Quantifying bee assemblages and attractiveness of flowering woody landscape plants for urban pollinator conservation

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Abstract

Urban and suburban landscapes can be refuges for biodiversity of bees and other pollinators. Public awareness of declining pollinator populations has increased interest in growing plants that provide floral resources for bees. Various publications and websites list “bee-friendly” plants, but such lists are rarely based on empirical data, nor do they emphasize flowering trees and shrubs, which are a major component of urban landscapes. We quantified bee visitation to 72 species of flowering woody landscape plants across 373 urban and suburban sites in Kentucky and southern Ohio, USA, sampling and identifying the bee assemblages associated with 45 of the most bee-attractive species. We found strong plant species effects and variation in seasonal activity of particular bee taxa, but no overall differences in extent of bee visitation or bee genus diversity between native and non-native species, trees and shrubs, or early-, mid-, and late-season blooming plants. Horticulturally-modified varieties of Hydrangea, Prunus, and Rosa with double petals or clusters of showy sterile sepals attracted few bees compared to related plants with more accessible floral rewards. Some of the non-native woody plant species bloomed when floral resources from native plants were scarce and were highly bee-attractive, so their use in landscapes could help extend the flowering season for bees. These data will help city foresters, landscape managers, and the public make informed decisions to create bee–friendly urban and suburban landscapes.

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Introduction

Many wild bee species, including important crop pollinators such as bumble bees (Bombus spp.), are declining in abundance or range [1–6]. Loss of floral resources, associated with agricultural intensification and habitat loss, is one of the major drivers of pollinator decline [5,7]. Protecting natural areas and restoring agricultural lands are important strategies for pollinator conservation, but urban landscapes, which offer a variety of forage and nesting sites, can also be refuges for bees [8–10]. Indeed, substantial portions of native bee communities can persist and even thrive in urban and suburban areas with support from gardens [11–16], parks [17], low-input lawns [18–19], and other properly designed and managed urban green spaces.

Bees are keystone species in urban environments, where their pollination services help propagate both wild and ornamental plants that in turn support birds and other urban wildlife by providing fruit and seeds as well as harboring insect prey [1,20–22]. Urban bees directly benefit people by pollinating crops grown in residential and community gardens [23,24], but they also present opportunities to interact with nature and engage in conservation [25–28]. The rise in urban honey beekeeping [29] and initiatives such as the “Million Pollinator Garden Challenge” [30], the Monarch Waystation program [31], and the Certified Wildlife Habitat program [32] in the United States, and the Royal Horticultural Society’s “Plants for Pollinators” [33] and Buglifes “B-lines” network of wildflower-rich habitat [34] in Great Britain have spurred public interest and participation in gardening or landscaping to help conserve pollinators, and many garden centers and websites now promote certain species or varieties of ornamental plants as “friendly” to bees, butterflies, and other flower-visiting insects [35,36].

Numerous lists of “pollinator friendly” plants have been compiled by conservation organizations [33,37–38], or produced by individuals and published in books [39,40] or on websites. Those lists, for the most part, are not well-grounded in empirical data [35] or do not cite published sources of such data, nor do they specify, except in general terms (e.g. “bees”, “butterflies”, or “flies”), the taxonomic composition of pollinator assemblages attracted to particular plant species. With > 4000 species of native bees in North America [41], each with unique life history and feeding preferences, such lists have limited conservation value. Another shortcoming is that, unlike the Royal Horticultural Society’s compilation of pollinator-attractive garden plants for Great Britain [33] which includes both herbaceous and woody plants, existing lists from North American invertebrate conservation organizations focus mainly on native herbaceous plants. For example, for the region of the United States that includes Kentucky, Pollinator Partnership’s planting guide lists only 13 species of bee-attractive trees and shrubs, and Xerces Society’s list of “Pollinator Plants” (Southeast Region) includes only seven [37,38]. Several scientific studies have documented the genera or species of bees associated with native eastern North American herbaceous perennials [42] and selected herbaceous native and non–native garden plants [12,16,34,43,44], but no comparable studies have documented the bee assemblages associated with a broad array of woody landscape plants anywhere in North America.

Flowering woody plants can provide valuable food resources for urban bee populations [22,45]. A single tree or large shrub can produce thousands of flowers, far more per unit area than in an
equivalent patch of garden plants or meadow, and offer copious pollen and nectar with high sugar content [45]. Landscapes with a mix of woody plants whose collective bloom periods extend from early spring to autumn can buffer bee populations from seasonal gaps in floral resource availability that can occur with herbaceous ornamental flowers in urban gardens [12,46]. Such landscapes also promote bee species richness and diversity by sustaining early–emerging seasonal specialists (e.g., Andrena spp.) as well as eusocial species (e.g., honey bees and bumble bees) whose colony development and reproduction requires large amounts of pollen and nectar throughout the growing season [45,47]. Establishing sustainable woody landscape plants to provide more and better food for bees should be part of any strategy to conserve and restore urban pollinators.

