallow feeder tree roots compete for water and nutrients with turf grown under or adjacent to trees.

SYMPTOMS

The above stresses in addition to lack of adequate sunlight can cause deterioration in turf quality. Symptoms include: development of finer leaves; reduced shoot and root growth; reduced shoot density; reduced tillering (secondary stems); delayed leaf initiation; increased leaf length; more upright growth habit; and succulent growth. Each of these abnormalities can increase turf disease susceptibility, and reduce turf tolerance to traffic, heat, cold, and drought.

REMEDIES

Despite the potential problems, growing a lawn in shade is not impossible with proper management. The following practices will help ensure success.

Turfgrass selection

Selecting a shade-adapted turfgrass species or cultivar is the single most important step to growing turf successfully under shade. Turfgrasses differ in their tolerance to shade. The relative shade tolerances of turfgrasses commonly grown in California appear in the table on page 2.

Shade modification

It is often possible to modify the shady environment to improve conditions for turfgrass growth. To increase light reaching the turf, selectively prune tree branches. Pruning is particularly effective for dense shade producers such as maple and oak. Prune limbs within 8 feet of the ground to allow direct sunlight to reach the turf during early morning and late afternoon.

Dense underbrush, hedges, or shrubs within the shaded area should be thinned or removed to facilitate air movement over the turf surface. Contrary to

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Shade Tolerance of Common California Turfgrasses

Turfgrass	Excellent	Good	Medium	Poor
Coal Season	Hard fescue* Red fescue* Chewings fescue* Rough bluegrasst	Tall fescue	Creeping bentgrass Colonial bentgrass Kentucky bluegrass Perennial ryegrass	Kentucky bluegrass* Annual ryegrass
Warm Season	St. Augustinegrass	Zoysiagrass Seashore Paspalum	-------------	Bermudagrass Kikuyugrass Buffalograss

*Dry Shade
†Wet shade
*Kentucky bluegrass cultivars are variable in their shade tolerance. Some cultivars perform poorly in shade.

common belief, pruning of shallow tree roots is not recommended. The majority of tree feeder roots grow in the uppermost 18 inches of soil and removing them significantly reduces water and nutrient uptake. Although the negative effects of this reduction may not appear for 3 to 4 years, it may then be too late to save the tree. Practices not as damaging as tree root pruning include deep irrigation and fertilization of trees to discourage the formation of shallow feeder roots. If exposed tree roots make mowing difficult, a uniform shallow topsoil or sand dressing around the tree may solve both problems. Never cover exposed tree roots with a layer of soil deeper than 1 to 1 l/2 inches.

Cultural Practices

Mowing. Since the amount of light reaching the turf surface is greatly reduced, it is important to allow the turfgrass to intercept as much available light as possible. This can be accomplished by raising the mowing height l/4 to l/2 inches above normal, thus providing greater leaf area for more efficient absorption of light. This practice also encourages deeper and more extensive rooting which enhances the turfs ability to compete with trees for water and nutrients. Increased mowing height also alleviates the thin appearance commonly associated with turf grown on shady sites. In addition, the higher cut ordinarily reduces mowing frequency which means fewer open wounds on the leaves and thus reduces likelihood of disease infection. And finally, fewer mowings mean less traffic on shady lawns. This is significant since the increased succulence of turfgrass tissue in shade decreases wear tolerance. All traffic on such lawns should be kept to a minimum.

Irrigation. Irrigation is crucial to managing lawns in shade. Since turf root systems are severely weakened under shady conditions, and tree roots have an advantage regarding moisture uptake to begin with, heavy infrequent irrigation is recommended. This will encourage deeper rooting of trees, thus lessening the competition for moisture within the root zone of grasses. Deep, infrequent watering also reduces the chance of disease development by decreasing the period in which the lawn surface is wet. Water should be applied to turf early in the morning to allow for rapid surface drying. Late evening or night watering leaves the lawn surface moist too long and promotes disease activity.

