FLORIDA TURF DIGEST

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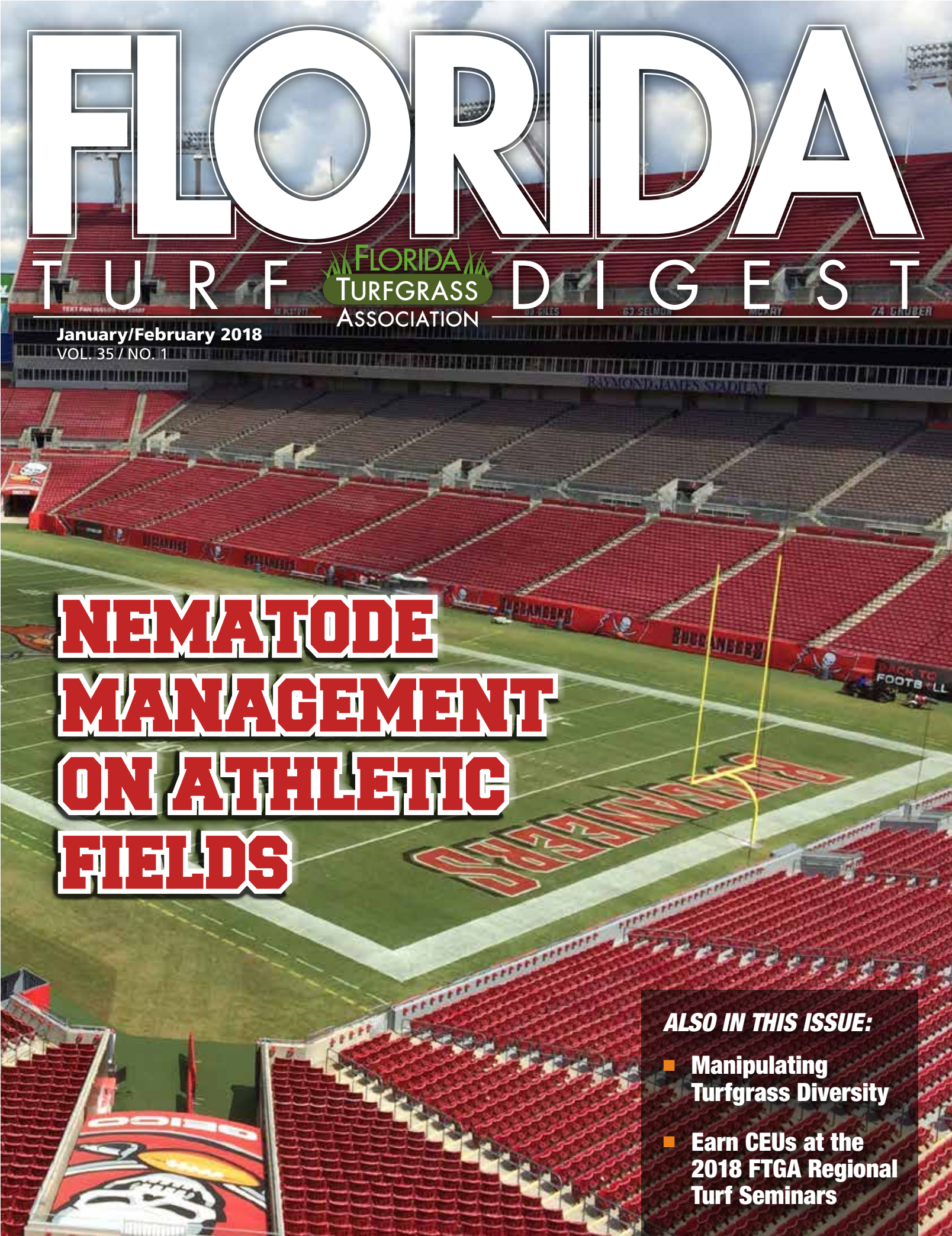

NEMATODE MANAGEMENT ON ATHLETIC FIELDS

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Manipulating Turfgrass Diversity

A Potential New Approach for More Sustainable Southern Lawns

By **Adam Dale**, *Ph.D., Assistant Professor and Extension Specialist, UF/IFAS Entomology & Nematology*

A foundation of integrated pest management (IPM) in urban and residential landscapes is to put the right plant in the right place. This form of preventive pest management can reduce plant stress, pest infestations, and pesticide applications. Although "right plant, right place" may have become cliché to some, its importance has never been greater in Florida. Matching a plant species to its local environment based on that plant's needs is critical for the plant to provide benefits. And healthy plants provide a lot of benefits. For example, trees in developed landscapes reduce temperatures, filter the air, and provide habitat for wildlife. Lawns do much of the same, filtering stormwater runoff, sequestering carbon from the atmosphere and making landscapes more attractive. Each of these services and more directly benefit human mental and physical health, which is signficant considering that 90% of Florida's 20 million residents live among these plants. The key here is that these plants need to be healthy. My lab is working toward determining methods to maintain that health without the need for superfluous inputs.

