TREE SELECTION FOR DROUGHT RESISTANCE

by Dr. Kim D. Coder, Daniel B. Warnell School of Forest Resources
University of Georgia 4/99

A fact of life in the Southeast is the mid-summer drought. In recent years drought periods have ventured into spring and fall. Drought has damaged many trees and landscapes. One means of drought-proofing your landscape is selection of drought resistant plants. No landscape can be made completely free of drought problems even under intensive irrigation. With more water shortages and drought periods ahead, planting trees and other plants that are drought resistant can be beneficial.

Drought resistant tree selection is a long-term solution to low maintenance landscapes. Drought resistance requires tree leaves use water efficiently, and continue to grow and make food at relatively low water concentrations. Drought resistance involves characteristics like extensive root systems, thick leaf waxes and bark, good stomate control, and the capacity for leaf cells to function at low water contents.

There are many lists of drought resistant plants available. The basic characteristics of trees that use water efficiency and are drought resistant to some degree are given below.

1) Use natives - Native trees adapted to local soil, moisture, climate and pests usually perform better over the long run than exotics.

2) Use early to mid-successional species - Trees that colonize old fields, new soil areas, and disturbed sites use available resources, like water, much more effectively than late successional species (climax species). Late successional species can be effectively used in partially shaded understories.

3) Select proper canopy type - Select trees for planting in full sun which will develop leaves and branches spread throughout a deep crown. These multilayered trees have many living branches with many leaf layers. Multilayered canopy trees are more water efficient in areas with greater than 60% full sun. The other type of leaf canopy concentrates leaves in a single layer along the outside of the canopy area. These single-layer trees are good in partial shade but are not water efficient in full sun.

   Examples of multilayered overstory trees include: oaks, pines, soft maples, ash, hickory, gums, walnut, poplars, and birches. Mono-layered understory trees include: beech, sugar maple, hemlock, magnolia, sassafras, sourwood, and redbud.

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4) Select proper crown shape - Crown shape has a great effect on heat dissipation and water use. Ideal trees would be tall with cone or cylinder shaped crowns. Do not use flat, widely spreading species in full sun. You want a tree to maintain a tall, rather than a wide appearance. Many trees that are wide-spreading when mature have narrow, upright crowns when young.

5) Select proper leaf size and shape - Select small-leaved or small, deeply lobed leaved trees. These leaves are more easily cooled and have better water use efficiency than larger leaves.

6) Select proper foliage reflection - Hardwood (broadleaved) trees reflect 25% more light than conifer trees on average. This translates into better water use efficiencies with hardwoods.

7) Select upland versus bottomland species - Upland species are usually more drought resistant than bottomland species. Unfortunately, upland species can be much slower growing and do not react well to site changes and soil compaction. Tree selection must be carefully made based upon disturbance, stress, and site-use expectations.

From these character you see that the ideal tree for a drought-resistant landscape is a native, early to mid-successional, upland hardwood species with a multi-layered canopy, small and/or deeply lobed leaves, and a narrow or upright crown shape.

Obviously you will never find an ideal drought resistant tree. Many trees do come close and have many fine features for a good landscape. A list of these species can be found in the following table. Remember young trees of any species must be allowed time to become fully established in a landscape before drought resistant features will be evident. Properly fit the tree to your site and local climate, and you will have a water efficient landscape.

Below is a list of drought resistant tree species.

scientific name	common genus name
Acer buergeranum	maple
Acer negundo	
Acer platanoides	
Acer rubrum	
Acer saccharinum	
Ailanthus altissima	tree**1**of**1**heaven
Betula maximowicziana	birch
Betula nigra	
Carya glabra	hickory
Carya ovata	
Carya tomentosa	
Catalpa bignonioides	catalpa
Celtis occidentalis	hackberry

scientific name	common genus name
Cercis canadensis	redbud
Crataegus spp.	hawthorn
Cupressocyparis leylandi	
Cupressus spp.	cypress
Diospyros virginiana	persimmon
Elaeagnus spp.	olive
Fraxinus pennsylvanica	ash
Ginkgo biloba	ginkgo
Gleditsia triacanthos	honeylocust
Gymnocladus dioicus	coffee tree
Ilex decidua	holly
Ilex vomitoria	
Juglans nigra	black walnut
Juniperus spp.	juniper
Maclura pomifera	osage orange
Morus spp.	mulberry
Nyssa spp.	tupelo
Ostrya virginiana	ironwood
Pinus echinata	pines
Pinus elliotti	
Pinus glabra	
Pinus palustris	
Pinus sylvestris	
Pinus taeda	
Pinus virginiana	
Platanus spp.	sycamores
Populus alba	white poplar
Populus deltoides	cottonwood

scientific name	common genus name
Quercus acutissima	oaks
Quercus coccinea	
Quercus durandii	
Quercus falcata	
Quercus georgiana	
Quercus imbricaria	
Quercus laevis	
Quercus laurifolia	
Quercus lyrata	
Quercus macrocarpa	
Quercus marilandica	
Quercus muehlenbergi	
Quercus oglethorpensis	
Quercus phellos	
Quercus prinus	
Quercus shumardii	
Quercus stellata	
Quercus virginiana	
Quercus velutina	
Robinia pseudoacacia	black locust
Salix nigra	willow
Sassafras albidum	sassafras
Ulmus americana	elms
Ulmus parvifolia	
Ulmus pumila	
Zelkova serrata	

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