Ornamental Plant Diversity and its Benefits to Urban Landscapes in Florida

Urban Landscape Summit, CLCE
20 March 2019
Sandra B. Wilson, Professor
Dept of Environmental Horticulture

60% Research/40% Teaching Appointment

• Research
  – Characterizing the invasive potential of ornamental plants in Florida
  – Introduction, production and use of native plants for urban landscapes

• Teaching
  – Native Florida Landscaping (ORH 3815/5817C)
  – Annual and Perennial Gardening (ORH 4804C/5021C)
  – Plant Propagation, online (PLS 3223/5222)

http://irrecenvhort.ifas.ufl.edu
The Value of Diversity

- Genetic pool (seed propagation)
- Increased bird and pollinator attraction
- Year round ecosystem services
  - Size
  - Flower and fruit time
  - Shelter
  - Leaf persistence
- Aesthetics - non-monoculture

Ornamental Plant Industry

- Florida has the second largest ornamental industry in the U.S.
- Total ornamental industry sales in FL were estimated at $10.71 billion in 2015.
- At least 5,000 species are available from over 10,400 firms.
- 45.2% of retailer firms surveyed offered “Florida Friendly Plants” (Hodges et al., 2016)
Native Plant Industry

- Florida has diverse ecosystems of 3,299 native plant species, 230 are endemic (Wunderlin et al., 2019)

- Florida native plants represented 15.5% of nursery sales.

The Value of Natives

- Tolerant of our climate patterns
- Can be drought tolerant once established
- May require less fertilizer and pesticides
- Less maintenance, reduce carbon footprint
- Restoration and conservation
- Alternatives to ornamental invasives
Unlimited Native Plants Resources

Native References

- Trees, shrubs and woody vines
- Wildflowers
- Shady landscapes
- Salt tolerance
- Gardener’s guide
- Identification and use
- Field guides
- Regional resources (N, C, S FL)
Web-based Plant Selectors

- IRREC teaching gardens (Treasure Coast)
  [http://irrecenvhort.ifas.ufl.edu/gardentool/index.html](http://irrecenvhort.ifas.ufl.edu/gardentool/index.html)

- FL friendly plant database

- Natives for your neighborhood (South FL)
Natural Diversity in Lawns

• Conventional landscaping typically creates homogenous habitats for birds and butterflies
• Compared 6 pairs of suburban properties
• Enhancing the biomass and diversity of native plants increased the diversity of and abundance of insect herbivores, creating greater resource base for insectivores (birds)

Research Note

Impact of Native Plants on Bird and Butterfly Biodiversity in Suburban Landscapes

KARIN T. BURGHARDT, DOUGLAS W. TALLAMY,* AND W. GREGORY SHIVER
Department of Entomology and Wildlife Ecology, University of Delaware, Newark, DE 19716-2314, U.S.A.

Abstract: Managed landscapes in which non-native ornamental plants are favored over native vegetation now dominate the United States, particularly east of the Mississippi River. We measured four landscaping
with native plants affects the areas and Lyphetus community on 6 pairs of suburban properties in suburban Pennsylvania. One property in each pair was landscaped entirely with native plants and the other celebrated a more conventional suburban mixture of plants—i.e., native species with non-native ground cover and ornamentals. Vegetation sampling confirmed that total plant cover and plant diversity did not differ between treatments, but non-native plant cover was greater on the conventional sites and native plant cover was greater on the native sites. Overall, arthropod abundance, species richness, biomass, and breeding bird abundance increased with enhanced and diverse native plant communities sampled from June 2006 to August 2009. Native properties supported significantly more caterpillars and caterpillar species and significantly greater bird abundance, diversity, species richness, biomass, and breeding pairs of native species. Of particular importance is that bird species richness was 4 times more abundant and significantly more diverse on native properties. In our study area, native landscaping positively influenced the avian and Lyphetus carrying capacity of suburban and provided a mechanism for reducing humanly invasive native habitats in suburban landscaping.

Keywords: Biodiversity, Birds, Lepidoptera, managed ecosystems, native plants, ornamental plants, suburban landscape

* Present address: National Audubon Society, 10200 Village Center Drive, Reston, Virginia 20190.
• Non-native plant species outnumber native species in most urban, suburban, and rural landscapes.
• The majority of native plants in the nursery trade are available as cultivars.
• Measured how 6 desirable traits of woody plant cultivars compare with their wild types in supporting insect herbivores.
• Traits examined were leaf color, variegation, fall color, habit, disease resistance and fruit size.
• Cultivars with anthocyanin-enriched leaves reduced insect herbivory.
• Usefulness of nativars depends on the trait.