Our ability to manipulate plants in urban landscapes is one of the biggest challenges with landscape pest management. Developed landscapes are often dominated by only a few plant species because people like those species, they may be easy to produce and maintain, or they may do well and be relatively maintenance-free. However, being dominated by only a handful of plant species may be a problem if a pest comes in that prefers to attack and kill one of those species. We have seen this multiple times. For example, when Dutch elm disease *(Ophiostoma spp.)* was introduced into the U.S., it rapidly wiped out the American elm as we knew it. More recently emerald ash borer *(Agrilus planipennis)* has killed millions of ash trees throughout the eastern half of the U.S. since its introduction in 2002. Roads that were once lined with beautiful American elm or ash trees are now barren because there was a lack of diversity.

Our ability to manipulate plants in urban landscapes also presents a huge opportunity. Previous research has shown that increasing the diversity of plants in a community can increase that community's resilience to stress, whether that is a pest or environmental condition. Thus, we can, and should, use research to make evidence-based planting decisions. Cultural practices such as plant selection or manipulation are a critical early step in IPM with the goal of setting up plants for success. Selecting pest-resistant plants can be an excellent approach. Alternatively, since resistant plants are often not available, increasing the diversity of plants in an area can reduce insect pest abundance and damage by making it more difficult for plant pests to locate favored hosts and move from host to host. More importantly, increasing the diversity of plants in a given area may make that area more resilient to stress.

Insect pests (such as the southern chinch bug) regularly attack and damage Florida lawns, reducing plant services and increasing pesticide applications targeting insect pests and subsequently invading weeds. Most Florida lawns are composed of St. Augustinegrass *(Stenotephrum secundatum)*. St. Augustinegrass, like most southern turfgrass species, is produced, planted and maintained as genetic monocultures. In other words, each plant in a weed-free sod lawn is a clone of itself. These plants have been selectively bred so that we have the best of the best in terms of aesthetic quality and tolerance to stressors. Just as pest-resistant plants are excellent IPM tools, breeders have painstakingly selected turfgrass cultivars because they are superior to others and are the "pest resistant" cultivars to a multitude of stress factors such as climate, maintenance practices, disease, insects and weed pests, while remaining

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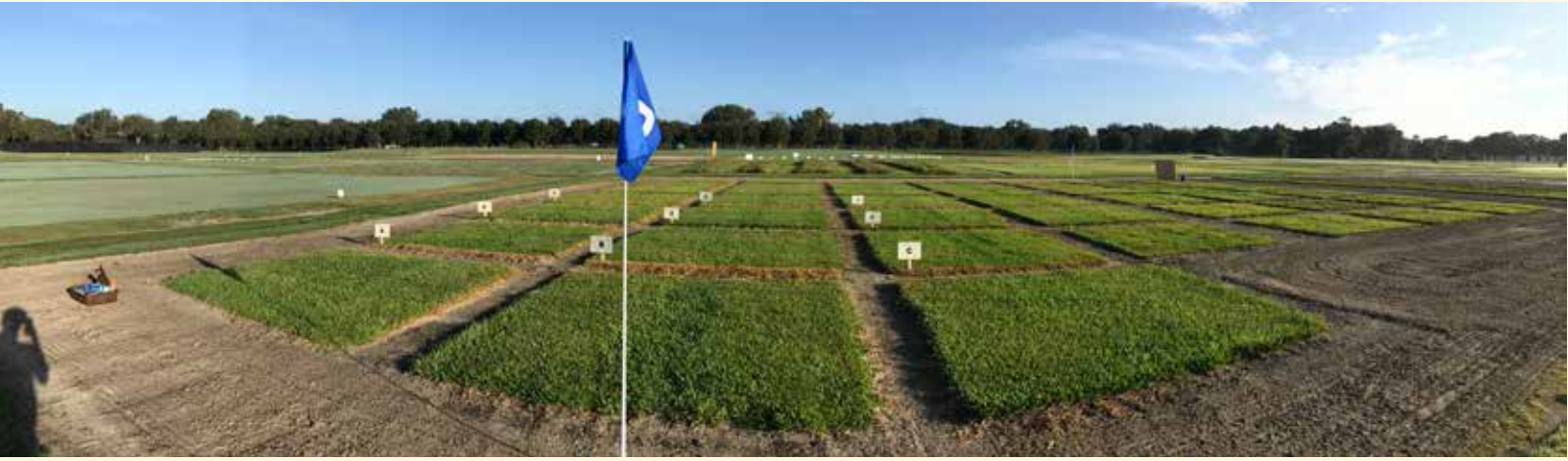