Fertilization. Proper nitrogen fertilization is also very important for the shady lawn. Too much nitrogen can be detrimental because nitrogen favors turfgrass shoot growth over root growth. It also encourages formation of succulent tissue, which is highly susceptible to disease infection and traffic injury. Consider the following when fertilizing shaded lawns:

1. The nitrogen need of turfgrasses grown in shade is approximately half that of turf grown in full sun.

2. Only minimum amounts of nitrogen should be applied to cool-season turfgrasses during the summer months. Fall and spring are the best times to apply fertilizer to shaded turf.

3. Maximize potassium fertilization on turfgrass grown in shade. Potassium increases shade tolerance of turfgrasses.

4. Trees in the area should not be surface fertilized. A good practice, is to place the fertilizer about 10 inches below soil surface. This places fertilizer in the zone of greatest tree root activity and below most of the turfgrass root system.

Disease control. Effective disease control is essential on shady lawns. The incidence of several turfgrass diseases is linked directly to the presence of shady environment. In general, disease is not a serious problem for most warm-season turfgrasses, if they can be grown in shade. Cool-season grasses, however, are often infected and damaged. Follow all suggested cultural practices to minimize the possibility of turfgrass disease activity.

Other cultural practices. Reduce traffic on lawns growing in shade. Promptly remove fallen tree leaves. Leave a two to three-foot turf-free zone around small trees to improve their growth and reduce mower injuries to them. If total renovation of a poorly performing, shade intolerant turfgrass stand is not possible, overseeding with a shade tolerant grass species is a possible compromise. For example, an established stand of bermudagrass growing poorly in deep shade could be overseeded with hard or red fescue; in medium shade, turf type tall fescue would be a better choice for overseeding. In either case, begin by mowing the bermudagrass short, then cultivate the soil slightly with a rake or power renovator to prepare the seed bed, spread the seed, fertilize, and topdress with a light covering of native or on-site soil. Irrigate to germinate the seeds and help the grass establish.

ALTERNATIVES

In some situations very dense shade makes the establishment or maintenance of a satisfactory lawn impossible, even with proper turfgrass selection and management. In these cases use a shade-adaptive ground cover, for the on-site environment. Examples of commonly used ground covers are English ivy, *Vinca minor*, creeping cinquefoil (Potentilla), vineleaf cinquefoil, etc.

In situations where plant materials are not suitable or cannot be worked into the landscape satisfactorily, decorative mulches such as shredded bark chips, wood chips, or gravel may provide useful alternatives.

The Performance of Tall Fescue Cultivars in California's Central Coast

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Tall fescue *(Festuca arundinacea schreb.)* is a bunch-type perennial turfgrass species adapted to a wide range of soils and climates. A cool-season grass, it tolerates heat better than all other cool-season turfgrass species, although it will not tolerate temperatures at either extremes. It does particularly well along the California Coast (from the San Francisco Bay Area south) and in California's Central Valley. It is not generally recommended for the northernmost and southernmost portions of California or the highest mountain altitudes because of its sensitivity to temperature extremes.

Tall fescue, commonly referred to as "dwarf' fescue is propagated by seed at seeding rates of 7-10 pounds per 1,000 square feet where a dense, uniform stand is desired. It is also widely available as sod. Recommended mowing height for tall fescue ranges from 1.5 to 3 inches. The species will not tolerate cutting closer than 1.5 inches.

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Tall fescue has good drought and shade resistance and is moderately tolerant of submergence, water-logged conditions, salinity, and sodicity. It does not produce stotons and, although some strains may produce very short rhizomes, grass will not spread significantly.

Due to its considerable adaptability, tall fescue is used for a variety of turf purposes, including athletic fields, parks, cemeteries, playgrounds, roadsides, airfields, waterways, slopes, and home lawns. With the introduction of improved cultivars, use of this grass has expanded rapidly.

Evaluations

In October 1992, a trial was initiated at the U.C. Bay Area Research and Extension Center in Santa Clara, CA, to evaluate newly developed tall fescue cultivars. Cultivars were evaluated for turfgrass suitability along the central coast of California, a "transition zone" climate. The National Turfgrass Evaluation Program, sponsored by the United States Department of Agriculture, supplied seed of these grasses.

