# Lawn & Landscape Insects and their Control

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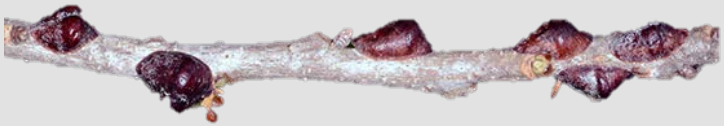
# Landscape plants provide benefits

- Benefit people
  - Temperature reduction
  - Air filtration
  - Aesthetic enhancement
  - Recreation
- Benefit the environment
  - Carbon sequestration
  - Air & water filtration
  - Wildlife habitat

# Unfortunately…

Herbivorous insects are more damaging in urban areas

- The evidence
  - Southern chinch bug, *Blissus insularis*
  - Azalea lace bug, *Stephanitis pyrioides*
  - White peach scale, *Pseudaulacaspis pentagona*
  - Oak lecanium scale, *Parthenolecanium quercifex*
  - Gloomy scale, *Melanaspis tenebricosa*
  - Others…



Raupp et al. 2010

# Landscapes and People

- Insect pests reduce plant services
- Reliance on chemical inputs or replanting is not sustainable

<u>This means:</u>

- Our cultural and pest management practices can have a HUGE effect on people

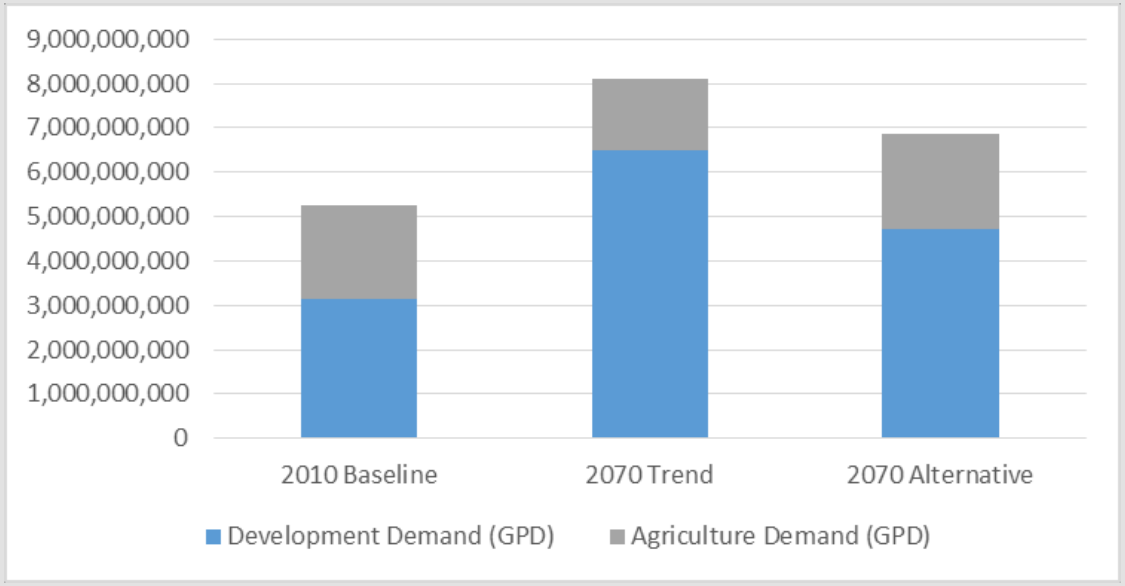
# Urban & residential landscapes

- Most rapidly expanding land-use type in Florida
- Over 90% of 20 million Floridians live here
- Turfgrass and ornamental plants are the vegetation of these ecosystems

- Insect pests that attack these plants directly affect people and the ecosystem

# The future brings challenges

- Urbanization-related water use is projected to increase by over 100% by 2070




www.1000friendsofflorida.org/Florida2070

# The future brings challenges

- Increasing legal pressures and regulations may reduce management options
  - Fertilizer use, water use, pesticide use…

| Irrigate only on your day(s), and not between 10 am and 4 pm | | |
|---|---|---|
| **Location** | **Summer** (2nd Sun. in Mar - 1st Sun. in Nov ) | **Winter** (1st Sun. in Nov - 2nd Sun. in Mar) |
| Odd House # | Wednesday and/or Saturday | Saturday |
| Even House # | Thursday and/or Sunday | Sunday |
| Non-Residential/ Commercial | Tuesday and/or Friday | Tuesday |

Alachua Co.



1


T.J. Walker


John L. Capinera

# Tuttle Mealybug
(*Brevennia rehi*)



- Found globally
- Reported in Orange, Lee, Collier, Duval, Walton, Palm Beach Counties; Arizona, California, and Texas
- Attacks zoysiagrass and bermudagrass
- Bodies are <2 mm long, pink; make white wax

# Tuttle Mealybug

- Hide between the grass blade and stem
- Produce a white wax

Little is known about its biology or natural enemies

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# Management Options

- Reduce habitat that's conducive to piercing-sucking arthropods
  - Minimize thatch (verticut)
  - Moderate fertility
- After reducing thatch, mow low and remove clippings immediately prior to insecticide application

# Management Options

- Product options: Use systemic products
  - Neonicotinoids (Merit, Arena, Meridian, Zylam)
  - If large infestation, combine with a contact toxic product (e.g. pyrethroid)
- Use sufficient spray volume in liquid applications
- Rotate product IRAC #s!

# Another recent challenge

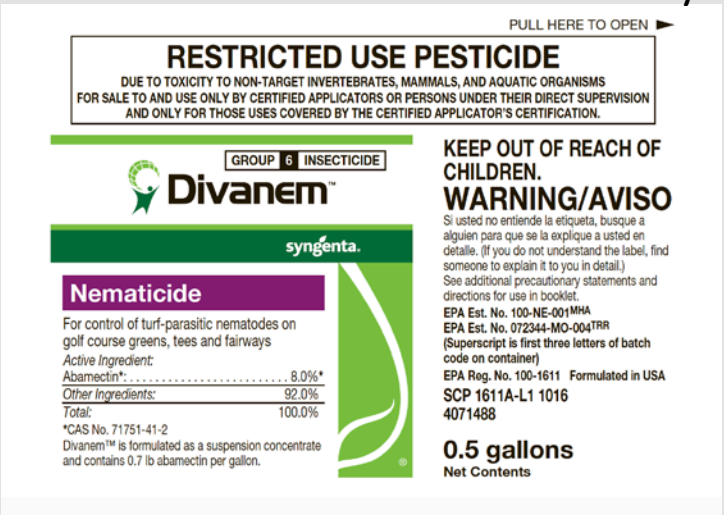
# Mite Pests of Turfgrass

- Bermudagrass mite & Zoysiagrass mite
  - Eriophyid mites
  - EXTREMELY small (0.2mm)
  - Live & feed under leaf sheath
  - Yellow, tufted areas of grass
  - Rapid generation time (~2 weeks)

# Management options

*Mow low & remove clippings

*Golf course use only


PULL HERE TO OPEN

RESTRICTED USE PESTICIDE

DUE TO TOXICITY TO NON-TARGET INVERTEBRATES, MAMMALS, AND AQUATIC ORGANISMS
FOR SALE TO AND USE ONLY BY CERTIFIED APPLICATORS OR PERSONS UNDER THEIR DIRECT SUPERVISION AND ONLY FOR THOSE USES COVERED BY THE CERTIFIED APPLICATOR'S CERTIFICATION.

