Adequate Turf Stands Under Shade Are Possible With Careful Culture

Getting suitable turf stands under shade trees can be solved, though the quality can never be expected to be as good as that on an open lawn. That's the thinking of Dr. James B. Beard, department of Crop Science at Michigan State University.

Shaded turf culture becomes important to the landscape contractor with realization that about 20% of existing turf is being grown under partial shade. Dr. Beard suggests sizing up the problem area carefully prior to establishing a seeding. Such factors as whether trees are open crowned types, such as honey locust, or whether they exclude more light, as is the case with Norway maple, Linden or white oak, bear on the course to be taken. A reduction of sunlight by 50% to 95% is not uncommon.

Dr. Beard lists 8 key effects of shade on turf stands:

(1) Reduced light intensity.
(2) Altered light quality.
(3) Extremes in temperatures are moderated.
(4) Wind movement is restricted.
(5) Relative humidity is increased.
(6) Intensity and duration of dews are increased.
(7) Atmospheric carbon dioxide levels are decreased.
(8) Turf is forced to compete with tree roots for water and nutrients.

Current research shows a definite need for cultural practices keyed to shaded turf conditions, and the use of adapted grass mixtures. Michigan trials point to several combinations which are best for the shaded home lawn such as this.

When turf is forced to survive in shade, the above ground portions of the plant received priority in terms of food available to the plant. Shade affects turf by:

(1) Reducing shoot growth.
(2) Reducing root growth.
(3) Producing lower root to shoot ratio.
(4) Reducing rhizome and stolon growth.

Physiological and Morphological Changes

Fewer shoots and rhizomes which are generally less sturdy add up to less overall plant vigor. Physiological changes which result from shading are also evident in Michigan trials. These physiological responses as listed by Dr. Beard are:

(1) Higher chlorophyll content.
(2) Lower respiration rate.
(3) Lower compensation point.
(4) Lower carbohydrate to nitrogen ratio.
(5) Lower carbohydrate level.
(6) Reduced transpiration rate.
(7) Higher tissue moisture content.
(8) Lower osmotic pressure.

Though physiological responses to turf from shading are not apparent to the naked eye, close study of such grass does reveal the associated morphological responses. These morphological responses which mean less vigorous plants are as follows, according to Dr. Beard:

(1) Thinner leaves.
(2) Reduced leaf weight.
(3) Increased leaf length.
(4) Reduced shoot density.
(5) Longer internodes.
(6) Reduced tillering.
(7) Lower rate of leaf appearance.
(8) Upright habit of growth.

Species composition, density count, and turf quality ratings of 8 grass mixtures grown under 5% of incident sunlight.

Grass mixture*	Composition, %		Density counts‡		Turf quality ratings (1-best; 9-poorest)§		
	Original seed†	Plants on 10/10/64	1962	1964	1962	1963	1964
F-K	50-50	86-14	16	39	6.8	6.4	3.9
F-K	75-25	91-9	22	41	7.0	5.5	4.4
F-K	25-75	92-8	27	33	6.2	6.0	4.6
F-R	50-50	68-32	48	35	3.3	5.6	5.5
K-R	50-50	17-83	56	22	3.3	5.0	5.5
F-K-P	33-33-33	63-11-26	23	30	6.5	5.6	5.6
F-K-R	33-33-33	45-12-43	46	59	3.9	5.2	5.7
K-T	50-50	32-68	16	19	6.9	5.2	5.8
		LSD, 5%	11.5	14.5	.0.8	1.0	1.8
		DR, 5%	13.2	16.6	0.9	1.1	2.0

* F-Pennlawn red fescue; K-Common Kentucky bluegrass; R-Roughstalk bluegrass; P-Common perennial ryegrass; T-Kent, 31 tall fescue. † Based on seed numbers. ‡ Shoots per 12.5 sq. in., counts made the second week in October. § Average of the seasonal ratings. ¶ Duncan's range test for equality with p of 8.

Turf quality ratings and density of 7 grasses grown under 5% of incident sunlight, all seedings being made in September, 1961*

Grass variety	Density count*		Turf quality rating†		
	1962	1964	1962	1963	1964
Pennlawn red fescue	25	34	6.5	5.4	4.3
Roughstalk bluegrass	54	44	3.2	4.9	5.8
Common peren. ryegrass	23	10	5.9	5.3	7.0
Kent, 31 tall fescue	18	10	6.8	7.0	7.3
Common Kent. bluegrass	15	4	7.9	6.7	8.1
Norlea peren. ryegrass	10	1	6.0	6.7	8.7
Merion Kent. bluegrass	10	0	7.4	9.0	9.0
LSD, 5%	11.5	14.5	0.8	1.0	1.8
DR, 5%	13.1	16.4	0.9	1.1	2.0

* Shoots per 12.5 square inches, counts made the second week in October.
† (1-best; 9-poorest) Average of the seasonal ratings.
‡ Duncan's range test for equality with p of 7.

In comparing these two tables, it is notable that after three years, the 33-33-33 mixture of red fescue, roughstalk bluegrass, and Kentucky bluegrass was higher in density than any one of the grass components planted alone.

Adaptability To Shade Studies Continue

Trials on turf growth in shade are continuing at Michigan State University but already have produced some tangible results. Among conclusions drawn is one in favor of fall seeding, because of extended light periods in both fall and spring. Bentgrass which performs best in sun also does best in shade.

Roughstalk bluegrass and common Kentucky bluegrass were both lost by disease in trials; Pennlawn red fescue was hurt but did recover. Kentucky bluegrasses are not good for shade because of susceptibility to powdery mildew.

For density of growth, the best grass variety mixture proved to be Pennlawn red fescue, roughstalk bluegrass and common Kentucky bluegrass.

For quality, the most superior mixture of grasses was 50% Pennlawn creeping red fescue and 50% common Kentucky bluegrass, on a seed count basis.

Dr. Beard reports that bentgrass is fairly well adapted to shade but water must be available to get it established. Disease, he said, proved to be the primary cause of turf loss in Michigan tests. Ground under trees was plowed six inches deep prior to reseeding under shade. For contractors doing this type work, Dr. Beard has suggested light irrigation only for establishing red fescue and sparse use of nitrogen. He believes nitrogen use should be kept below 4 pounds per year on red fescue.

In the Michigan tests, sandy loam was limed to a pH of 6.0. Adequate phosphorus and potassium were used along with 2 pounds of nitrogen per 1,000 square feet, half in the spring and half in the fall. No irrigation was used. All seedings were made, alone and in mixtures, during early September 1961. Plots were planted on a seed count basis, 3½ million seeds per 1,000 square feet.

A summary of recommendations for establishing turf in shade areas based on Michigan State University tests under the supervision of Dr. James B. Beard are as follows:

1. Use adapted species such as Pennlawn red fescue for Michigan and similar areas.
2. Raise the height of normal mowing about 1 inch.
3. Avoid excessive nitrogen fertilization (keeping disease problems down by not providing succulent plant growth).
4. Practice deep, infrequent irrigation.
5. Avoid excessive traffic.
6. Select trees with more open crowns.
7. Thin crowns of trees.
8. Improve air movement by removing solid screens or barriers of shrubs.
9. Practice shallow tree root pruning to reduce root competition.
10. Remove fallen leaves promptly in the fall.
11. Use deep fertilization for tree roots.
12. Prune tree limbs to heights of 8-10 feet.