Ninety-two (92) cultivars were seeded in October 1992, at a rate of 8.8 pounds per 1,000 square feet in 25-sq. ft. plots, replicated three times in a randomized, complete block design. Analysis of the soil, a silt loam, at the beginning of the study indicated favorable pH, a safe salinity level, and adequate phosphorus and potassium.

Routine maintenance of the plots consisted of a total annual application of 4 pounds per 1,000 sq. ft. nitrogen from ammonium nitrate (applied twice in the spring and twice in the fall), mowing at 2 inches, and irrigation as needed. Plots were not exposed to any appreciable traffic, and no herbicide, fungicide, or insecticide was applied. The trial ran for three years, ending in December 1995.

During the evaluation period, plots were visually rated, monthly or seasonally as relevant, for color, density, weeds, disease and insect activity, and overall quality. Table 1 summarizes combined data for the four-year evaluations.

At the trial site, average monthly soil temperatures ranged from a low of 43.8° F in December to a high of 75.0° F in August, with measurements taken at a depth of 4 inches. Average monthly air temperatures also were lowest in December at 39.5° F; the highest average monthly air temperature was 8 1.3° F in August. According to temperatures given in Table 2, this is a moderate temperature area.

Overall quality ratings are based on evaluation of all turfgrass quality components combined into one turf score. As indicated by the overall ratings, most of the newly developed cultivars produced significantly higher quality turf than did older cultivars. The same conclusion emerges from review of individual quality components. New cultivars were darker green and produced denser stands of grass.

No disease or insect activity was detected on any of the cultivars during this study. Minor weed invasion occurred on a few plots. Virtually no thatch developed on any of the plots over the term of this study, indicating that, at least within a few years after planting, thatch should not be a problem in tall fescue stands.

Results of this study supported our previous findings that newly developed tall fescue cultivars are well suited for use as turf under central coastal California conditions, characterized as a "transition zone" climate. New cultivars perform significantly better as turfgrasses under such conditions than do old cultivars. Since all tall fescue cultivars competed well with weeds, and the area's common diseases and insects affected none, this grass may also be considered a low maintenance species in regard to pest control.

Acknowledgments

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Table 1. Turf quality and quality components ratings for turf-type tall fescue cultivars grown in Santa Clara, California (1993 - 1995)*.

