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Trees, Turf and People

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Picture your ideal home, the place of your dreams. Most of us will imagine a house surrounded by an expanse of green turf and one or more shade trees in the yard. The turf is green and lush and extends all the way up to the trunk of the trees. This combination of shade and turf creates a peaceful, idyllic image in our minds. Unfortunately this combination of lush turf and dense shade exists only in our minds. Turf and trees are often planted together, but they are not always compatible. In fact, they can even be described as mortal enemies.

Trees and turf competing for the same light, water and mineral elements.

Opposite Survival Strategies

The shade trees and fruit trees that we treasure in our landscapes were originally adapted to growing in forests in close association with other trees. In the forest they can remain small for many years. As soon as there is an opening in the canopy allowing light to reach the forest floor they grow rapidly. This great height allows trees to assume a place of dominance over other plants; their trunks lift their leaves high into the air, allowing them to intercept the maximum amount of sunlight before it reaches other plants. Thus, trees grow tall and provide us with their much-appreciated shade.

The survival strategy for grasses is different from that of trees. Grasses don't grow tall like trees but are able to out-compete other species using different strategies. Grasses that make the best lawns, parks, golf courses and athletic fields form dense, uniform mats. This dense carpet makes it a good surface for walking and play. In nature this dense growth prevents tree seedlings from getting started. Grasses tolerate drought better than most trees by extracting water more efficiently from the soil and going dormant during the most severe periods of drought. Occasionally when it is hot and dry, natural expanses of grass will burn, killing young tree seedlings. Although fire is not a major factor in lawns, many types of turf exude from their roots chemicals that suppress the growth of other plants, including trees. These chemicals are especially damaging to young, recently planted trees in our landscapes. When tree growth is suppressed, a disease or insect may be able to attack the plant. Like shade trees in landscapes, most grasses grow best in full sun. Over time and under the right circumstances grasses are able to out-compete young trees before they are able to get started. Grasses can also suppress the growth of trees that are able to get a foothold. Prairies are grasslands where naturally occurring fires control trees and encourage the growth of grasses; these grasslands look quite different from a forest dominated by trees.

The large shade trees in the urban landscape will try to out-compete the turf by shading it to the point where it is barely able to survive. Grasses will out-compete trees for water during extreme drought. Some grasses will also secrete chemicals that suppress the growth of the tree. Neither trees nor grasses have the ability to completely dominate the other, but as enemies they make survival more difficult for the other. Proper management of both the turf and the trees is the key to attractive, healthy landscapes.

The Human Interaction

Trees have enough problems with turf competing against them, but their human owners often present even more significant challenges to their survival. Damage to tree trunks by lawn equipment used to manage the turf is common in many landscapes. String trimmers and mowing equipment that contact tree trunks can cause life-threatening damage. Sometimes equipment hits a trunk and knocks off large patches of bark. Loss of bark can be especially serious in spring when bark is not tightly attached, but spring is also the time when turf is growing most rapidly and needs the most maintenance. Sometimes a bump with a mower leaves a crack too small for humans to see but is easily penetrated by diseases and insects.

Even though bark is non-living, it is an important barrier against diseases and insects and keeps living tissues inside the tree from drying out and dying. The tissues just under the bark are where sugars and other organic compounds are translocated from the leaves to the roots. The outermost layer of wood is where water and mineral elements move from the roots to the shoots. As soon as an area of the trunk is damaged, sugars are unable to get past the point of damage to the roots. Shortly after this, water and mineral elements are restricted in their movement from the roots to the shoots. A small horizontal wound to a trunk is actually more damaging than a larger vertical wound.

Competition for light, water and mineral elements as well as damage from maintenance equipment frequently have a negative effect on plants in our landscapes. Proper management techniques are essential for maintaining healthy, attractive lawns, trees and shrubs that make our communities better and healthier places for us to live, work and play.

Management Solutions

The optimum solution is to keep turf in full sun where it grows best and not under the dense shade of trees. This practice benefits your trees as they grow and provides the best opportunity for healthy, vigorous turf.

Mulch

Bare soil and the resulting problems of dust and mud under trees can be solved by using mulch. Mulch is advantageous for the tree because it reduces the amount of soil erosion, keeps the soil cooler in summer and warmer in winter, and increases the amount of rainwater that can infiltrate into the soil. In urban areas if water can enter the soil it does not carry pollutants and sediment into streams and does not have to be processed as part of the wastewater stream.