GROUP 6 INSECTICIDE

Divanem™

syngenta.

Nematicide

For control of turf-parasitic nematodes on golf course greens, tees and fairways

| | |
|---|---|
| *Active Ingredient:* | |
| Abamectin*: | 8.0%* |
| *Other Ingredients:* | 92.0% |
| *Total:* | 100.0% |

*CAS No. 71751-41-2

Divanem™ is formulated as a suspension concentrate and contains 0.7 lb abamectin per gallon.

KEEP OUT OF REACH OF CHILDREN.

WARNING/AVISO

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

See additional precautionary statements and directions for use in booklet.

EPA Est. No. 100-NE-001MHA

EPA Est. No. 072344-MO-004TRR

(Superscript is first three letters of batch code on container)

EPA Reg. No. 100-1611 Formulated in USA

SCP 1611A-L1 1016

4071488

0.5 gallons

Net Contents

## Resistant cultivars

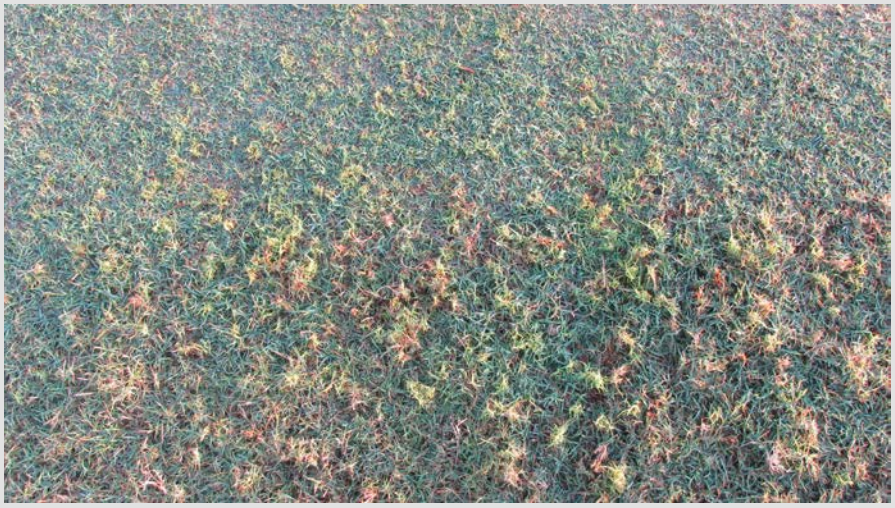
- Tifsport & Tifway

## Highly susceptible cultivars

- Celebration

## Chemical control

- Dursban
- Azadirachtin
- Divanem



# Mite Pests of Turfgrass

- Divanem (abamectin) was recently relabeled for mite control in turfgrass on golf courses

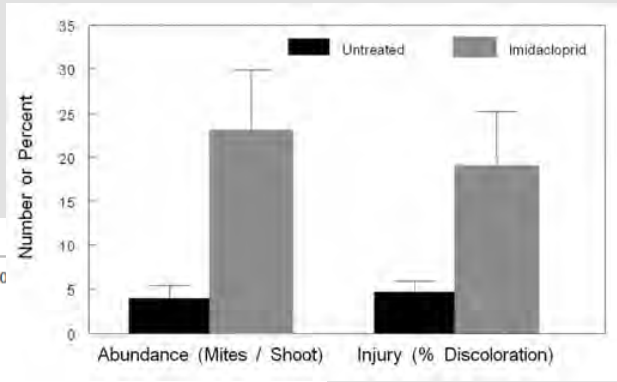
Table 1. Insecticides registered for use on turfgrass in Florida.

| Active Ingredient | Trade Names | Chemical Class | IRAC Classification | Mode of Action | Notes |
|---|---|---|---|---|---|
| Bermudagrass Mite | | | | | |
| Azadirachtin | Azatrol, Neemix, Turplex | Azadirachtin | 18B | Ecdysone agonist / molting disruptor | |
| Bifenthrin | Talstar, Menace | Pyrethroids, Pyrethrins | 3 | Sodium channel modulators | |
| Chlorpyrifos | Dursban, Chlorpyrifos SPC | Organophosphates | 1B | Acetylcholine esterase inhibitor | For use on sod farms |
| Deltamethrin | Deltagard G | Pyrethroids, Pyrethrins | 3 | Sodium channel modulators | |
| Dicofol | Dicofol 4E, Kelthane | Organochlorine | 2A | GABA-gated chloride channel blockers | Sod farms and non-residential only. |
| Lambda-cyhalothrin | Battle, Demand, Scimitar, Cyonara | Pyrethroids, Pyrethrins | 3 | Sodium channel modulators | |
| Zeta-cypermethrin + Bifenthrin +Imidacloprid | Triple Crown Golf, T&O | Pyrethroids, Neonicotinoids | 3, 4A | Sodium channel modulators, Nicotinic acetylcholine, receptor agonists/antagonists | |

Buss & Dale. 2016. EDIS #ENY-300

# Pyrethroids cause secondary pest outbreaks

- Secondary pests – herbivores that are common, but typically remain below damaging levels (e.g., mites, scale insects, aphids)




HORTICULTURAL ENTOMOLOGY

**Reducing Insecticide Volume and Nontarget Effects of Ambrosia Beetle Management in Nurseries**

STEVEN D. FRANK[1,2] AND CLIFFORD S. SADOF[3]

J. Econ. Entomol. 104(6): 1960–1968 (2011); DOI: http://dx.doi.org/10.1603/EC11124

**ABSTRACT** Ambrosia beetles (Coleoptera: Curculionidae: Scolytinae) are increasingly important pests of nursery-grown trees because of the arrival of several invasive species. Ambrosia beetles bore into young trees and inoculate them with ambrosia fungus, which interferes with vascular transport resulting in limb or tree death. In spring, when beetles are active, growers make frequent applications of pyrethroid insecticides to susceptible tree species to deter beetles from boring into trees. Applications often are made with airblast sprayers that forcefully release insecticide mist that billows through nursery beds. Our objective was to compare the environmental, nontarget, and economic effects of airblast sprayer applications to applications made with a new dual-nozzle spray wand that makes targeted applications only to tree trunks where beetles attack. Through replicated experiments at commercial nurseries, we found that 5 times more insecticide was released by airblast sprayers than the manual spray wand. The extra insecticide from airblast applications landed on tree canopies, between rows, and left the nursery beds as drift. As a consequence of not spraying tree canopies, 50% more natural enemies and 50% fewer spider mites were captured in nursery beds treated with the manual spray wand than beds treated with the airblast sprayer. Manual applications require 12 times more labor than airblast applications. However, increased need for expensive miticide applications may make manual applications an economically feasible strategy for integrated pest management (IPM) of ambrosia beetles in nurseries.