Do Cultivars of Native Plants Support Insect Herbivores?

Emily C. Baider1,2, Douglas W. Tallamy1,2,*, Destree L. Narango1,2, and Eileen Boyle1,2

Additional index words: conservation, garden, biodiversity, anthocyanins

Abstract: Native plants are becoming widely used in both landscapes to help mitigate the loss of biodiversity caused by urbanization. The primary advantage of native plant species over introduced ornamentals is their ability to support the development of the insects that fuel vertebrate food webs as well as specialist pollinators. The horticultural industry has introduced many cultivars of native plants to improve their aesthetic value and disease resistance, but there has been little work that measures the impact of these genetic changes on insect herbivores and pollinators. Here we measure how 6 desirable traits in native woody plant cultivars (leaf color, variegation, fall color, habit, disease resistance, and fruit size) compare with their wild types in terms of their ability to support insect herbivores, pollinators, and species richness. Using a common garden experiment, we compared wild-type and cultivar counterparts of these traits in the same species and its cultivars for growth and development over a 2-year period, as well as cumulative leaf damage over the entire season. We also conducted field trials with crape myrtle (Lagerstroemia indica) to measure the preferences of beneficial caterpillars for cultivars vs. straight species. We found that cultivars that had leaves from green to red, blue, or purple deterred insect feeding in all three experiments, a preference for variegated cultivars in one of our experiments, but no consistent pattern of use among the species and cultivars chosen for other traits. These results suggest that the usefulness of native cultivars in restoring insect-driven food webs depends on the cultivar trait that has been selected.

The dominant landscaping practice of recent centuries has been to create landscapes adorned with ornamental plants that have been introduced from other countries. This practice has been pervasive that native plant species are outnumbered native species in most urban, suburban, and rural landscapes (Swift et al., 2007; Aizen et al., 2011; Orians et al., 2008; Orians and Hook, 2003). For example, as an experiment in Washington, DC, suburbia measured 55% native plant biomass (Narango et al., 2013). Our study is prepared by nursery stock dominated by ornamental ornamentals. A study done at Mr. Cabe's Center, a botanical garden dedicated to native plant horticulture and research in Rockefeller, D.C. (a large mid-Atlantic U.S. wholesale nursery) carried only 28% native species (Cooper and Gilden, 2013). There is growing evidence that non-native plant species out reproduce on single native plant genera (Fowler et al., 2016). Moreover, non-native plants support the growth and development of the insects that transfer the most energy from plants to vertebrate food webs for better than nonnative plants (Burgess et al., 2010; Prine et al., 2018; Tallamy, 2017; Tallamy and Roughol, 2009). The lack of native species in urban communities depresses populations of the wildlife that helps run (food) ecosystems (Burgess et al., 2008; Narango et al., 2013). This is particularly true for the over utilized lands in North America, 90% of which are built on native species (defined from Peterson 2008).

There is increasing interest in gardening for wildlife, and consequently a growing market for native plant nursery stock (American Society of Landscape Architects, 2017; Bunnell and Hartman, 2009). This, in turn, has led to questions regarding the value of “native” and what is not, what are appropriate commitments from plant preservation, and, most often, are cultivars of native plants (often called “natives”) the ecological equivalents of the parent species from which they were selected? This last question is particularly important because the increased use of native plants is being driven more by their ecological function in the landscape than by their aesthetic roles. Moreover, the majority of ornamental plants in the nursery trade are available as cultivars (Cooper and Gilden, 2013).

There are two primary ways cultivars may impact the insects that use plants for the growth and reproduction:

• Surveyed 841 active vendors selling native plants in the U.S.
• More than 6,500 native plant taxa were identified.
• This represents 26% of the country’s native vascular flora.
• Critical need to increase taxonomic diversity of commercially available germplasm for restoration.
• Need for education and outreach to increase demand for native plant materials.
• Exotics interfere with natives in the capture of resources—space, water, nutrition
• Competition for pollination occurs when a plant species suffers pollen limitation (less fruit and seeds as a result of pollinator sharing)
• Used a data set of 40 studies to evaluate the effect of exotic neighbor plant species on visitation to and reproduction of native co-flowering species

REVIEW AND SYNTHESIS

A meta-analysis of impacts of alien vs. native plants on pollinator visitation and reproductive success of co-flowering native plants

