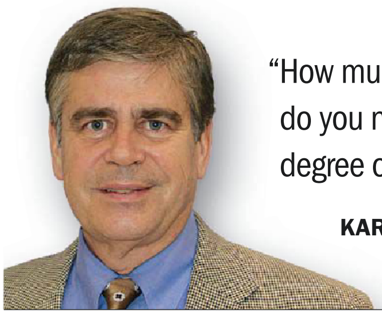

"How much diversity in functional grouping do you need? The answer depends on the degree of extreme environmental change."

KARL DANNEBERGER, PH.D., *Science Editor*

Resisting change

Climate change induced by global warming has greatly impacted the stability of the world's ecosystems. Weather patterns resulting from climate change have become more extreme. Whether it is too hot or too cold, too wet or too dry, a "normal" year seems to be a rare event.

On a smaller scale, but still just as devastating, we see how climate change has impacted our turf systems. We are seeing bermudagrass use expand further north to account for the increased stress of managing creeping bentgrass. At the same time, as we saw this past winter, extreme cold in combination with ice and snow, wreak havoc on annual bluegrass (*Poa annua*) turf around the Great Lakes region.

In natural systems, the centerpiece for stability is biodiversity. Biodiversity as related to stability, is the idea that multiple or numerous species provide stability by filling gaps that are created by a species that is sensitive to an environmental change or a biotic factor like predators and diseases. The implication often assumed is that a whole lot of species in a habitat or ecosystem are more stable than one with fewer species. This is not always true.

Species diversity has two primary components: richness (the number of species), and the composition (what the species are). When we talk about large natural systems, we often focus on species richness. However, it is the identity or what the species are and their function in the ecosystem, often called functional traits, that are important for stability. Species that have similar functional traits are grouped into similar or functional groups.

Your habitat may be species rich, but if all the species were contained in one or two functional groups the level of stability would be low. In a previous *Golfdom* column (2007 — "When are golf greens stable?") I wrote along similar lines with regard to complexity/biodiversity.

How much diversity in functional grouping do you need? The answer depends on the degree of extreme environmental change. Using a putting green as our habitat, located in a temperate region that consists of creeping bentgrass and annual bluegrass, we can see that under normal conditions we might be stable, but under extreme conditions not so much.

Let us assume our putting green is primarily annual bluegrass and is infected with the pathogen that causes the disease summer patch. In year one, the summertime temperatures are considered normal to below normal. We might see a summer patch yellow ring symptom develop on the annual bluegrass, but not much else — no turf thinning or loss to the annual bluegrass.

The second year is warmer than normal and summer patch is much more active to the degree it is killing the annual bluegrass, but at a rate equal to that of creeping bentgrass, filling in the center areas. So in this instance, the idea is that diversity in the form of the additional turfgrass species (creeping bentgrass) is contributing toward stability.

However, let's say that the third year the summer is much warmer than normal, to the point where annual bluegrass is rapidly dying at a rate where the creeping bentgrass cannot match because it is under stress due to temperature. Now we have large gaps or patches of dead grass on our green. In this situation we do not have the diversity to be stable. More specifically, the functional grouping of creeping bentgrass and annual bluegrass in this situation is not different enough to contribute to stability.

Although we do not have the plant diversity in a putting green that many other habitats may have, we do have one big advantage: We can intervene to provide some stability through management practices. In future columns we will look at how management practices impact turfgrass populations and communities.

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