

surface water from heavy rains will drain quickly. Positioning greens in consistently wet areas, such as along river beds, flooded plains, and along marshes must also be carefully planned to allow for adequate subsurface drainage. A current trend in the industry is to build greens elevated above the fairway. Elevation encourages surface drainage, helps prevent runoff from adjacent higher elevations onto the green's surface, and adds character to the hole.

Greens that are flat, which have less than a 2-percent slope to the front of the green, generally require extensive drainage systems. Drainage lines should be placed every 10 to 20 feet across the entire green. Greens with a 2 to 3-percent slope have a greater proportion of excess water carried into the front of the green. In these cases, drainage lines are especially important in the front of the green. In lower rainfall areas in the United States, such greens do not need interceptor drain lines on the back half of the green. However, in Florida, rainfall is often heavy and these interceptor drain lines are needed on the entire green.

Shade

Shade reduces the turf's ability to intercept the required amount of sunlight needed to grow and also reduces the cooling effects of airflow across the green's surface. Full sunlight is needed to produce food through photosynthesis, to dry out greens after heavy precipitation, and to discourage algae and moss buildup.

One of the basic physiological facts about bermudagrass, is its relatively poor shade tolerance. This is especially true for bermudagrass maintained under putting green conditions since close mowing reduces the exposed leaf surface available for photosynthesis (Fig. 2). Bermudagrass requires full sunlight for a minimum of 6 to 8 hours per day. In order to receive this amount of sunlight, it is mandatory to remove all moderate to heavy shade sources surrounding any putting surface.

Often little foresight is used to plan for existing trees surrounding greens. Florida is known for its beautiful oak trees with Spanish Moss hanging effortless in the summer breeze. However, trees with dense canopies and golf greens **do not mix**. Planning should also take into account that during fall and winter months, the sun is lower on the horizon than during spring and summer months.

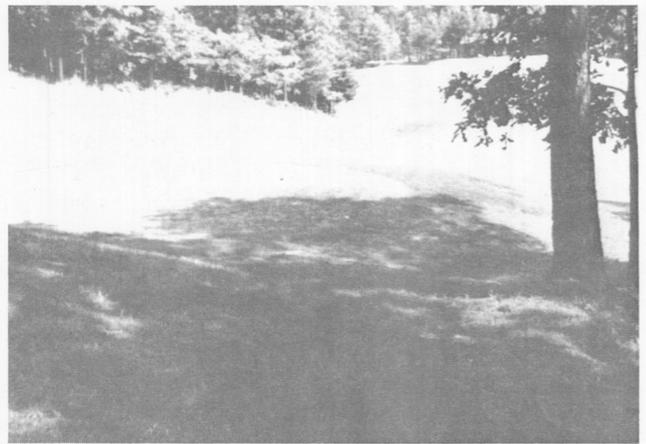


Figure 2. Weak, thin bermudagrass resulting from exposure to excessive shade.

Therefore, trees to the south and southwest of greens will cast longer shadows during the cooler months and do not necessarily need to be adjacent to the green in order to cause shade problems. In north Florida, shade also contributes to the potential of cold damage to the bermudagrass as frost on shade-covered greens melts slower compared to greens receiving full sunlight. It is suggested that during the planning stage, the summer and winter shade patterns for proposed golf green sites be sketched at 8:00 a.m., 10:00 a.m., 12:00 p.m., and 2:00 p.m. to provide a blueprint of tree shade surrounding a proposed or existing green site. This sketch will allow selective trees to be removed, if necessary, or possible relocation of the putting green away from those areas where trees can not be removed. If tree removal is impossible, prune as necessary to allow for increased filtered light.

Adjacent holes, houses, roads, etc.

Another location consideration is a green's relationship to adjacent golf holes, housing developments, highways, and other high population areas. Many times a green can be strategically placed as to guide players away from these areas, however, tree barriers, shrub line or even nets are sometimes required to protect nearby personnel and property.

Size

The size of a golf green should be large enough to allow for adequate selection of pin placement but not so large as to become a financial and/or agronomic burden. Smaller sized greens will readily show effects from traffic concentration, while larger ones increase maintenance costs. In general, golf greens range from 5000 to more than 7500 square