

How Native Cultivars Affect Pollinators

Understanding the benefits and tradeoffs of using cultivated varieties of native plants in the landscape

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Slide List:

- 1-4. My personal journey to ecological landscape design and curiosity about native cultivars as substitutes for native species.
5. Native Species: A plant that is a part of the balance of nature and has developed over hundreds or thousands of years in a particular region or ecosystem.
Non-botanical terms that are often used as synonyms for native species, but have slightly different/ambiguous meanings:
 - straight species
 - true native
 - wild genotype
 - open-pollinated native
6. Native Cultivar: A variation of a native species, deliberately selected, cross-bred or hybridized for desirable characteristics that can be maintained by propagation. Colloquial Synonym (not an accepted botanical term): Nativar
7. Native species are often difficult to find in retail garden centers. Native cultivars dominate the market and are still typically marketed as native species.
8. Past evaluations of native cultivars has focused on their garden performance and cultural traits (e.g. disease resistance, flower qualities, etc.)
9. My research goal: evaluate whether native plant cultivars can provide the same ecological value as native species for pollinators in pollinator habitat restorations
10. Importance of pollinators:
 - 20,000 - Number of bee species, worldwide
 - 75% - Percentage of the world's food crops that depend at least in part on pollination (Klein et al. 2007)
 - \$235-577 billion - Annual value of global crops directly affected by pollinators
 - 300% - Increase in volume of agricultural production dependent on animal pollination in the past 50 years (Aizen and Harder 2009)
 - 39% - Percentage of pollinator-dependent crop area in the U.S. that suffers from a mismatch between supply of wild bees and the need for their pollination services (Koh et al. 2016)
 - 90% - Percentage of wild flowering plants that depend on animal-mediated pollination (Ollerton et al. 2011)
11. Habitat Loss
 - Habitat loss is among the most significant drivers of pollinator population declines (Potts et al. 2010)
 - Negatively affects the abundance and species richness of wild bees (Winfree et al. 2009)
 - Preserving and/or restoring pollinator habitat can improve bee abundance, richness, and productivity, even in landscapes with little natural habitat (Williams and Kremen 2007; Ricketts et al. 2008; Garibaldi et al. 2013; Nicholls and Altieri 2013)
12. Restoring Habitat/Floral Resources:
 - Pollinators prefer, but not necessarily exclusively, to forage on the nectar and pollen from native plants (Memmott and Waser 2002; Harmon-Threatt and Kremen 2015; Morandin and Kremen 2013; Morales and Traveset 2009).
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14. Criteria for plant selection in our study: Native to the Northeast, commonly recommended for pollinator habitat restoration, commercially available, and had one or more cultivars commercially available. Also selected plants to have early, mid, and late-season blooming plants and have different cultivar types represented.
15. Studied all pollinators, classified into 7 taxonomic/functional groups that could be identified visually 1-2m away in the field.
- 15-17. Field sites located in Fairfax, VT and Maidstone VT (USDA hardiness zones 4a and 4b, respectively.) Research gardens designed for rigorous statistical modeling.

18. Within a flower garden on a diversified organic farm in Vermont, 43% of over 8000 observed pollinators were bumblebees, 30% honeybees, 13% other native bees, 6% flies, 4% beetles/bugs, 2% butterflies/moths, 2% wasps/ants.

19. Different pollinator groups have clear preferences for different plant species.

20. Native cultivars studied varied from the species in their peak bloom period, bloom duration, floral abundance, plant height, color, disease resistance and hardiness. About half of the cultivars studied were significantly less hardy than the native species in Zones 4a and 4b.

21. Of the 11 cultivars evaluated in our first study, 6 cultivars were significantly less attractive to all pollinators (combined), 1 cultivar was preferred over the species, and 4 cultivars were just as attractive than the species. Preferences of different pollinator species/pollinator groups varied.