Over time mulch will decompose and need to be replaced. This process of decay is advantageous to the tree. Worms, insects and other animals will incorporate the decaying organic matter into the soil. Decomposing organic matter releases essential mineral elements for use by the tree. Organic matter also improves drainage and allows roots to grow more vigorously and spread over a greater area in search of water and mineral elements. After only one year of mulching under a tree's canopy the tree will have significantly more roots for absorbing water and mineral elements than in the years before it was mulched. Mulching mimics the natural processes occurring in the forest, where leaves and twigs cover the forest floor.

Even if mulch provided none of these benefits listed above, it would still be recommended because of its ability to unify the design. Mulching a number of trees and shrubs in the landscape provides a unifying element that visually joins the different plants. An area that is appropriately mulched looks better than sparse turf and is easier to care for; mulch will also make mowing the turf easier. A variety of materials are commonly used to create mulch (Table 1).

Table 1. Common materials used for mulch

Mulch	Advantages	Cautions
Wood chips	Readily available and may be free from local arborists; commercially available products are often dyed offering visual options	Chips should be composted for at least a couple of weeks before being used in landscapes, longer if they contain green foliage.
Pine bark	Attractive and readily available; uniform appearance; does not need to be replaced frequently; slow to decompose, enriching the soil	Small nuggets may wash on steep slopes.
Hardwood bark	Attractive and readily available; uniform appearance	In addition to characteristics of pine bark, over time hardwood bark can make the soil more alkaline.
Pine needles	Attractive and excellent walking surface; acid forming	Less common than other mulches; can be a fire hazard so is not recommended in public areas (stores, golf courses, etc.) where people may be smoking.
Compost	Often locally available or can be made in home composting bins	Decomposes rapidly and should only be used in thin layers to keep it from matting into a water-impervious mat.
Sawdust	Often locally available	Decomposes rapidly and should only be used in thin layers to keep it from matting into a water-impervious mat.
Cypress	Readily available	May mat down preventing water from infiltrating the soil; does not break down rapidly, allowing organic matter to build up in the soil.
Rock	Permanent	Generally not recommended. Rock thrown by mowing equipment can be dangerous, is hot, becomes mixed with the soil and does not have advantages of organic mulches.
Plastic films and weed barriers	Impervious to most weeds that germinate below it	Soil becomes very hot in sun and films and barriers should have an organic mulch placed on top; does not add organic matter to the soil; destroys soil structure; reduces water infiltration.

Groundcovers

Shade tolerant groundcovers are a good option for sites where it is difficult to grow turf. Many of these low-growing plants are found in woodlands and are naturally adapted to growing in the dense shade under trees. In selecting a groundcover, match the water needs of the groundcover with that of the tree.

To avoid damage to the root system or even death of the tree, do not till the soil under established trees. If you are planting a groundcover under an established tree, just dig a hole of an appropriate size to ensure that the young plant can become established. If you must eliminate existing turf, do not allow herbicides to contact the roots of the shade tree. You may damage a tree's root system if you try to remove existing turf with a sod cutter or by hand with a shovel.

The following is a list of some groundcovers that have been used successfully under trees (Table 2). Not all groundcovers in the table will be compatible with the design characteristics of the remainder of your landscape. It may be desirable to mulch around some groundcovers until they become established.