Name	Overall Quality	Genetic Color	Leaf Texture	Density Spring	Density Summer	Density Fall
BAR FA 214	7.5	7.4	6.8	7	6.8	7.0
BONSAI	7.5	7.4	7.2	7	6.8	7.0
GAZELLE	7.5	7.3	7.1	7	7.0	7.0
MICRO DDs	7.5	7.3	7.3	7	6.8	7.0
SOUTHERN CHOICE	7.5	7.3	6.8	7	7.0	7.0
ADOBE	7.4	7.4	7.0	7	6.7	7.0
DEBUTANTE	7.4	7.3	6.9	7	7.0	7.0
DUSTER	7.4	7.3	7.1	7	6.8	7.0
EMPRESS	7.4	7.3	7.6	7	6.7	7.0
JAGUAR 3	7.4	7.4	6.9	7	6.7	7.0
LANCER	7.4	7.3	7.2	7	6.8	7.0
MB-22-92	7.4	7.3	6.7	7	6.7	7.0
PYRAMID	7.4	7.3	7.1	7	7.0	7.0
SHORTSTOP	7.4	7.3	7.2	7	6.7	7.0
APACHE II	7.3	7.4	6.4	7	7.0	7.0
ATF-007	7.3	7.3	7.1	7	6.8	7.0
BONSAI PLUS	7.3	7.4	6.8	7	6.7	7.0
CORONADO	7.3	7.3	6.9	7	6.8	7.0
COYOTE	7.3	7.7	7.1	7	6.8	7.0
CROSSFIRE II	7.3	7.3	6.9	7	7.0	7.0
FA-19	7.3	7.4	6.9	7	6.7	7.0
FA-22	7.3	7.3	7.1	7	7.0	7.0
FALCON II	7.3	7.6	6.6	7	6.8	7.0
ISI-AFA	7.3	7.4	6.7	7	6.8	7.0
KITTYHAWK	7.3	7.3	7.0	7	6.8	7.0
M-2	7.3	7.2	6.7	7	6.8	7.0
MIRAGE	7.3	7.3	7.0	7	6.8	7.0
NINJA	7.3	7.4	7.0	7	6.7	7.0
OFI-ATK	7.3	7.3	7.1	7	7.0	7.0
PICK 90-l 0	7.3	7.3	7.0	7	6.8	7.0
PIXIE	7.3	7.4	7.0	7	6.8	7.0
PRO-91 78	7.3	7.3	7.0	7	6.8	6.8
PST-5DX W/ENDOPHYTE	7.3	7.6	7.1	7	6.8	7.0
PST-5STB	7.3	7.4	6.2	7	6.7	7.0
STARLET	7.3	7.4	6.9	7	7.0	7.0
VEGAS	7.3	7.3	6.3	7	6.8	7.0
COCHISE	7.2	7.3	6.7	7	6.8	7.0
ELDORADO	7.2	7.3	6.8	7	6.7	7.0
ISI-CRC	7.2	7.3	6.6	7	6.3	7.0
REBEL,JR.	7.2	7.4	6.6	7	6.7	6.8
SR 8200	7.2	7.3	6.4	7	6.8	7.0
TOMAHAWK	7.2	7.4	6.6	7	6.7	7.0
403	7.1	7.4	6.6	7	6.5	7.0
AVANTI	7.1	7.4	6.7	7	6.7	7.0
BAR FA 0855	7.1	7.3	7.0	7	6.7	7.0
BAR FA 2AB	7.1	7.2	6.7	7	6.7	7.0
FINELAWN 88	7.1	7.3	6.1	7	6.7	7.0
FINELAWN PETITE	7.1	7.3	6.7	7	6.8	7.0
GEN-91	7.1	7.3	6.7	7	6.5	7.0
GUARDIAN	7.1	7.3	6.8	7	6.7	6.8

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Table 1. Continued.

Name	Overall Quality	Genetic Color	Leaf Texture	Density		
				Spring	Summer	Fall
HOUNDOG V	7.1	7.3	6.6	7	6.7	7.0
LEPRECHAUN	7.1	7.3	6.3	7	6.8	7.0
LEXUS	7.1	7.4	8.7	7	6.3	7.0
MARKSMAN	7.1	7.3	6.8	7	7.0	7.0
MONARCH	7.1	7.3	6.4	7	6.5	7.0
OLYMPIC II	7.1	7.1	6.4	7	6.7	7.0
PST-5LX	7.1	7.2	6.3	7	6.7	7.0
PST-5PM	7.1	7.3	7.1	7	6.2	7.0
PSTF401	7.1	7.1	6.8	7	6.8	7.0
PSTF-LF	7.1	7.3	6.3	7	6.8	7.0
REBEL 3D	7.1	7.2	6.2	7	6.7	7.0
SAFARI	7.1	7.3	6.7	7	7.0	7.0
SILVERADO	7.1	7.2	6.7	7	6.7	7.0
SR 8210	7.1	7.4	6.8	7	6.7	7.0
TITAN 2	7.1	7.2	6.9	7	6.8	7.0
VIRTUE	7.1	7.4	6.4	7	6.7	7.0
ASTRO 2000	7.0	7.1	6.6	7	7.0	7.0
AUSTIN	7.0	7.2	6.2	7	8.8	7.0
AZTEC	7.0	7.3	6.6	7	6.5	7.0
BONANZA II	7.0	7.4	6.6	7	6.8	7.0
CAFAI 01	7.0	7.2	6.7	7	6.7	7.0
CASLA20	7.0	7.3	6.8	7	6.8	7.0
CAS-MA2 1	7.0	7.2	6.8	7	6.8	7.0
CHIEFTAN II	7.0	7.3	6.6	7	6.7	7.0
DUKE	7.0	7.3	6.3	7	6.7	7.0
MONTAUK	7.0	7.3	6.3	7	6.3	7.0
PALISADES	7.0	7.4	6.2	7	6.5	7.0
PST-5VC	7.0	7.3	6.8	7	6.3	7.0
PSTF-200	7.0	7.2	6.2	7	6.8	7.0
TRAILBLAZER II	7.0	7.4	6.1	7	6.5	7.0
TWILIGHT	7.0	7.2	5.9	7	6.8	7.0
ALAMO	6.9	7.3	6.1	7	6.5	7.0
GRANDE	6.9	7.3	6.9	7	6.5	7.0
SR 8300	6.9	7.3	6.3	7	6.7	7.0
SHENANDOAH	6.8	7.2	6.1	7	6.3	7.0
BONANZA	6.5	7.0	5.9	7	6.8	7.0
PHOENIX	6.4	7.1	6.0	7	6.7	7.0
FALCON	6.2	6.6	5.9	7	6.8	7.0
ARID	6.0	5.8	5.4	7	6.8	7.0
ANTHEM	5.8	5.6	5.3	7	6.0	6.8
KY-31 NO END0	4.6	4.9	4.8	7	5.5	6.2
KY-31 W/END0	4.4	4.8	4.0	7	5.3	6.2
LSD VALUE'*	0.3	1.2	0.6	--	0.9	0.2