**KEY WORDS** economic analysis, insecticide coverage, *Oligonycus aceris*, *Xylosandrus crassiusculus*, secondary pest outbreak

Arboriculture & Urban Forestry 38(2): March 2012

Arboriculture & Urban Forestry 2012. 38(2): 37–40

**Effects of Imidacloprid on Spider Mite (Acari: Tetranychidae) Abundance and Associated Injury to Boxwood (*Buxus* spp.)**

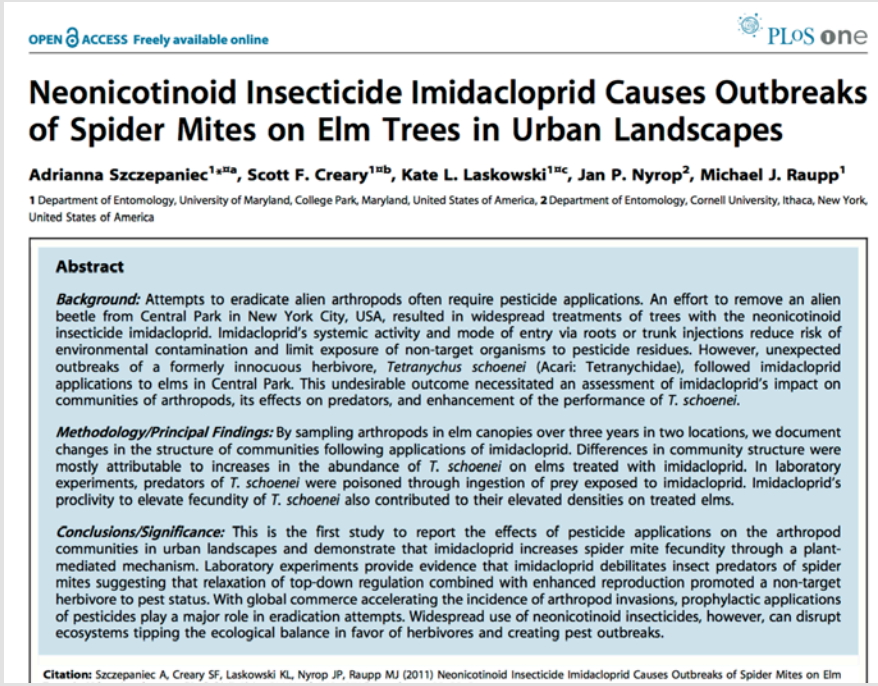
Adrianna Szczepaniec and Michael J. Raupp

**Abstract.** Boxwoods are one of the most widely used woody shrubs in managed landscapes, but they suffer frequent attack by the boxwood leafminer (*Monarthropalpus flavus*). The neonicotinoid insecticide imidacloprid is highly efficacious in reducing the abundance of *M. flavus* when applied as a foliar spray or a soil drench. Recent reports of elevated populations of spider mites following applications of imidacloprid to other species of woody plants prompted an investigation to determine the effects of imidacloprid on abundance of a specialist spider mite, *Eurytetranychus buxi*, and the resultant damage it causes. Boxwoods treated with imidacloprid housed significantly more *E. buxi* and sustained more discoloration than untreated boxwoods. Moreover, there was a direct relationship between the abundance of *E. buxi* and the amount of associated injury. Arborists and landscape managers should be aware of the potential for elevated abundance of spider mites on boxwoods and greater levels of discoloration following applications of imidacloprid.

**Key Words.** *Buxus* spp.; *Eurytetranychus buxi*; Imidacloprid; Injury; *Monarthropalpus flavus*; Secondary Pest Outbreak.

# Imidacloprid may also make mite problems worse

- Imidacloprid can reduce the biological control of mites by natural enemies
- Mites feeding on plants treated with imidacloprid produce more offspring!



OPEN ACCESS Freely available online

PLoS one

**Neonicotinoid Insecticide Imidacloprid Causes Outbreaks of Spider Mites on Elm Trees in Urban Landscapes**

**Adrianna Szczepaniec[1¤a], Scott F. Creary[1¤b], Kate L. Laskowski[1¤c], Jan P. Nyrop[2], Michael J. Raupp[1]**

**1** Department of Entomology, University of Maryland, College Park, Maryland, United States of America, **2** Department of Entomology, Cornell University, Ithaca, New York, United States of America

**Abstract**

***Background:*** Attempts to eradicate alien arthropods often require pesticide applications. An effort to remove an alien beetle from Central Park in New York City, USA, resulted in widespread treatments of trees with the neonicotinoid insecticide imidacloprid. Imidacloprid's systemic activity and mode of entry via roots or trunk injections reduce risk of environmental contamination and limit exposure of non-target organisms to pesticide residues. However, unexpected outbreaks of a formerly innocuous herbivore, *Tetranychus schoenei* (Acari: Tetranychidae), followed imidacloprid applications to elms in Central Park. This undesirable outcome necessitated an assessment of imidacloprid's impact on communities of arthropods, its effects on predators, and enhancement of the performance of *T. schoenei*.

***Methodology/Principal Findings:*** By sampling arthropods in elm canopies over three years in two locations, we document changes in the structure of communities following applications of imidacloprid. Differences in community structure were mostly attributable to increases in the abundance of *T. schoenei* on elms treated with imidacloprid. In laboratory experiments, predators of *T. schoenei* were poisoned through ingestion of prey exposed to imidacloprid. Imidacloprid's proclivity to elevate fecundity of *T. schoenei* also contributed to their elevated densities on treated elms.

***Conclusions/Significance:*** This is the first study to report the effects of pesticide applications on the arthropod communities in urban landscapes and demonstrate that imidacloprid increases spider mite fecundity through a plant-mediated mechanism. Laboratory experiments provide evidence that imidacloprid debilitates insect predators of spider mites suggesting that relaxation of top-down regulation combined with enhanced reproduction promoted a non-target herbivore to pest status. With global commerce accelerating the incidence of arthropod invasions, prophylactic applications of pesticides play a major role in eradication attempts. Widespread use of neonicotinoid insecticides, however, can disrupt ecosystems tipping the ecological balance in favor of herbivores and creating pest outbreaks.

