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GROUP 1 —Low oxygen tolerant trees which require full sun
Alnus glutinosa (European Alder)
Fraxinus americana (White Ash) (after it has passed the juvenile stage)
Larix laricina (American Larch)
Quercus imbricaria (Shingle Oak)
Quercus palustris (Pin Oak)
Salix spp. (Willow)
Sassafras albidum (Common Sassafras)
Taxodium distichum (Common Bald-cypress).

GROUP 1A —Low oxygen-tolerant species preferring shade
Alnus serrulata (Silver Maple)
Aesculus hippocastanum (Common Horsechestnut)
Carpinus caroliniana (Am. Hornbeam)
Crataegus spp. (Hawthorn)
Juniperus virginiana (Eastern Redbud)
Larix decidua (European Larch)
Ostrya virginiana (Am. Hornbeam).

GROUP 2 —High water table trees
Acer negundo (boxelder)
Acer pseudoplatanus (Plant-tree Maple)
Acer rubrum (Red Maple)
Aesculus glabra (Ohio Buckeye)
Castanea dentata (American Chestnut)
Chionanthus virginicus (White Fringetree)
Fagus grandiflora (American Beech)
Fagus Sylvatica (European Beech)
Gleditsia triacanthos (Thornless Honeylocust)
Juglans nigra (Black Walnut)
Magnolia acuminata (Cucumbertree Magnolia)
Ostrya virginiana (American Hornbeam)
Pinus albicarpa (White Bark Pine)
Pinus flexilis (Limber Pine)
Pinus jeffreyi (Jeffrey Pine)
Pinus resinosa (Red Pine)
Platanus occidentalis (Am. Planetree)
Quercus cocinea (Scarlet Oak)
Quercus imbricaria (Shingle Oak)
Quercus palustris (Pin Oak)
Quercus robur (English Oak)
Tilia americana (American Linden)

GROUP 3 —Well-drained fertile soil trees
Acer saccharum (Sugar Maple)
Carya ovata (Shagbark Hickory)
Celtis occidentalis (Common Hackberry)
Cercis canadensis (Eastern Redbud)
Cornus florida (Flowering Dogwood)
Liriodendron tulipifera (Tuliptree)
Malus spp. (crab apple)
Ostrya virginiana (Am. Hornbeam)
Pinus strobus (Eastern White Pine)
Pinus sylvestris (Scotch Pine)
Platanus occidentalis (Am. Planetree)
Quercus coccinea (Scarlet Oak)
Quercus rubra (Red Oak)
Tsuga canadensis (Canadian Hemlock).

GROUP 4 —Droughty site trees
Abies concolor (White Fir)
Betula papyrifera (Paper Birch)
Calapta spp (calapta)
Elaeagnus angustifolia (Russian Olive)
Ginkgo biloba (Ginkgo)
Gleditsia triacanthos (Thornless Honeylocust)
Gymnocladus dioicus (Kentucky Coffeetree)
Malus spp. (crab apple) (to a lesser extent)
Nyssa sylvatica (Black Tupelo)
Pinus ponderosa (Ponderosa Pine)
Quercus macrocarpa (Bur Oak)
Quercus velutina (Black Oak).
Robinia pseudoacacia (Black Locust).

Ponderosa pine is extremely drought tolerant and adapts well to much of the United States.

review this list of trees for their adaptation or need for a relatively high water table; that is, water within the upper several feet. Many of these trees grow well along the shore of ponds, water hazards, and/or streams.

Group 3: Well-Drained Fertile Soils
The next group of trees are quality trees for large-area, intensely maintained landscapes. They require fertile, well-drained soils. These trees are the most sensitive to a quality environment while being specific in their requirements.

Group 4: Droughty, Sandy Sites
There are a reasonable number of trees that grow on droughty sites. These plants will thrive as companions with turf while tolerating sandy, extremely well-drained, droughty sites.

This doesn’t mean they won’t tolerate additional moisture, but they do seem to tolerate droughty sites through a deep root system or as efficient extractors of water.

Other golf course trees
A few types of trees are particularly important because they have contrasting environmental requirements. These include the maples, beech, larch, ash, pine, and oak.

The maple site requirement ranges from trees requiring well-drained, fertile soils to those that survive heavy, low oxygen soils with a relatively high water table.

Acer saccharum, Sugar Maple, requires a slightly acid soil, being partially well-drained and fertile. It does not tolerate salt or air pollutants but is a regal specimen. Silver Maple and/or boxelders grow in a wide range of soils, thrive in a high water table site, tolerate flooding for various periods of time, and exist in low oxygen situations. Contrastingly, Red, Sycamore, and Norway Maples will grow in a wide range of soils, from fertile to heavy clays yet prefer frequent rains normally received throughout the Great Lakes and Northeast areas.