About 75% of all U.S. households engage in yard and garden activities [48], so there is a need for actionable science to help city foresters, landscapers, and a larger, interested public make informed decisions in creating bee–friendly landscapes. To that end, we quantified bee visitation to a wide range of established flowering trees and shrubs at 373 urban and suburban sites in central and northern Kentucky and southern Ohio, USA, and sampled the bee assemblages associated with 45 of the most bee–attractive plant species. Although wind-pollinated plants can serve as important pollen sources for spring-active bees [49–51], we focused on insect-pollinated trees and shrubs that are attractive to consumers in part because of their showy flowers or fruits. We compared overall attractiveness and bee genus richness and diversity between native and non-native plant species, trees and shrubs, and early-, mid-, and late-season blooming species. Patterns of preference and seasonal activity of different bee taxa based on their abundance in collections from each plant species were quantified. We identified numerous bee-attractive species of woody landscape plants and documented clear differences in the assemblages of bees attracted to different plant species.

Materials and methods

Plant species

In total, 72 species of flowering woody plants were sampled from 2014–2017 (Tables 1 and 2). Sampling took place from February to November each year. Plant species were selected based on recommendations from land care professionals, their suitability for planting within the Ohio River Valley region, and availability and frequency of use in urban landscapes. Both native and non-native plant species were included in order to compare their usage by bees. Plants listed as an invasive or nuisance species by the USDA National Invasive Species Information Center [52] or by the state governments of Kentucky, Tennessee, Missouri, Illinois, Indiana, Ohio, West Virginia, or Virginia were not included. Additionally, we sampled three sets of plant species (Hydrangea spp., Ilex spp., and Rosa spp.) to compare bee–attractiveness and bee genus diversity among cultivars differing in horticultural characteristics, and between closely-related native and non-native plants.

Sample sites

All 373 sample sites were located within the urban landscape and were separated by at least 1 km for same–species sites to ensure minimal overlap of bee populations. Sample sites included street-side and municipal plantings, commercial and residential landscapes, campuses, parking lots, and urban arboreta and cemeteries. Most (93%) of the sample sites were within the Lexington, Kentucky USA metropolitan area; the remainder were in urban or peri-urban
Bee-attractiveness ratings

Given the wide range in plant height and form, and in floral density, size, and morphology across such a wide range of trees and shrubs planted at hundreds of sites, it was not possible to standardize sampling on the basis of floral area such as has been done in studies [e.g., 15,40] quantifying bee visitation to same-sized replicated plots of herbaceous flowering plants in a common-garden setting. Instead, each plant species’ relative bee-attractiveness was rated based on two 30-second “snapshot” counts [16] per site for in most cases 10 (minimum of six) snapshot counts per plant species. The snapshot counts were also used to justify the exclusion of relatively non-attractive plants from more extensive bee sampling. Snapshot counts were taken at or near peak bloom of a given plant. During each 30-second period, bees actively foraging on the flowers of the target plant(s) were counted, taking care to avoid counting the same insects more than once. Snapshot counts were taken while walking slowly around the tree or shrub, or along hedges or other sites with long, continuous plantings (> 2.5 m), whereas for smaller shrubs they were taken while stationary. For relatively tall trees, snapshot counts were taken only as high up in the canopy as the observer was able to distinguish bees from flies or other insects. Because of the large number of sample sites and distances between them, variable weather conditions, and the relatively brief (1–2 week) and overlapping bloom periods for many of the plants, in most cases it was not possible to visit and sample a given site more than once. Sampling conditions were as consistent as possible within a given species; e.g., same-species sites were sampled on the same day or within a few days of each other in a given year, snapshot counts were taken between 10:00 to 18:00 EST during non-inclement weather (e.g., sunny to partly cloudy, winds < 16 kph), and sampling of early spring-blooming species was done only on days with temperatures >10°C and bees were active. Snapshot counts at a given site were taken immediately before collecting each 50-bee sample (see below) to minimize disturbance of the bees.

Sample collection

We sampled the bee assemblages associated with 45 of the 72 aforementioned plant species, excluding relatively non-attractive species with average snapshot counts of < 5 bees. Samples were collected from 213 total sites including five sites for 35 of the plant species, four sites for eight species, and three sites for two of the rarer plants (213 total sites). Bees were collected immediately after taking snapshot counts and represented the first 50 bees observed on the flowers after the counts were finished (250 total bees collected for most plant species). Most samples were collected using aerial insect nets that could be extended to collect from heights up to about 5 m above ground level, when necessary. Some shrubs with fragile flowers were sampled by knocking individual bees into plastic containers filled with 75% EtOH. Sampling time ranged from < 15 min to more than 2 h per site. Bee samples were washed with water and dish soap, rinsed, then dried using a fan-powered dryer for 30–60 min, and pinned. All bees were identified to genus [53,54]. Bumble bees (Bombus spp.) and honey bees (Apis mellifera L.) were identified to species. Reference specimens are deposited in the University of Kentucky Department of Entomology Insect Collection.

