

Kentucky Bluegrass, *Poa pratensis* L.

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Introduction:

Kentucky bluegrass has long been the most important cool season grass planted as turf. It has been used for lawns, athletic fields, golf course fairways, tees, and rough, and been widely planted for pastures in regions where it thrives. Kentucky bluegrass is the grass that made sod production possible in northern climates. In most peoples mind this is the grass that is turf. Because it is adapted to such a wide range climates, you might think it is a native species, but like many of our other grasses Kentucky bluegrass arrived in North America along with traders and settlers from Europe.

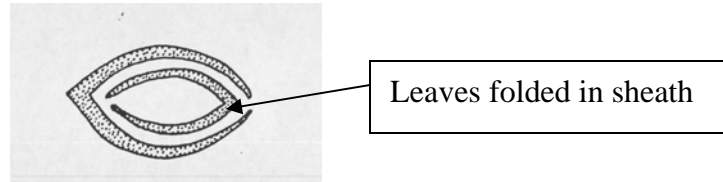
Botanical Characteristics and Identification:

Kentucky bluegrass is a sod forming rhizomatous cool season (C-3) grass that is adapted to climates with warm summers and cold winters. It has a so called perennial root system in which maximum root system development occurs after one to two years from planting. While there is an annual flush of new roots in spring many of last years roots remain alive and functioning. Because many roots live through the winter, it is not unusual to dig up a patch of healthy bluegrass and observe that most of the roots appear brown.

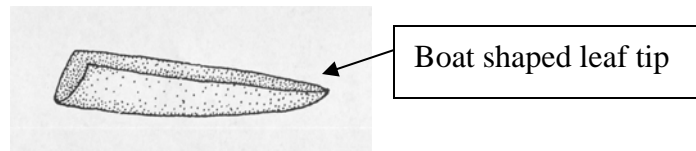
Genetically Kentucky bluegrass is quite variable with chromosome numbers ranging from $2n=28$ to 154. It does hybridize but generally produces seed apomictically. Apomixis is a form of asexual reproduction where seed forms from cells in the ovary wall of the flowers so the progeny are identical to the parent plant. Breeders have been able to make controlled crosses and in many cases the resulting crosses are still highly apomictic. Many early cultivars including 'Merion' Kentucky bluegrass are simple selections of highly apomictic plants.

In general Kentucky bluegrass is an upright grower but with enough variation to allow classification into three basic categories. Common types make up one category and are erect growing with fine textured leaves. They are adapted to lower levels of culture, are hardy and generally survive stresses by going dormant. Under high fertility, low mowing, and regular irrigation they devastated by diseases. Compact types have low compact form, turn purple in cold weather and generally have a long winter dormancy period. They are best adapted in sunny climates with low humidity and cool nights. There are numerous sub-groups of compact types. The final category includes the BVMG (Baron, Victa, Merit, Gnome) types. These have medium low growth, and produce medium quality turf. Leaf blades are often wide. Regardless of which category a cultivar fits into its morphological characteristics are the same as other types.

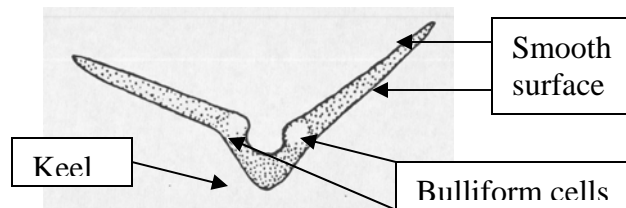
Vernation: Young leaves of bluegrasses are folded as they emerge from surrounding leaf sheaths.



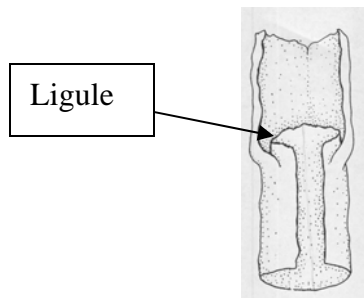
Leaf Tips: Leaf tips form a distinct boat shape, very similar to the shape of a canoe.



Leaf morphology: Leaves are smooth on the adaxial or upper leaf surface. They are smooth on the lower leaf surface and have a small distinct keel. The underside of the leaf blade ranges from dull to somewhat shiny. In general it is not as shiny as perennial ryegrass. Along side the keel you can see two parallel clear veins kind of like racing stripes. These are caused by thin walled bulliform cells located on either side of the keel.