**Citation:** Szczepaniec A, Creary SF, Laskowski KL, Nyrop JP, Raupp MJ (2011) Neonicotinoid Insecticide Imidacloprid Causes Outbreaks of Spider Mites on Elm

# Alternatives

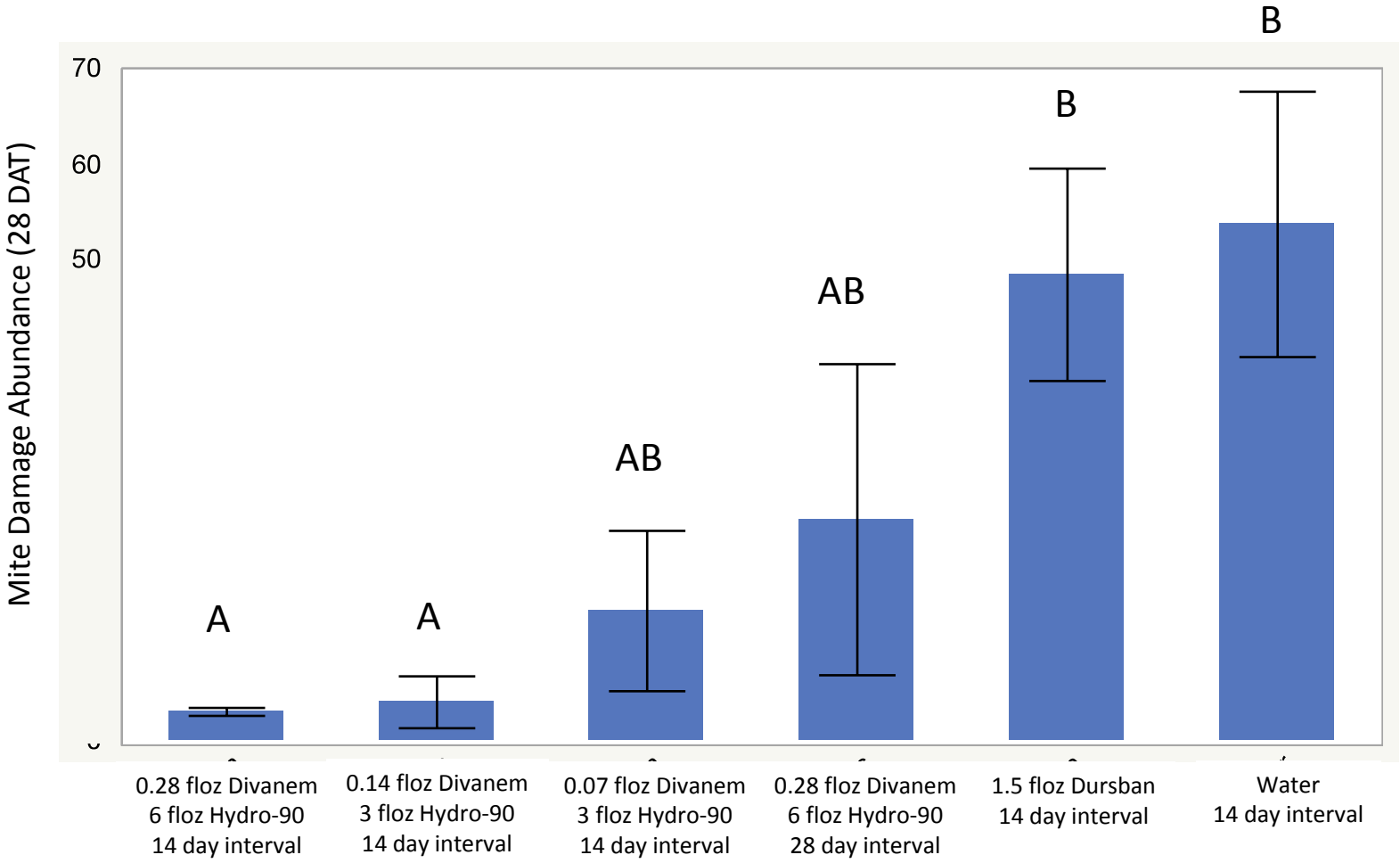
- Abamectin is an attractive alternative
- *In combination with an integrated approach

| Product | Form | Rate/1000 $ft^2$ | App. Interval | Special Instructions |
|---|---|---|---|---|
| **Water** | | | | |
| **Divanem + Hydro-90** | 0.7SC SC | 0.28 fl oz 6 fl oz | 14 day | 4 applications |
| **Divanem + Hydro-90** | 0.7SC SC | 0.14 fl oz 3 fl oz | 14 day | 4 applications |
| **Divanem + Hyrdo-90** | 0.7SC SC | 0.07 fl oz 3 fl oz | 14 day | 4 applications |
| **Divanem + Hydro-90** | 0.7SC SC | 0.28 fl oz 6 fl oz | 28 day | 4 applications |
| **Dursban** | 2E | 1.5 fl oz | 14 day | |

# Bermudagrass Mite Control


$F_{5,18} = 0.77$, $P = 0.5815$

# Bermudagrass Mite Control




$F_{5,18} = 4.48$, $P = 0.0079$

# Bermudagrass Mite Control

- Use an IPM approach
- Mow low and collect clippings (reduces damage and mite abundance)
- 0.14 floz + 3 floz Hydro-90 per 100 gal showed best control

# Overarching Objective

**More sustainable solutions**

- How can we incorporate ecological principles into current landscape management practices to reduce non-renewable inputs?

# Some Pests Dominate

- **Southern chinch bug** is the most damaging insect pest of turf in Florida
- **Tropical sod webworm** and **fall armyworm** are the most damaging caterpillar pests
- Each pest is targeted with frequent wall-to-wall insecticide applications throughout the year

# What factors of landscapes affect herbivore pressure?

- Plant stress
- Plant selection
- Habitat disturbance
- Microclimate conditions
- Presence/absence of natural enemies
- Plant diversity & the abundance of host plants

# Why does diversity matter?

- Basic genetic diversity increases a population's resilience to pests

# Why does diversity matter?

Insect ecology predicts, that as plant diversity and complexity increase:

- Herbivores will become less abundant and damaging
- Natural enemies will become more abundant and diverse

# Urban Plant Diversity

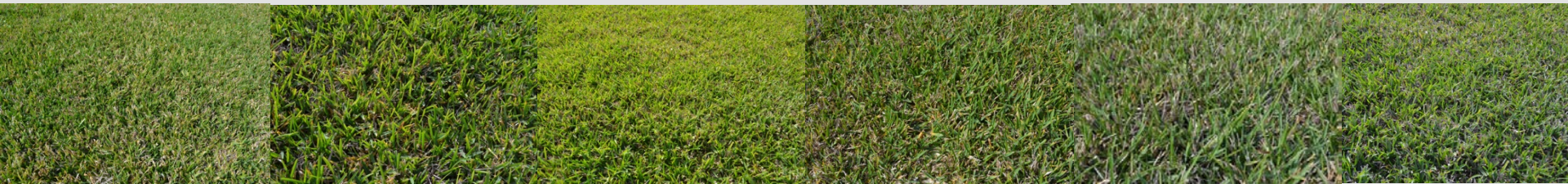
- Urban landscapes are often dominated by one or a few plant species, which may predispose them to challenges