aesthetically attractive. Maintaining this superiority is only achievable if you reproduce clones of the same plant.

From a diversity perspective, this leaves something to be desired. A lack of diversity in Florida lawns could be a major issue, since over half of our 4.4 million acres of turfgrass is St. Augustinegrass. Based on our understanding of how insects and plants interact, such large stands of turfgrass monocultures may predispose lawns to attack from plant pests and repeated pesticide applications. Different turf species look very different from one another and have different maintenance requirements. However, cultivars of St. Augustinegrass are difficult to differentiate and typically have similar maintenance requirements.

My lab is currently conducting research to see if increasing the diversity of St. Augustinegrass in a lawn can reduce insect pests, their damage and the need to control them. Not only are we increasing diversity, but we are doing so by mixing cultivars that have been selected because they are the best of the best. Therefore, we are combining plants that are resistant to multiple stressors with the strategy of increasing the plant community's resilience to any threats.

To test this experimentally, we have worked with several generous Florida sod producers and the Florida Nursery, Growers and Landscape Association to plant large plots of St. Augustinegrass as cultivar mixtures and monocultures at the UF/IFAS Plant Science Research and Education Unit in Citra, Florida. We are also conducting greenhouse and laboratory experiments to determine the effects of mixing St. Augustinegrass cultivars on its most damaging insect pests: southern chinch bug, tropical sod webworm, and fall armyworm. Our primary goal is to determine the effects of mixing cultivars on factors such as pest development, reproduction, population growth, pest establishment, and plant damage. As insect-centric as I like the world to be, I realize that insects are not all that matters. This is certainly the case with turfgrasses in Florida where drought, nematodes, pathogens, weeds and other pests are a high priority. Fortunately, increasing turfgrass diversity may provide benefits on multiple fronts. Research in cool-season turf and agricultural systems has shown that increasing plant diversity can also increase tolerance to drought, disease, and weed establishment. These are other factors that we hope to investigate as this research moves forward.

So, what will happen if we plant a mixture of multiple St. Augustinegrass cultivars in the same lawn? Our prediction is that mixtures will be more resistant to insect pests and provide greater aesthetic and environmental benefits. Our long-term answer is, "We don't know." Graduate students, Ethan Doherty and Brianna Whitman, have been working hard to figure this out, and their preliminary evidence is encouraging. Southern chinch bug populations seem to grow significantly more slowly when developing in more diverse compared to monoculture lawns. Caterpillar pests develop into much smaller individuals and do not survive as well when feeding on diverse compared to monoculture lawns. Interestingly, caterpillars also prefer to feed on monocultures over cultivar mixtures when presented with the option.

Finally, at this year's North-Central Florida Turfgrass Field Day, graduate student, Brianna Whitman, presented turf industry professionals with three St. Augustinegrass lawn options: monocultures, mixtures of two cultivars, and mixtures of four cultivars. She asked them to rate each one on a scale of 1 to 9, where 9 is the best. On average, participants rated the mixture of four St. Augustinegrass cultivars higher than monocultures and mixtures of two cultivars. This suggests that mixing cultivars could gain traction in application.

There is still a lot of research to do, but if these predictions and our preliminary evidence hold true, this planting strategy could have major benefits for Florida's turf and landscape industries. As urbanization continues to progress, restrictions on water, fertilizer and pesticide use increase, and landscape plant health becomes more important, we must come up with alternative approaches to management. My lab's objective is to help figure those out, and we are looking forward to working with Florida's turf and landscape industries to do so.

Adam Dale is an assistant professor and extension specialist of turf and ornamental entomology at the University of Florida in Gainesville, Florida. His primary responsibilities are to address the pest management needs of Florida's green industry and disseminate information to industry professionals across the state. He aims to develop more sustainable pest control strategies by investigating interactions between plants, insects and their environment.