Ligules: There is a small distinct ridge like ligule at the juncture between the blade and sheath. This is a good characteristic for differentiating between species of bluegrasses.



Auricles: Bluegrasses do not have auricles.

Other: Kentucky bluegrass has rhizomes (underground shoots), which are easy to observe if you dig into the soil.

History:

After arriving from Europe during colonial times, bluegrass rapidly spread west along with the settlers. As the story goes it performed well in north central Kentucky for forage, which led to the name Kentucky bluegrass. It continued to spread west and north until it became an important grass through out the northern United States and Canada from coast to coast.

Before breeding and selection programs most bluegrass was known simply as common Kentucky bluegrass. All early commercial seed was harvested from wild stands in the Midwest, often from pastures. Early varieties were all common types and included 'Delta' released by the Canada Department of Agriculture in 1938, 'Troy' released by the Montana AES and Crops Research Division ARS, USDA in 1955, and South Dakota Certified, which comes from naturalized common type seed fields that must be at least 10 years old. Variety selection was underway by the 1950's and led to several released cultivars into the mid 1960's. Memorable varieties included Arboretum, Campus, Kenblue, Newport, and Park.

The big story in Kentucky bluegrass development began when Joe Valentine who was the superintendent at the Merion Golf Club in Pennsylvania discovered a large patch of Kentucky bluegrass that performed much better than the common types that made up most of the bluegrass at the course. After testing in turf trials, it was released as 'Merion' in 1947 by the USGA Green section and the Crop Research Division, ARS, USDA. Merion was the first of the low growing, dark green, disease resistant, improved Kentucky bluegrasses. Its strength was its low compact growth habit, tolerance to low mowing, and resistance to leafspot disease. It quickly became the standard against which all other bluegrasses would be judged. Since it was apomictic, it produced genetically pure seed. If you planted Kentucky bluegrass between 1955 and 1970 there is a good chance you planted 'Merion'. Merion forever changed our vision of quality Kentucky bluegrass.

Other early improved types included 'Cougar', 'Fylking', 'Nugget', 'Pennstar', 'Warrens A-10', and 'Windsor'. Cougar was released by the Washington AES and Plant Materials Center SCS, USDA in Pullman, WA. in 1964. In tests in Eastern Washington, Cougar was truly an impressive turf. Unfortunately, when tested in other parts of the northern USA it failed due to leafspot susceptibility. Warrens A-10 was a highly sexual variety so it could only be produced vegetatively as sod. It was popular in the mid-West for a while before being replaced by newer seeded varieties.

The 1960's through the 1970's produced a flood of new cultivars as the breeding program at Rutgers University, under the leadership of Dr. Reed Funk, unraveled the mysteries of breeding Kentucky bluegrass. Landmark cultivars developed at Rutgers during this period included 'Adelphi', 'Bonnieblue', 'Galaxy', 'Glade', and 'Majestic' among others.

Breeding programs at other Universities and at private seed companies contributed to this flood of new cultivars leading presently to over 200 released cultivars.

Breeding and selection work with Kentucky bluegrass continues today and has focused on improved color, low growth, disease resistance, heat tolerance, shade tolerance, and better seed production. While improvements have been made in all of these areas there have been many new problems to contend with such as Stripe Smut, Necrotic Ringspot, excessive thatch production, and high nitrogen requirement.

Performance in the Pacific Northwest:

Kentucky bluegrass use in the Pacific Northwest reads like a 'Tale of Two Cities'. In areas east of the Cascade Mountains it has always been the dominant turfgrass. With a climate defined by hot summers, low humidity, cold winters, and calcareous soils, bluegrass grows incredibly well. West of the Cascades, bluegrass has been tried repeatedly without much success. The first major effort to use Kentucky bluegrass in western parts of Oregon and Washington started around 1960 when sod production started. Following the lead of sod growers around the USA farmers planted mixtures containing 'Merion' bluegrass to increase sod strength. Early plantings were noted for their susceptibility to Stripe rust. They typically failed in 3-5 years being replaced by indigenous grasses and often with annual bluegrass. Gradually, people quit trying to plant pure Kentucky bluegrass and today you will generally find bluegrass only in seed mixtures marketed nationally and in some sod blends. Some of the specific performance characteristics in the Northwest are discussed below.