**4.4 million acres of turf, >50% of which is St. Aug, of which >80% is 'Floratam'**

| Florida Turfgrass Production | | |
|---|---|---|
| Type | % | No. species |
| St. Augustinegrass | 51% | 1 |
| Bahiagrass | 33% | 1 |
| Bermudagrass | 7.4% | Multiple |
| Zoysiagrass | 5.1% | 2-3 |
| Centipedegrass | 3% | 1 |

# What if we increase lawn diversity?

- Mixing turfgrass species may not meet industry needs (sod production, aesthetics, plant competition, etc)
- Mixing turfgrass cultivars may reduce insect pests and their damage, while conserving the traits we desire



# St. Augustinegrass Diversity

## Six St. Augustinegrass cultivars

- Floratam
- Palmetto
- Bitterblue
- Classic
- Seville
- Captiva

3 Treatments

- Monoculture (M1)
- Mixture of 2 cultivars (M2)
- Mixture of 4 cultivars (M4)

M1

M2

M4

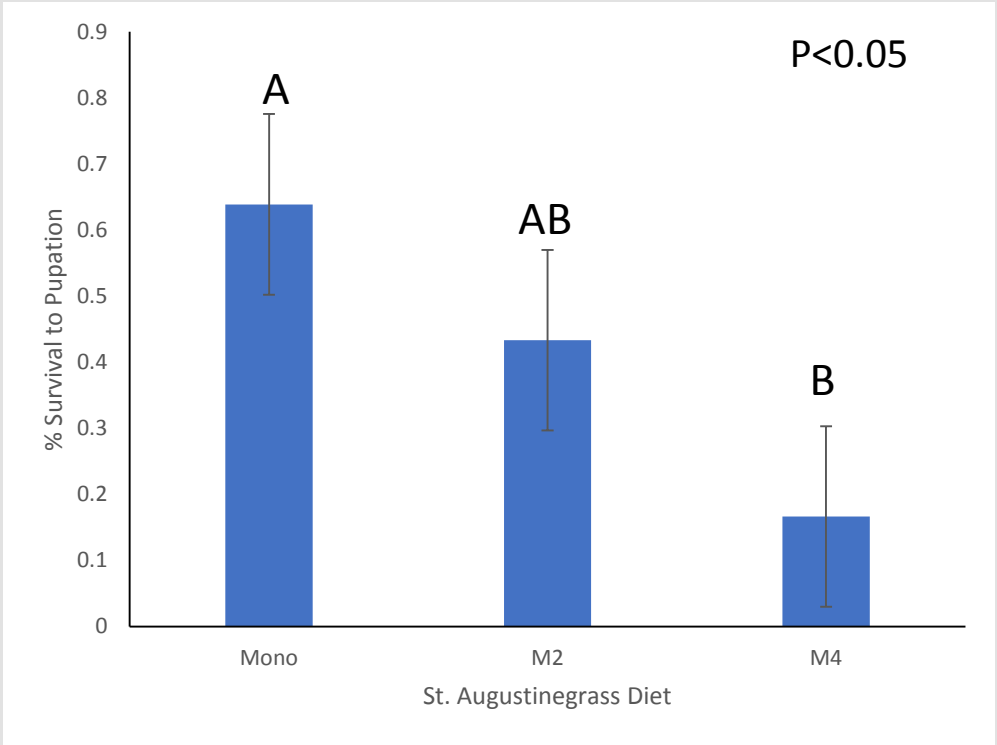

13


14
12

# Lab Feeding Experiments

# The effect of diversity on tropical sod webworm

- Raised tropical sod webworm on each St. Augustine mixture treatment: M1, M2, M4
- Tracked development rate, body size, survival and more

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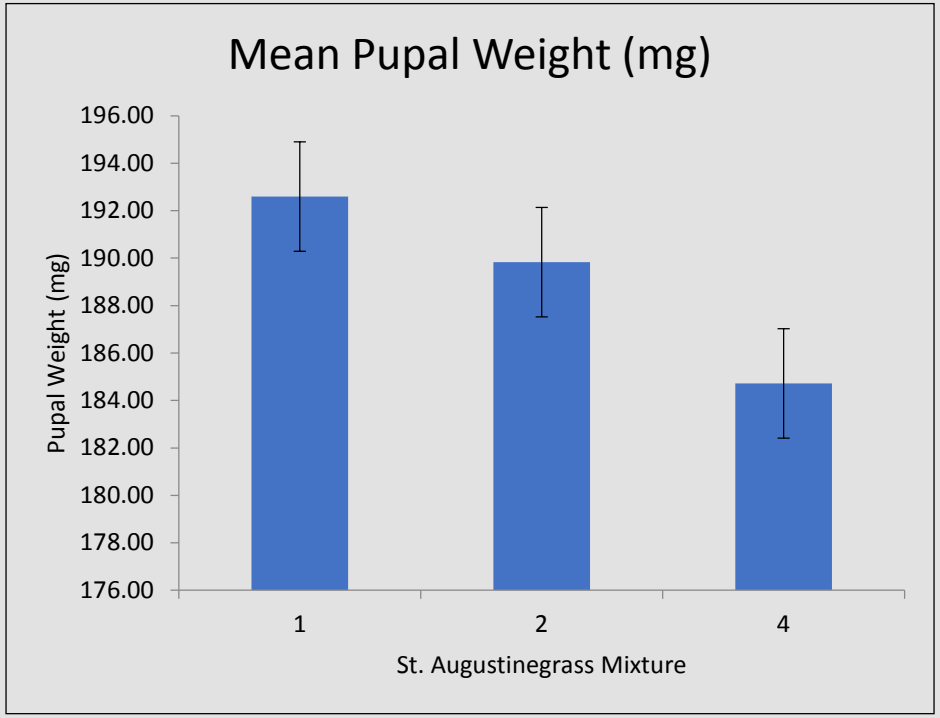
# How does diversity affect fall armyworm?