American and European Beech are similar yet have dramatically different pH requirements. American Beech prefers a slightly acid, well-drained soil, tolerating high water tables. European Beech grows best in a slightly alkaline soil but on a broad range of soil types. American Beech transplants with great difficulty and grows best in the Northeast on acid soils, where European Beech transplants quite readily and will tolerate a much broader soil range.

Further, all of the improved beech cultivars, such as weeping (‘Pendula’), copper leaf (‘Riversii’), and fern leaf (‘Asplenfolia’) forms, are of European Beech. There are no cultivars of American Beech.

European and American Larch grow in a wide range of soils and flourish in high water tables. European Larch is less sensitive to air pollutants yet will not tolerate chlorides. American Larch is extremely sensitive to many air pollutants.

White and Green Ash differ in one key soil requirement—pH. They both thrive on a wide range of soils, tolerate some flooding, and prefer a relatively high water table. But White Ash grows on acid soils (Northeast U.S.), where Green Ash prefers alkaline pH.

Many pines require extremely well-drained soils with high water tables. Scotch and White Pines grow on a wide range of soil conditions as long as the upper 24 inches are reasonably well drained. White Bark, Jack, Limber, Jeffrey, and Red Pines grow on sandy, infertile soil with a perched water table. In fact, they grow better in infertile than fertile soils, e.g. beachhead sand.

Ponderosa Pine is unique in that it grows on well-drained soils but is extremely drought tolerant. Its native range is the Western U.S., yet it adapts to other areas, e.g. Midwest, Central, and Northeast, as long as the soil is extremely well drained. One should take advantage of the unique characteristic—extreme drought tolerance.

Oaks are as varied as the maples. They grow in a wide range of soil conditions from fertile, well-drained soils (White Oak), to heavy, lower oxygen soils (English, Red, Scarlet, and Pin
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Ostrya virginiana, American hop hornbeam, grows well in a high water table, but requires a well-drained upper 18 inches of the soil profile.

Bur Oak, crab apples, catalpa, Honey Locust, hickory, and Kentucky Coffeetree compete well with turf without damaging it.

Kentucky Coffeetree are several of the trees to grow in companion with turf as they compete well while not damaging the grass growth.

Douglas Chapman is horticulturist, administrator, The Dow Gardens, Midland, MI, and serves on the WT&T editorial advisory board.
That's because the odds of winning are so favorable. Unlike other contests where millions enter and the odds of winning are astronomical, WT&T's "Folding Green" Sweepstakes is just for you Golf Course Superintendents who enter it during the GCSAA Show this February 5-13 in Washington, D.C.! In fact, the more times you enter, the better your chances of winning!

**HERE'S ALL YOU HAVE TO DO:**

1. You must be a Golf Course Superintendent registered at the Show. This Sweepstakes is not open to family members or exhibitors.

2. Get either copy of *WEEDS TREES & TURF*'s Golf Daily at the Show for listings of participating booths.

3. Go to any listed booth, get an entry blank with complete rules/details, fill it out, and drop it in the ballot box.

4. Enter as often as you like, but only once at each booth.

5. Pick up your prize — if you’re one of the lucky winners. Prizes will be mailed if winners are not present.

See you at the Show... and good luck!
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CUSHMAN

It works harder because it's built better.
Bob Musbach was up against a wall. As superintendent of North Hills Country Club, Menomonee Fall, WI, he’d observed the spread and summer kill of annual bluegrass. It was an epidemic with no cure.

His course has steep southern-facing slopes that soak up the hot sun. Clay soil prohibits water infiltration, and syringing fairways, up to five times a day in the summer stress period, created unacceptable, mushy playing conditions.

After trying bensulide compounds, maleic hydrazide, chloroflurenol compounds, and arsenicals with limited success, Musbach was up against a wall.

“The members were sick of wet fairways from syringing. My fear was to keep the bent wet enough would keep the poa thriving. We had to come up with a witches brew of turf to adapt to the situation,” Musbach revealed.

Musbach and his assistant Mark Kienert spent a great deal of time and money trying improved turfgrass cultivars evaluating color, drought/heat resistance and crown depth related to cold and wear tolerance.

But, it seemed the answer was more than just aggressive grasses. Something was needed to stunt the annual bluegrass until the perennial grasses were established.

What Musbach and Kienert discovered has greatly increased the sales of two products in their area, Rubigan and perennial ryegrass. “The Rubigan suppresses with pheno- 50/50 mix of bentgrass and poa annua,” says Otto.

His maintenance routine included mowing with a Toro GM3 with bas-kets at 1/2-inch from one to three times a week as needed. He aerified in June and September and overseeded in the same months with Emerald

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Poa Gets One-Two Punch with Growth Regulators and Overseeding