Mowing:

Common type Kentucky bluegrasses perform well when mowed at 2" or higher. At lower mowing heights, diseases generally destroy the stand. The dwarf or compact types starting with 'Merion' perform much better at heights as low as 0.75". One and a half to 2" is probably the optimum height for improved cultivars used in the Northwest. As mowing heights have gotten lower on golf course fairways and tees Kentucky bluegrass has lost its value because it cannot compete. In spite of our best intentions there are no new bluegrass cultivars that can hold up over time when mowed at 0.5". Since hope springs eternal, some will continue to plant Kentucky bluegrass on fairways mowed at 0.5" only to end up with annual bluegrass and other better adapted grasses.

Fertilization:

Kentucky bluegrass also has a split personality when it comes to fertilizer. The common types do best with modest amounts of Nitrogen. High N increases susceptibility to leafspot diseases resulting in loss of turf. Newer compact cultivars require higher levels of N to grow well and look their best. Under low fertility these grasses get hit by Stripe rust in spring and fall, go dormant early in fall and are late to green up and grow in spring. In many areas East of the Cascades, Kentucky bluegrass turf will perform well with +/- 4 lb. N/1000 sq ft per year depending on expectations and mowing habits. If you

remove clippings and want really dark grass you may have to apply 6 lb of N or more. In sites where color is not an issue and clippings are returned, 2-3 lb of N may be adequate. In Western Oregon and Washington plan on 4 to 6 lb N/1000 per year in order to maintain vigor and density while the bluegrass is still the dominant component of the mix. Higher rates of N will probably speed up encroachment of invading species. At lower N levels the bluegrass won't be vigorous enough to compete and rust disease will be severe.

Irrigation:

Kentucky bluegrass has no special irrigation requirements. Its water use rate is typical of other commonly used grasses. Young stands have good drought stress tolerance but that quickly declines as stands age and thatch builds up. Lawns subject to prolonged drought stress will go dormant and recover via emerging rhizomes. A healthy lawn without deep thatch can perform well with one to three irrigations per week. With the development of Necrotic Ringspot disease, irrigation is best applied on a light frequent basis because the disease tends to weaken the root system significantly.

Thatch:

Bluegrass is a relatively heavy thatch producer. In samples taken in Bend, OR thatch levels on mature lawns often run as deep as 4"-8"! Thatch management should be an important part of Kentucky bluegrass culture. The key to effective thatch control is to be aggressive and dethatch annually in spring or every other year starting about two springs after planting. Once thatch gets too thick you can assume that most roots will be located in the thatch so expect to increase irrigation applications significantly and to irrigate on a frequent basis to avoid development of localized dry spots. West of the Cascades, Kentucky bluegrass tends to build up thatch rapidly, reaching as much as 2" in the first three years after planting. Thatch becomes less of an issue on the west side as time goes by because other grasses move in and take over the stand.

Diseases:

For many years disease was not much of an issue in Eastern parts of the region. High value turf might require preventive fungicide treatments for Grey snowmold but there really wasn't much else to worry about. The arrival of 'Merion' bluegrass taught us about rust, but even rust was not a severe problem. From the mid 1970's through the present the big disease has been Necrotic Ringspot. From Spokane to the Tri-Cities to Bend Necrotic Ringspot has altered our vision of pure stands of Kentucky bluegrass.

West of the Cascades disease has played a major role in the failure of Kentucky bluegrass as a viable turfgrass. Rusts are generally the first diseases observed in the fall on new plantings followed by leafspot during late winter. Both diseases cause turf thinning and open the stand to germinating invaders. Turf planted from sod or seed can be devastated after several years of growth by Necrotic Ringspot. Under high fertility and shade

Fusarium patch can cause significant injury. Other diseases seen occasionally include Powdery mildew and occasionally Red thread, although neither of these is devastating.

Insects:

In eastern parts of Oregon and into the Boise-Twinfalls area in Idaho, Bluegrass billbug is a common pest. Sod webworm occurs sporadically throughout the entire Northwest but rarely causes serious damage. West of the Cascades, bluegrass could be attacked by European Crane fly but there is so little bluegrass that it is hard to say whether it is a problem or not.