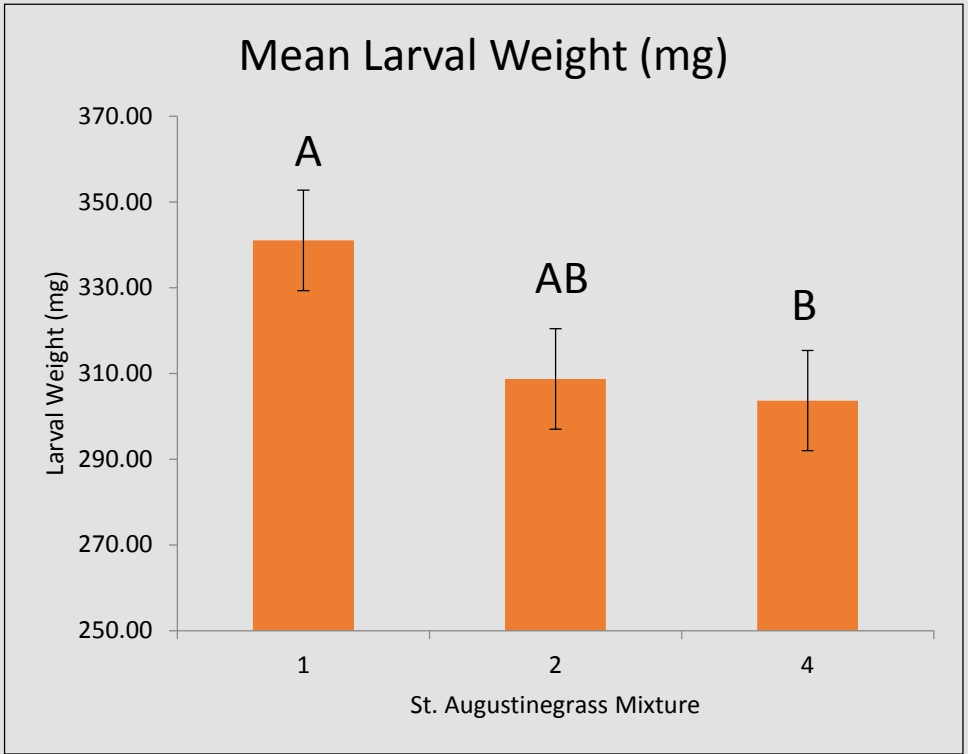
- Raised fall armyworms on each treatment of St. Augustine: M1, M2, & M4
- Tracked development rate, body size, survival, and more

# Effects on Size



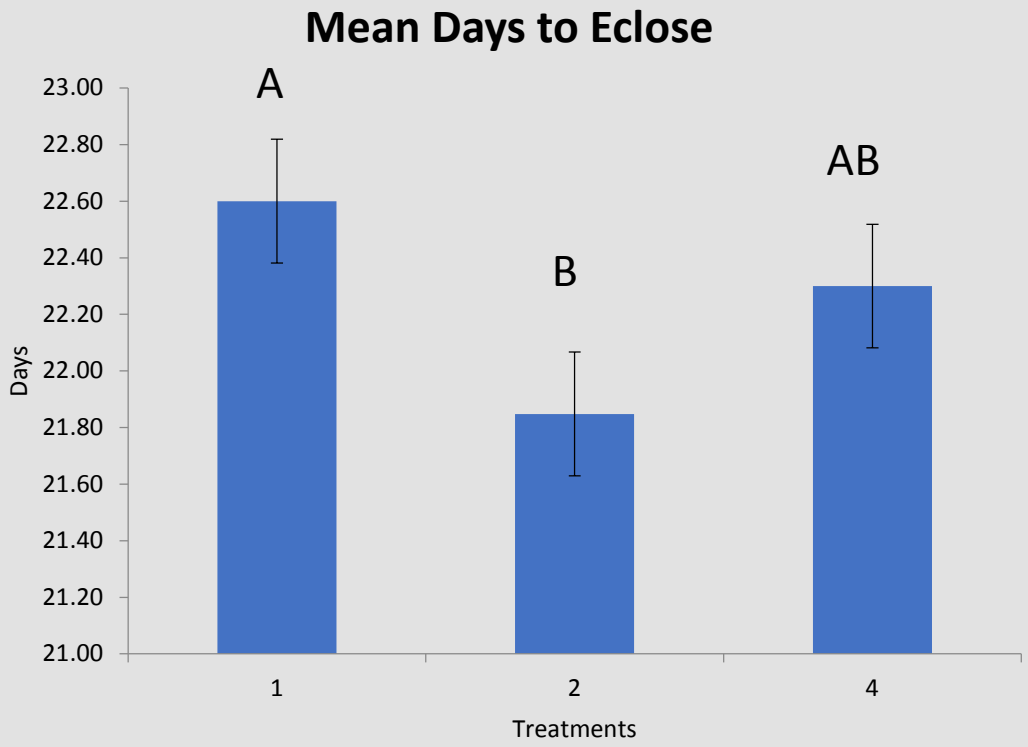

| F Ratio | P-Value |
|---|---|
| 2.4897 | 0.0859 |

| F Ratio | P-Value |
|---|---|
| 4.1834 | 0.0167* |



# Effects on Development Time

- Armyworms feeding on mixtures of two cultivars develop into moths more slowly than those feeding on other treatments



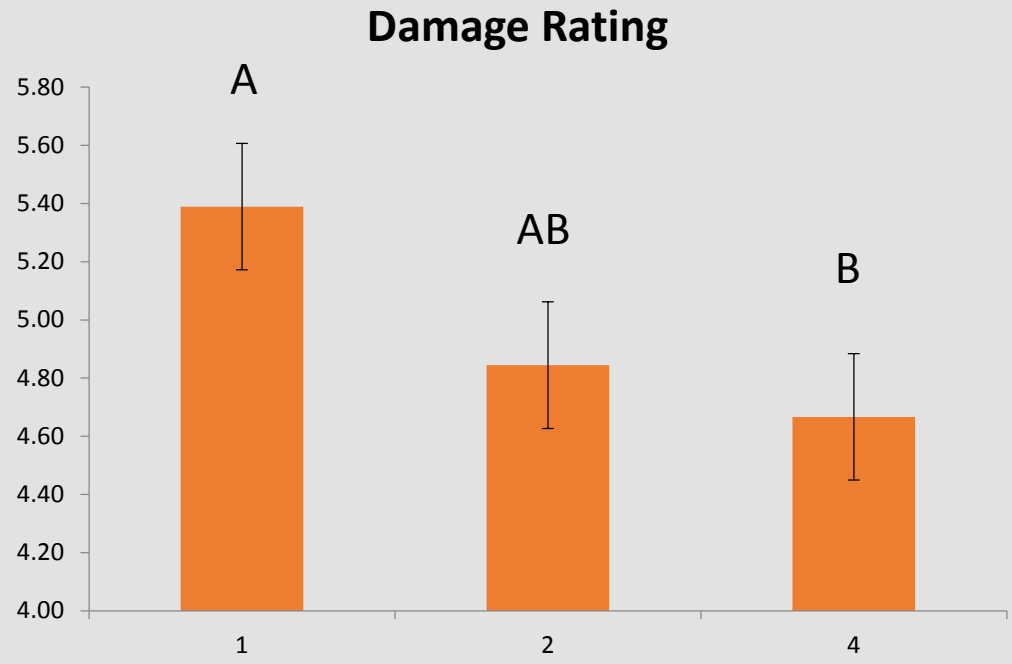

| F Ratio | P-Value |
|---|---|
| 4.6517 | 0.0110* |

# How do effects change when cultivars are planted together?

- Planted in pots as stolons
- Two second instar fall armyworm caterpillars to each pot