Abstract

Alien plant species can alter pollinator visitation and, in turn, the sexual reproduction of natives. Using a conventional and a phylogenetically controlled meta-analytical approach on a data set of 40 studies, we evaluated the effect of alien neighbour plant species (allees) on visitation to and reproduction of native co-flowering focal species (focals), and compared such effect to that of native neighbours (natives). An overall significantly negative effect of aliens on visitation to and reproduction of focals was confirmed. Interestingly, aliens differed from natives in their effect on visitation, but not on reproductive success. The negative effect of aliens on visitation and reproductive success increased at high relative alien plant abundance, but this increase was proportionally lower than the increase in relative plant abundance. Likewise, effect of aliens on visitation and reproductive success was more detrimental when alien and focal species had similar flower symmetry or colour. The phylogenetic relatedness between alien neighbours and focals influenced the reproductive success of the focal species.

Results of the phylogenetic meta-analysis were only partly consistent with those of the conventional meta-analysis, depending on the response variable and on whether we controlled for the phylogeny of neighbour or focal species, which calls for special attention to control for species relatedness in this type of review. This study demonstrates the predominant detrimental impact of alien plants on pollination and reproduction of natives, and highlights the importance of phenotypic similarity to the outcome of the interaction.

Species

<table>
<thead>
<tr>
<th>Species</th>
<th>No. Selections Evaluated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buddleja spp.</td>
<td>14</td>
</tr>
<tr>
<td>Lantana spp.</td>
<td>24</td>
</tr>
<tr>
<td>Ligustrum spp.</td>
<td>12</td>
</tr>
<tr>
<td>Miscanthus sinensis</td>
<td>15</td>
</tr>
<tr>
<td>Nandina domestica</td>
<td>11</td>
</tr>
<tr>
<td>Pennisetum spp.</td>
<td>11</td>
</tr>
<tr>
<td>Ruellia simplex</td>
<td>9</td>
</tr>
<tr>
<td>Stachyta pheta spp.</td>
<td>8</td>
</tr>
</tbody>
</table>

https://assessment.ifas.ufl.edu/
### 2019 Florida Invasive Status

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Ranking</th>
<th>Cultivar Exceptions</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Ruellia simplex</em></td>
<td>FLEPPC Category I</td>
<td>Purple Showers, Mayan Series (Pink, White, Purple, Compact Purple), Aztec Series (pink/white, pink, purple)</td>
</tr>
<tr>
<td><em>Nandina domestica</em></td>
<td>FLEPPC Category I</td>
<td>Firepower, Gulf Stream, Harbour Dwarf</td>
</tr>
<tr>
<td><em>Ligustrum sinense</em></td>
<td>FLDACS Noxious Weed</td>
<td>Variegatum, Sunshine (FDACS)</td>
</tr>
<tr>
<td><em>Lantana camara</em></td>
<td>FLEPPC Category I</td>
<td>T2, T3, T4, T9, Bloomify Rose, Bloomify Red</td>
</tr>
<tr>
<td><em>Pennisetum setaceum</em></td>
<td>FLEPPC Category II</td>
<td></td>
</tr>
<tr>
<td><em>Stachytarpheta cayennensis</em></td>
<td>FLEPPC Category II</td>
<td></td>
</tr>
<tr>
<td><em>Buddleja davidii</em></td>
<td>None</td>
<td></td>
</tr>
<tr>
<td><em>Miscanthus sinensis</em></td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
Sexual and Asexual Propagation

- Seeds
- Cuttings
- Micropropagation
Evaluating the Attractiveness and Resource Value of Ornamental Plants for Native Bees
Recent Publications (http://irrecenvhort.ifas.ufl.edu)

- **Invasive Potential** - J. Environ. Hort.; HortScience; HortTechnology  
- **Breeding** - HortScience  
  - Deng et al., 2017; Fetouh et al., 2016; Freyre et al., 2015, 2014, 2012; Czarnecki et al., 2014
- **Restoration** - Ecological Restoration; Applied Vegetation Science  
  - Smith et al., 2016, 2015a, 2015b
- **Native propagation** - Native Plants Journal, J. Propagation of ornamental plants  
  - Thetford et al., 2012, 2019; Heather et al., 2010, Smith et al., 2014; Wilson and Stoffella, 2009
- **Economics** - Journal of Environmental Horticulture  
  - Bechtloff et al., 2018; Wirth et al. 2004