Trees & Turf:

Compromising Performance and Values

by Dr. Kim D. Coder, School of Forest Resources, University of Georgia Oct.. 2002

Both tree and turf cultural systems strive for great plant performance, high landscape values, and exceeding client expectations. Management of either trees or turf requires similar knowledge of sites and soils, plus additional unique knowledge of specific biological and ecological reactions. Health care and structural maintenance of both tree and turf systems call for specialized knowledge. When trees and turf are required to effectively meet management objectives growing on the same site, additional knowledge and efforts are required to allow both to thrive.

Separations

Clearly trees and turf can not grow on an identical spot. There is a separation in nature between trees and turf which varies by the amount and quality of the resources each can gather and control. The less intense and extensive management remains, the more tree / turf interactions are governed by ecological processes. Under extreme resource limitations, tree / turf site occupancy can be clearly differentiated at the soil surface as a root interference zone and in the leaves as a light gathering problem. As management becomes more intensive and more resources are added to the site to hold it away from ecological equilibrium, and to assure great plant performance, interference between trees and turf (as well as physical separation) becomes less visually evident.

Ecologically, all plant systems must use the same set of resources to live. In locations where essential resources are not limiting, optimal growth can occur for every living thing. Unfortunately, the economics of scare resource allocations among different living things are an universal problem for which different plants approach solutions in different ways. To propel their gene sets forward in time, a host of strategies have developed: tall, short, perennial, annual, biennial, woody, succulent, wind-pollinated, insect-pollinated, monoecious, dioecious, massive, tiny, etc. Trees and turf have each found success in wildly different strategies of life even though they require the same essential resources.

Growing Out & Up

Trees continue to exist by shedding inefficient parts externally (leaves, twigs) and internally (heartwood, compartmentalization). Trees grow by physically advancing their position each growing season through elongation and expansion. Trees establish a new sheath of living tissue over the old exterior of living tissues every growing season. Trees sense and react to changes in their environment at shoot tips, root tips, and the cambium (boundary between xylem / wood and phloem / inner bark). Living tissue on the outside of twigs, stems and woody roots (just beneath the bark) are the most active, reactive and responsible for a tree's biological success, as well as for maintaining structural integrity.

Trees grow and expand their ecological area of influence by interference (which is a combination of competition and allelopathy,) and by structural expansion (increasing the extent and reach of resource gathering systems). The elevation and distribution of tree leaves is a strategy to capture and control all photosynthetically active radiation coming from sunlight while maintaining biological and mechanical efficiency. The initiation and elongation of tree roots is a strategy to gather and control all essential soil-resident resources while sustaining ecological dominance.

Rooting Out

Tree root systems have a high oxygen demand, are shallow, and can extend hundreds of feet away from the tree. There are three main tree root colonization areas (Figure 1) surrounding any tree stem base: 1) structural root area or root plate (tree diameter in inches measured at 4.5 feet above ground multiplied by 0.9 which equals the diameter of root plate in feet); 2) primary occupation and resource mining area (tree diameter in inches measured at 4.5 feet above ground multiplied by 2.5 which equals the diameter of primary resource gathering area in feet); and, 3) active interference and exploration area (tree diameter in inches measured at 4.5 feet above ground multiplied by four which equals the diameter of root resource exploration area in feet).

Living Together

The plight of planting trees and turf together is the perceived decline in performance of both. The resources which both trees and turf require must be gathered, controlled, and effectively utilized in a ecologically efficient way. A tree with limited growth development space placed in a turf dominated area will be stressed by the limited resources available. Turf placed in a space dominated by active tree root colonization and light filtering will be stressed by the limited resources available. Both trees and turf will attempt to gather resources before the other can gain control (competition) or insert an ecologically active agent into air, water, or soil which prevents gathering of resources (allelopathy). Allelopathy can become more noticeable when competitive forces of interference are not as effective in gathering and controlling resources. Interference between trees and turf can be severe and disrupt effective management of a landscape with combined objectives.

Tree / turf management ideally requires a complete separation of resource bases and space. Separating the combatants is an easy way to have both in a general area but not have to compromise in the management of either. Complete separation is difficult to accomplish in small spaces and for many landscape objectives. Many people perceive the ideal landscape as intermixed species and demand the same performance in multi-culture as in mono-culture. To meet client expectations, a landscape manager is forced to compromise plant performance and values to reach a management optimum incorporating both trees and turf.

Combination Environments

Changes in the mutual environment of tree / turf culture are concentrated around: A) Light Resources – Quality, quantity, duration, form, shade, litter; B) Moisture Content – Relative humidity, dew retention, evaporation, water infiltration, and water run-off; C) Air Movement – Wind velocity, advected heat, air turbulence; D) Temperature – Air temperatures, soil surface temperature; and, E) Soil Resources – Oxygen, compaction, essential elements, element availability.