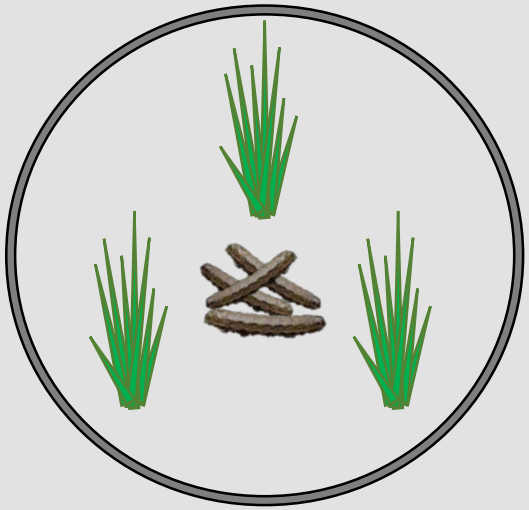
# Effects of Diversity on Plant Damage

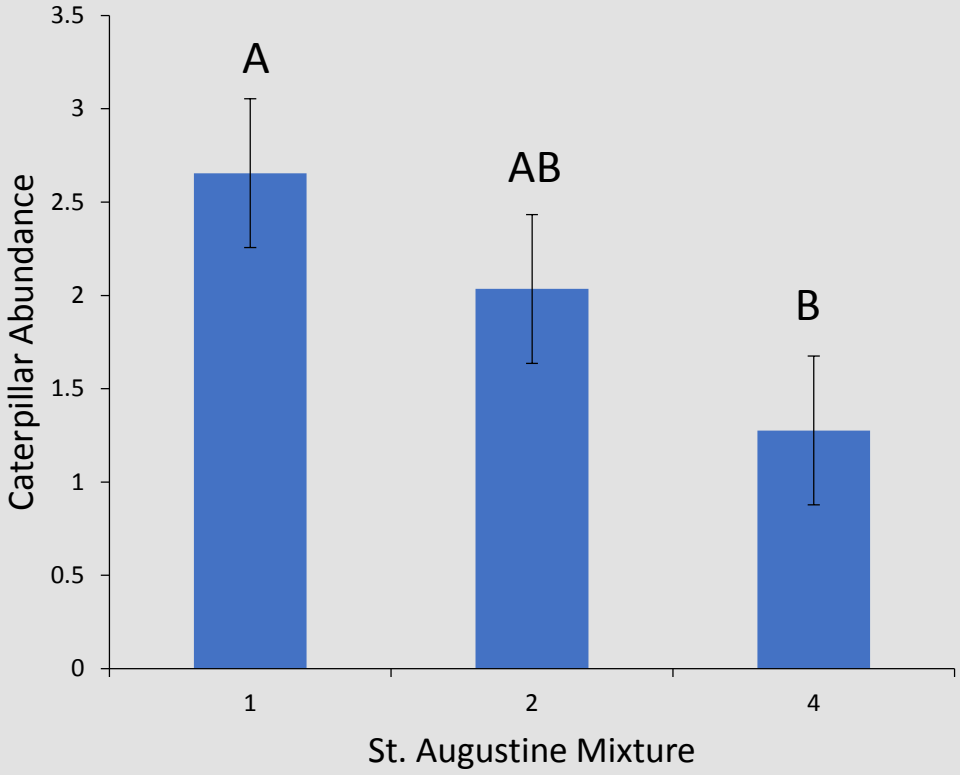
- Rated herbivory damage to each pot at then end of larval development during each experiment replicate



# Caterpillars Choose!

- Caterpillars choose to feed on monocultures over mixtures of four cultivars





# What about effects on chinch bugs?

- Chinch bugs are the most economically damaging insect pests of turfgrass in the southeastern U.S.

- Applicators make up to 6 – 8 wall-to-wall insecticide applications targeting chinch bugs per year


Joseph Giuliano





# Sampling for Arthropods

- Monthly pitfall and bug-vac samples to quantify the abundance and diversity of arthropods in each plot

- Determine the abundance of southern chinch bug within each plot/treatment

# Chinch bug fitness

- We are currently determining the effect of mixing St. Augustinegrass cultivars on southern chinch bug survival, reproduction, and damage

# We Really Care About the Plants

- How does mixing St. Augustinegrass cultivars affect aesthetic quality, agronomic traits, and marketability?

- Monthly turf quality ratings, turf color & density measurements, and industry professional surveys


M1
M4
M2
M2
M4
M1
Joseph Giuliano

# Can people tell a difference?

- We surveyed 60 turfgrass and landscape professionals to see if they could differentiate mixtures from monocultures
- Presented them with M1, M2, & M4


**Figure 2.**

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# Can people tell a difference?

- We surveyed 83 turfgrass and landscape professionals to see how they rated mixtures and monocultures
  - Scale of 1 – 9, how good does each plot look?

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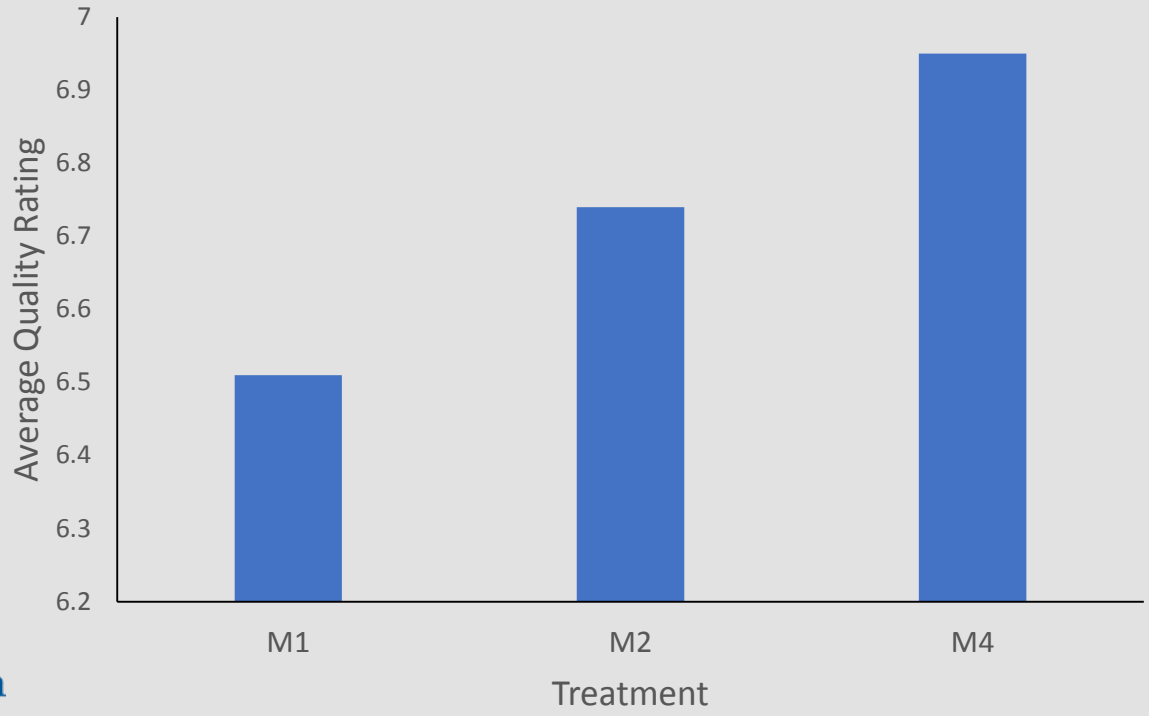
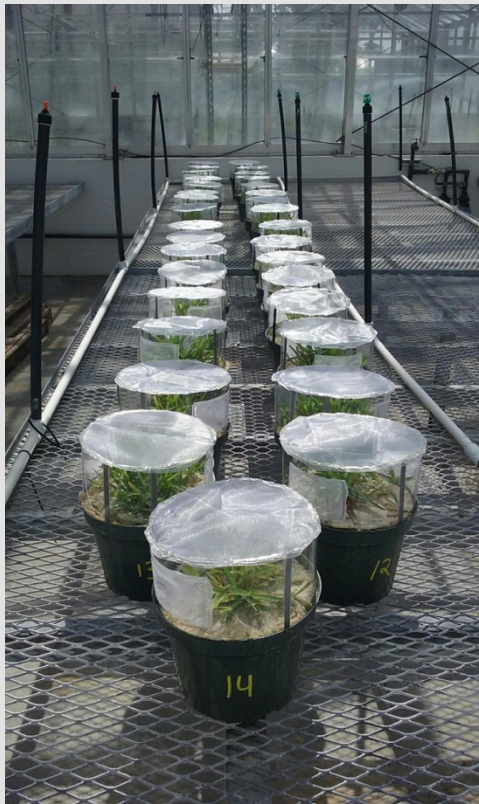
  - Scale of 1 – 9, how good does each plot look?