Table 2. Shade tolerant groundcovers

Groundcover	Height (in)	Characteristics
Ajuga *(Ajuga reptans)*	4–6	Shade or full sun; evergreen; will not tolerate any traffic
Wild ginger *(Asarum canadensis)*	6–8	Shade or full sun; dies down in winter
Bearberry cotoneaster *(Cotoneaster dammeri)*	12–18	Semi-evergreen
Lily of the valley *(Convallaria majalis)*	8	Dormant in winter
Bigleaf wintercreeper *(Euonymus fortunei)*	8, becoming a climbing vine	Not recommended because of the potential to be invasive.
Epimedium *(Epimedium sulphreum)*	12	Dormant in winter
Liriope *(Liriope muscari)*	8–18	Shade or full sun; evergreen; clumping
Ferns		
Japanese painted fern *(Athyrium niponicum 'Pictum')*	12–16	Deer resistant, dies down in winter
Japanese shield fern *(Dryopteris erythrosora)*	18–24	Evergreen
Southern shield fern *(Dryopteris ludoviciana)*	30–48	Semi-evergreen
Ostrich fern *(Matteuccia struthiopteris)*	36–72	Dies down in winter
Cinnamon fern *(Osmunda cinnamomea)*	30–60	Dies down in winter
Royal fern *(Osmunda regalis)*	24–60	Requires higher light intensity and moist site
Christmas fern *(Polystichum acrostichoides)*	12–24	Evergreen
Foamflower *(Tiarella cordifolia)*	6–10	Herbaceous perennial with white flowers; flowers April through June
Plantain lily *(Hosta* spp.*)*	12–36	Dormant in winter; slugs can be a problem in wet weather
English ivy *(Hedera helix)*	6–10, becoming a climbing vine	Evergreen; sun or shade; will become a climbing vine (best to keep off trunks)
St Johnswort *(Hypericum calycinum)*	18	Semi-evergreen; yellow flowers; drought tolerant
Pachysandra, Japanese spurge *(Pachysandra terminalis)*	6–10	Evergreen; needs good soil
Allegheny spurge *(Pachysandra procumbens)*	6–10	Evergreen; needs good soil; less common than Japanese spurge
Fragrant sumac *(Rhus aromatica)*	36	Woody shrub that defoliates in winter
Big leaf periwinkle *(Vinca major)*	6	Evergreen
Periwinkle *(Vinca minor)*	6	Evergreen
Yellowroot *(Xanthorhiza simplicissima)*	24	Woody groundcover that defoliates in winter

Maintaining Turf under Trees

Turf is not only attractive but is safer for pedestrian traffic than other walking surfaces. When possible, turf should be grown in full sun. However, sometimes turf is the only practical solution under trees. For the health of the tree, establish a small grass-free zone adjacent to the trunk that will prevent potential damage to the tree trunk. Several management techniques will improve the cultural environment and make growing turf easier. (Not all of these techniques will be possible in a specific situation.) These methods include:

- Restricting traffic under the tree. Where traffic must pass under the canopy, consider installing a raised boardwalk that will reduce wear and soil compaction where tree roots are growing.
- Hiring a certified arborist to selectively remove small interior branches from the tree. Foliage on the interior of a tree's canopy is less efficient in producing sugars than foliage at the top of the canopy. No more than 25 percent of the foliage should be removed. Topping is not a solution for reducing shading. No turf, regardless of the claimed shade tolerance, will grow in dense shade.
- Mowing the turf at a higher level. Leaving longer leaf blades on turf will make it more efficient at photosynthesizing. Taller turf will also produce more vigorous roots, and the extra length of the leaf blades will make the turf look thicker.

- Avoiding high rates of nitrogen fertilizer. Nitrogen encourages vigorous growth that is less tolerant of traffic. On sites where light is reduced turf is less able to carry out photosynthesis, the process necessary to produce sugars necessary for growth and recovery.
- Choosing turfgrasses adapted to Kentucky's climate. Only three are suitable (tall fescue (*Festuca arundinacea*), fine fescue (*Festuca rubra*) and zoysiagrass (*Zoysia japonica*) for growth in moderate shade. Of these three turfs, tall fescue is the best choice for sun/shade situations in our climate.
- Watering appropriately when turf roots and tree roots are occupying the same soil area.
- Avoiding guards around the base of smaller trees. Guards provide only minimal protection from mowers and string trimmers, don't absorb much of the impact and transfer the majority of the force to the trunk. They also can get very warm in the intense summer sun.
- Overseeding with annual ryegrass to create a temporary cover for aesthetic reasons. The ryegrass will give a temporary green cover on the soil surface, although it will likely not persist in anything but very light shade.

Turf and trees are the two most dominant components in our landscapes, parks and recreation areas. Each produces unique visual and functional characteristics that cannot be duplicated by anything else. Though turf and trees are potentially antagonistic to the other, management options allow us to use both trees and turf to improve our environment and lifestyle.

Mulching is one of the best things that we can do for plants in our landscapes or one of the worst things we can do to them. Proper mulching encourages the development of fine roots enabling the plant to take up more water and mineral elements than is possible under turf. This image shows samples of roots taken from opposite sides of the same white oak. One side was under turf; the other had been mulched for only one year (used with permission of G. Watson, Morton Arboretum).

Mulching around trees is the best way to avoid string trimmer damage to trunks.

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