*The values are averages of monthly and quarterly ratings from 1993 through 1995. The rating scales are:
-Overall quality (turfscore): I-9; 9 = Ideal turf.
-Genetic color: I-9; 9 = Darkest color.
-Leaf texture: I-9; 9 = The narrowest leaf blades.
-Density: I-9; 9 = The densest stand of turf.
**LSD Value: To determine statistical differences among cultivars, subtract one cultivar's mean from another cultivar's mean. Statistical differences occur when this value is larger than the corresponding LSD value. If the difference between the mean values for two cultivars within the same column is not greater than the corresponding LSD, then the two cultivars are statistically the same for that specific quality component.

Table 2. Average monthly air and soil temperature, precipitation and evapotranspiration in Santa Clara, California (1993 – 1995).

Month	Air Temperature °F Max.	Min.	Mean	Soil Temperature °F*	Precipitation inches	Evapotranspiration (ET) inches
January	59	42	50	50	4.1	1.2
February	61	43	51	53	2.1	1.6
March	66	46	55	57	3.2	3.2
April	68	47	57	60	0.6	4.9
May	71	51	60	65	0.8	5.7
June	78	53	66	69	0.2	6.7
July	80	57	67	73	0.1	7.1
August	82	56	68	73	0.0	6.6
September	79	55	65	70	0.0	4.8
October	75	50	62	65	0.3	3.6
November	65	45	53	57	1.1	1.9
December	58	41	49	52	2.6	1.1

***Soil temperature measured 4 inches below surface.**

WARNING ON THE USE OF CHEMICALS

Pesticides are poisonous, Always read and carefully follow all precautions and safety recommendations given on the container label. Store all chemicals in their original labeled containers in a locked cabinet or shed, away from food or feeds and out of the reach of children, unauthorized persons, pets, and livestock.

Recommendations are based on the best information currently available, and treatments based on them should not leave residues exceeding the tolerance established for any particular chemical. Confine chemicals to the area being treated. THE GROWER IS LEGALLY RESPONSIBLE for residues on his crops as well as for problems caused by drift from his property to other properties or crops,

Consult your County Agricultural Commissioner for correct methods of disposing of leftover spray material and empty containers, Never **burn pesticide containers.**

PHYTOTOXICITY: Certain Chemicals may cause plant injury if used at the wrong stage of plant development or when temperatures are too high. Injury may also result from excessive amounts of the wrong formulation or from mixing incompatible materials. Inert ingredients, such as wetters, spreaders, emulsifiers, diluents and solvents, can cause plant injury. Since formulations are often changed by manufacturers, it is possible that plant injury may occur, even though no injury was noted in previous seasons.

NOTE: Progress reports give experimental data that should not be considered as recommendations for use. Until the products and the uses given appear on a registered pesticide label or other legal, supplementary direction for use, it is illegal to use the chemicals as described.

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