# Ongoing research

- Stay tuned for more results!
- Several experiments underway with chinch bugs, caterpillars, and field plots
- See it in person at the field day this fall!

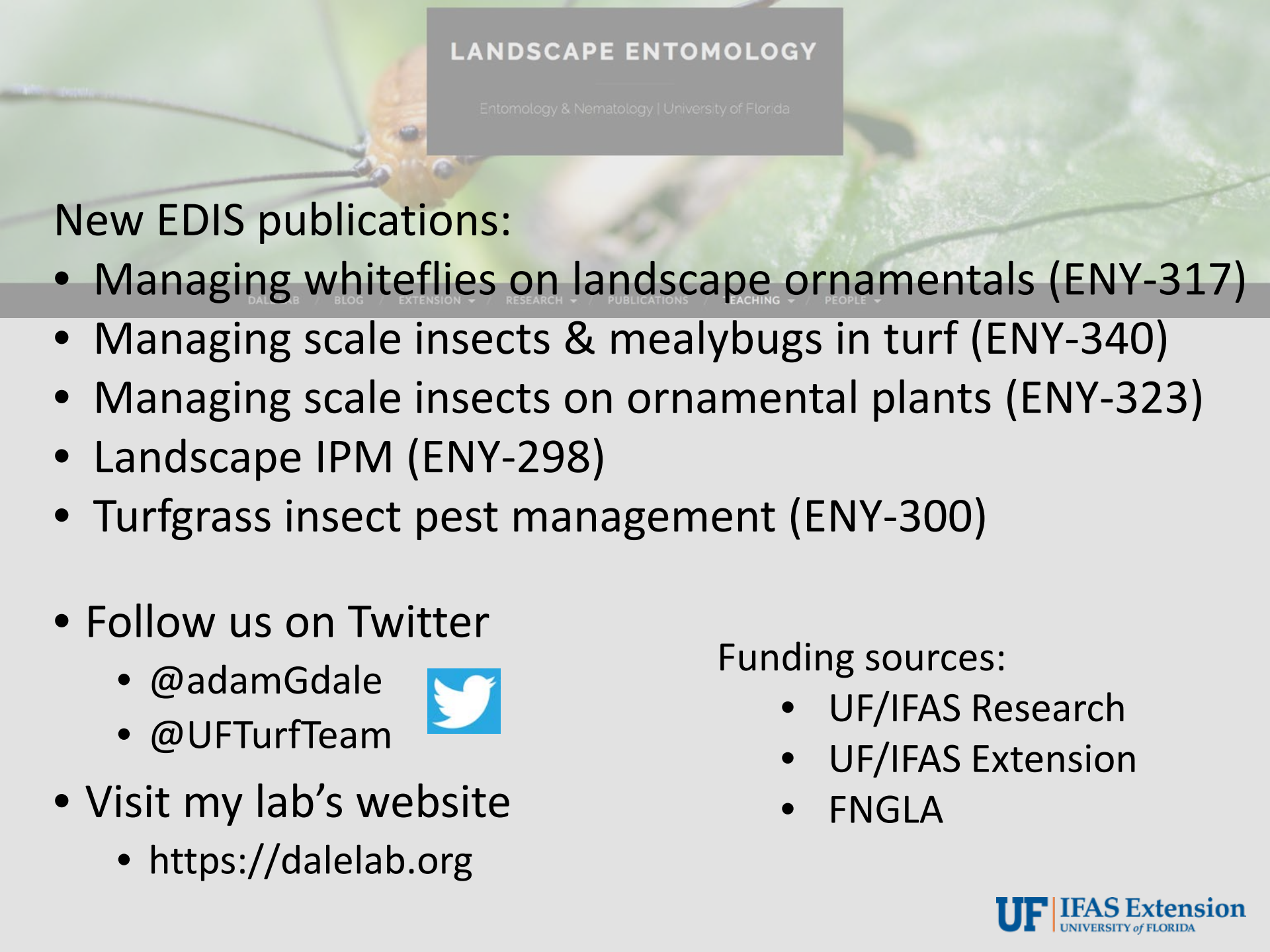
# Manipulating St. Augustinegrass Diversity

Brianna Whitman, MS graduate student

- How does manipulating turf diversity affect southern chinch bug success?
- How does increasing turf diversity affect the lawn and its acceptability?


Ethan Doherty, MS graduate student

- How does manipulating turf diversity affect caterpillar success?
- Tropical sod webworm & Fall armyworm




New EDIS publications:

- Managing whiteflies on landscape ornamentals (ENY-317)
- Managing scale insects & mealybugs in turf (ENY-340)
- Managing scale insects on ornamental plants (ENY-323)
- Landscape IPM (ENY-298)
- Turfgrass insect pest management (ENY-300)

- Follow us on Twitter
  - @adamGdale
  - @UFTurfTeam
- Visit my lab's website
  - https://dalelab.org

Funding sources:

- UF/IFAS Research
- UF/IFAS Extension
- FNGLA

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# The Helpful, Harmful, Harmless Bug Deck is Back!!!


Visit my lab's website: https://dalelab.org

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