

# The Turfgrass Family Tree

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If you've ever looked at a family tree, think of how hard it is to gather all the information necessary to trace your background. Now imagine doing it with no documentation of who your grandfather married, or who his father married. How would you construct the tree? Theoretically, you could look at all the people around you and measure every imaginable trait—hair color, eye color, height, nose shape and size—and relate this to your genetic history. You probably look more like your brother or sister than your cousin or aunt. Although this method would work, it would be nearly impossi-



A breeder test block of grasses.

ble considering the time it would take to not only gather but to analyze the information.

Now suppose you could look at the DNA from each person. While DNA makes each of us a unique individual, we all have some similarities that make us humans. Because DNA is passed on from parents to children, you have more genetic similarities to your mother and father than you do to your next-door neighbor. Even though your mother's and father's families used to be genetically distinct, they are now joined by you and your siblings (Figure 1). These are the ties that can be used to re-create a genetic family tree, human or grass.

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## Diversity and the grass family tree.

Though you can see evidence of diversity all around you, it is greatest near a species' point of origin. It is in these areas that a plant or animal has had the greatest amount of time to change according to environmental pressures. Theoretically, exposure to drought conditions or insect predation will promote survival of those individuals that are more tolerant of drought or insect damage. Perennial ryegrass, along with many other cool-season turfgrasses, originated in Europe near the Mediterranean Sea. Natural grass stands from this area represent a nearly limitless source of genetic diversity for breeders. It is from these grasses that we are trying to construct a perennial ryegrass family tree.

Just as there is variation between two species of grass (creeping bentgrass versus Kentucky bluegrass) or between two

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varieties of grass (Crenshaw versus L-93 creeping bentgrass), there is often variation between individuals within a variety of grass. This is the case with perennial ryegrass,

which is an outcrossing species (each plant requires pollen from a separate plant to produce seed). Although two individuals within a variety are more alike than two individuals from different varieties, there are still some differences we can see when we look at the DNA. These differences, and similarities, can be used to determine common genetic (parental) backgrounds.

### Does diversity matter?

With humans, we know that genetic diversity does matter. Laws prohibit siblings and first cousins from marrying in an attempt to prevent problems associated with inbreeding. Inbreeding is the mating of two individuals who are genetically more alike than the population at large. It has the effect of reducing genetic variability and enhancing problems of genetic disorders. After Queen Victoria of England

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passed the gene for hemophilia to her son and two daughters, generations of inbreeding among European royal families resulted in a higher than average occurrence of the disease. Though not all effects of inbreeding are as obviously detrimental as those of hemophilia, the gradual loss of diversity can have a profound impact on any breeding program.


### Diversity and the consumer.

At the University of Illinois, we are searching for genetic diversity using molecular techniques. Our preliminary studies have found these techniques to be successful at measuring diversity. It is our hope that we will find new and different germplasm specifically for use in the Midwestern United States.

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Although constructing a family tree of perennial ryegrass will not necessarily produce a better turf, it will provide a picture of how varieties are related. By looking at these relationships and the amount of variation present at the DNA level, we can determine which varieties of perennial ryegrass may be useful in new breeding programs. This variation may be the source for resistance to diseases or tolerance to environmental stresses. For the homeowner, this means more options for controlling diseases and less reliance on chemicals. For you, this means a more competitive stand (one that requires fewer inputs) and an overall superior turf. 

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