Less attractive cultivars = *Achillea* 'Strawberry Seduction,' *Agastache* 'Golden Jubilee,' *Baptisia x varicolor* 'Twilight Prairieblues,' *Helenium* 'Moerheim Beauty,' *Symphotrichum novae-angliae* 'Alma Poetschke,' *Tradescantia* 'Red Grape'

Equally attractive cultivars = *Asclepias tuberosa* 'Hello Yellow,' *Monarda fistulosa* 'Claire Grace,' *Penstemon digitalis* 'Husker Red,' *Rudbeckia fulgida* 'Goldsturm'

More attractive cultivar = *Veronicastrum virginicum* 'Lavender Towers'

22-26. *Symphotrichum novae-angliae* vs. *S. novae-angliae* 'Alma Poetschke.' Highly significant preference for the species. About 20 times more pollinators were observed foraging on the flowers of the native species versus the cultivar. (Both resources were equally available.)

27-29. Most pollinators preferred *Veronicastrum virginicum* 'Lavender Towers' over the species.

30-31. Beetles/bugs showed a significant preference for *Agastache foeniculum* over the chartreuse-leaved *Agastache* 'Golden Jubilee,' but most bees showed no preference.

32-33. *Echinacea purpurea* is preferred by bee pollinators over the cultivars 'White Swan' (open-pollinated seed cultivar), 'Pink Double Delight' (double-flowered), and 'Sunrise' (sterile hybrid). 'White Swan' was significantly preferred over 'Pink Double Delight' and 'Sunrise.'

34. What about the value of the floral reward? We need more studies on nectar and pollen quantity and quality.

35-38. Ornamental hybrids of *Lobelia cardinalis* (hummingbird pollinated) and *Lobelia siphilitica* (bumblebee pollinated) have nectar production similar to *L. siphilitica*. *L. x speciosa* 'Fan Scarlet' is marketed as a hummingbird-friendly plant, but only has 15% of the nectar energy that is available in *L. cardinalis*.

39. The best plants to support pollinators seem to be unmodified native species or cultivars that are minimally modified (i.e. open-pollinated seed cultivars). Cultivars that are moderately modified may not be the best plants for pollinators, but still provide some value. Highly modified cultivars are highly variable in their value to pollinators.

40. Plant selection isn't as simple as pollinator attraction. Numerous other considerations (e.g. cost, availability, disease resistance, etc.) need to be considered.

41. Other concerns with native cultivars:

- Breeding native species (e.g. *Panicum virgatum*) for increased biomass production and physiological performance can increase the invasive characteristics of the resulting cultivars
- Decreased genetic diversity = decreased resiliency to environmental fluctuations
- Risk of genetic pollution of native species
- *Lupinus perennis* is susceptible to hybridization and introgression by *Lupinus x hybrida* (Hybrid Lupines), e.g. Russell Hybrids
- An evaluation of 10 commercial seed sources found only 2 to be the straight species (Gibbs et al. 2012. *Restoration Ecology*.)
- Reportedly, hybrid Lupines are not a host plant for Karner Blue Butterflies

42. Native Species Benefits: Adapted to local soils & climate conditions, preferred host plants for native insects and food source for native birds, promote biodiversity, promote conservation and stewardship of our natural heritage

Native Species Challenges: Less predictable in the landscape, less uniform in size/shape, aesthetic perception that they are "too wild" and "too weedy," difficulty sourcing plant material

Native Cultivar Benefits: Unique aesthetic traits (e.g. new flower or foliage color), more uniform in size/shape, some have more flowers and longer bloom times, often easier to propagate

Native Cultivar Challenges: Loss of genetic diversity (natural genetic diversity in plant populations makes them more resilient to environmental fluctuations), less adapted to local soils & climate, may not be open-pollinated and will not self-seed, may be less attractive and provide less and lower quality floral resources to pollinators

43. Recognize that what gardeners might find most important (e.g. plant stature, flower color, etc.) isn't necessarily what pollinators or other wildlife find most valuable.

42. "We shall never achieve harmony with the land, anymore than we shall achieve absolute justice or liberty for people. In these higher aspirations the important thing is not to achieve but to strive." - Aldo Leopold, Round River: From the Journals of Aldo Leopold