Shade:

Kentucky bluegrass does not perform well in shade in Western parts of the Northwest. In shade it is generally destroyed by leafspot diseases and rarely lasts more than a couple of years. East of the Cascades shade performance is better but bluegrass is still not a great shade grass. All things considered bluegrass will perform well in partial shade and in sites where it receives significant sun for 4-6 hrs during daylight. If shade is constant, mix bluegrass with other grasses better adapted to those conditions such as the fine fescues.

Stress tolerance and persistence:

Kentucky bluegrass can survive the coldest winters the Northwest has to offer. In sites subject to wind without snow cover it can suffer from desiccation injury but cold is rarely a problem for this grass. Heat stress is rarely a problem anywhere in the Northwest except perhaps the Tri-Cities or the Medford areas. Because humidity is generally low and night temperatures are fairly cool we simply don't develop the kind of heat load for long enough to cause serious problems.

Throughout all areas east of the Cascades, Kentucky bluegrass is very persistent. It is possible to find Kentucky bluegrass lawns in Central Washington that are 75 years old and still fairly pure. The same probably holds true for central and eastern Oregon and all of Idaho. West of the Cascades, Kentucky bluegrass does not persist for long periods. Early cultivars were lost to disease and because they weren't competitive in the winter when other better adapted grasses continued to grow. It isn't clear how well the newer cultivars might do over time. It is possible they would last longer but would still be replaced by other grasses in 5-10 years. In mixtures with other species such as perennial ryegrass and hard fescue bluegrass might be a significant component for a longer time. This may be an area we should revisit to see if all that breeding work has fundamentally changed the ability of bluegrass to compete for long periods.

Overall performance:

East of the Cascades under optimum climatic conditions and with optimum inputs of fertilizer, water, regular thatch control, and timely applications of herbicides, insecticides, and fungicides Kentucky bluegrass will provide as close to perfect turf as we can hope to achieve. Even with average maintenance bluegrass produces a good lawn. We still don't have any cultivars that can be fairly called low input turfgrasses.

With all the research done on Kentucky bluegrass and all of the breeding and selection work, it seems like we should have the ultimate turfgrass at our disposal. There is no question we have dozens of cultivars available that are superior to older varieties, but there are still many problems to contend with. Necrotic Ringspot is now a problem in areas that were never affected before the availability of the newer cultivars. Is this a coincidence or is there a connection? That question hasn't been answered. While bluegrass has always been a thatch forming grass some of the newer cultivars are so aggressive that thatch is almost unmanageable. Where older common type bluegrasses performed well with little Nitrogen fertilizer newer cultivars of the compact growers require fairly high Nitrogen levels to reach their potential.

West of the Cascades, bluegrass is still a marginally adapted grass. Current cultivars may perform better than older types but conditions are not optimal for Kentucky bluegrass and indigenous grasses will still be the dominant grasses in lawns over time.

Kentucky bluegrass cultivars:

There are literally hundreds of cultivars of Kentucky bluegrass and many produce outstanding turf. In recent years the spread of Necrotic Ringspot disease has forced us to consider resistance to the disease when producing recommended lists of cultivars. The cultivars listed below appear to have enhanced resistance to Necrotic Ringspot disease based on their performance in the NTEP trials or in other regional trials. In western Oregon, rust and leafspot diseases can also cause significant turf thinning.

Apparent Necrotic Ringspot tolerant cultivars*

Abbey	Dragon	Nustar	Total Eclipse
Allure	Eclipse	Odyssey	Unique***
America***	Fortuna	Princeton 105	Wildwood
Apollo***	Haga***	Quantum Leap	
Award	Impact	Rugby II	
Baronie	Jefferson	Seabring	
Brilliant***	Langara***	Showcase	Others:**
Caliber	Liberator	Sidekick	Adelphi
Challenger	Midnight	Sodnet	Cynthia
Champagne	Moonlight	SR 2000	Mystic
Chateau	Nuglade	SR 2284***	Somerset

*Based on resistance ratings for Necrotic Ringspot disease in 1996-2000 National Turfgrass Evaluation Trial.

**Based on regional field trials.

*** May be better suited to western Oregon than other bluegrasses.

For more information consult www.ntep.org.