In addition to the physical features of the growth environment which change, the landscape management environment can generate a number of negative impacts including neglect and abuse through ignorance, landscape machinery initiated damage, and health maintenance practices targeted at one plant system which damages the other. In addition, both budget and evaluating success in a managed tree / turf system must be carefully defined.

Conclusions

Trees and turf can live in the vicinity of each other and maintain great aesthetic and biological performance values. The closer they grow together the more compromises must be made in the management of each. Trees need more care in turf culture situations to prevent loss of values, to decrease liability risks, and to prevent tree death.

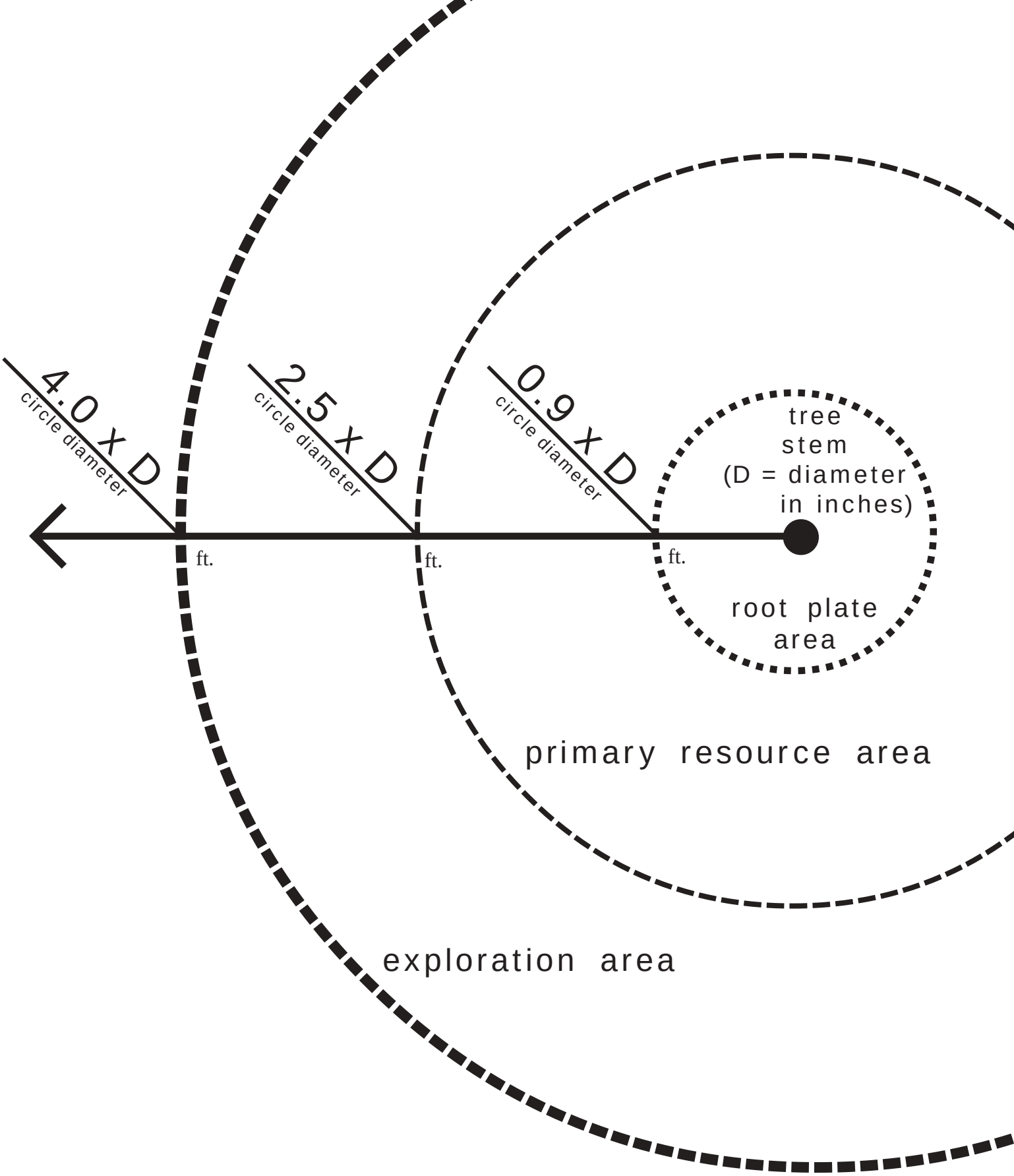

Figure 1: Diagramatic definition of functional tree rooting areas as viewed from above. Diameter of tree stem in inches measured at 4.5 feet above the ground is used as a multiplier in determining specific tree rooting diameters measured away from the stem in feet.