Statistical analysis

Snapshot counts, bee genus diversity, and abundances of each of the five predominant families of bees (Andrenidae, Apidae, Colletidae, Halictidae, Megachilidae) and of Bombus spp. and A. mellifera, were compiled across sampling years and analyzed for main effects of plant species, plant family (as a proxy for plant species due to limited degrees of freedom), provenance (native or non-native), plant type (tree or shrub), and Julian date number for peak bloom using General linear models procedure (SAS, Version 9.4; SAS Institute, Cary, NC, USA). Species diversity was based on the inverse of Simpson’s D (hereafter 1/D), which calculates a number between 0 and 1, with higher numbers indicating more species–rich and even samples (Margarun 2004). For analysis of bee taxa abundance, we counted the number of individuals in each sample belonging to one of five North American bee families (Apidae, Andrenidae, Colletidae, Halictidae, Megachilidae) and two additional taxa, Apis mellifera and Bombus spp. and analyzed abundance of each for main effects. Sampling date was standardized by converting to a Julian date number, which assigns each calendar date a unique integer starting from 0 on January 1. We also attempted to analyze main effects of flower color, flower type, and inflorescence type on bee snapshot counts, taxa abundance, and diversity but were unable to do so due to the uneven distribution of the data among class variable levels.

Results

Bee-attractiveness ratings

Snapshot counts, which were obtained for all 72 plant species, ranged from 0 to 103 with an
average count of 12.8 bees per 30-second observation per site. Plants' general attractiveness ratings are summarized in Table 3. The plants with the five highest average snapshot counts were *Rhus copallinum*, *Tetradium daniellii*, *Maackia amurensis*, *Heptacodium miconioides*, and *Hydrangea paniculata* (65.3, 50.1, 42.2, 33.2, and 31.4, respectively). We did not observe any bees during the snapshot counts for *Calcycanthus floridus*, *Hydrangea arborescens* 'Annabelle', *Hydrangea macrophylla*, *Magnolia liliiflora*, and *Sassafras albidum* at any of the sites sampled. Plant species and family, plant type (tree or shrub), and Julian date number had significant effects on snapshot counts (Table 4). There were small but statistically significant differences in snapshot counts between trees and shrubs, with trees having higher snapshot counts than shrubs (Fig 1). Snapshot counts increased slightly as the growing season progressed. There were no significant differences in snapshot counts between native or non-native species (Fig 1).

![Fig 1. Comparison of snapshot counts on trees and shrubs, and native and non-native plants.](https://doi.org/10.1371/journal.pone.0208428.g001)

Table 3. Bee-attractiveness rating*, distribution of bee taxa*, bee genus diversity*, and provenance* of 45 species of bee-attractive flowering trees and shrubs.

Plant species are arranged in order of bloom period. [Link](https://doi.org/10.1371/journal.pone.0208428.t003)

Table 4. Summary of analysis of variance for effects of plant species, plant type (tree or shrub), provenance (native or non-native), and Julian date number on bee genus diversity and snapshot counts.

[Link](https://doi.org/10.1371/journal.pone.0208428.t004)

**Bee abundance by taxon and genus diversity**

Overall, 11,275 bees were collected from 45 species of flowering woody plants that attracted, on average, ≥ 5 bees in the snapshot counts. Apid bees comprised 44.0% of all bees sampled and were present on all 45 plant species sampled (Tables 3 and 5). Halictid bees were similarly ubiquitous on all plant species and accounted for 23.6% of total bees. Andrenid bees accounted for 21.4% of total bees and often dominated the bee assemblages of early blooming plants. Colletid and megachilid bees were the least abundant bees overall, comprising only 5.0 and 5.9%, respectively, of the total bees in our samples. *Apis mellifera* and *Bombus* spp. were collected from 44 and 39 of the sampled plant species, respectively, and accounted for 21.4 and 11.9% of the total bees.
Plant species (Table 4), and by extension plant family, played a key role in abundance of all bee taxa analyzed (Table 6) and both were the only significant factors for Andrenidae, Apidae, and A. mellifera. Most woody plants attracted bees from at least four families; one exception was mock orange (Philadelphus) from which >95% of the bees collected were Chelostoma philadelphia (Robertson), a small megachilid. Colletidae, Halictidae, and Bombus all showed strong seasonal patterns in abundance, with the proportion of Colletidae in our samples declining sharply with increasing Julian date, while proportionate abundance of Halictidae and Bombus increased. Colletidae were proportionately more abundant on trees than on shrubs, and on native as opposed to non-native plant species (Table 6). All other bee taxa, including non-native A. mellifera and native Bombus, were equally proportionately abundant on native and non-native plants.

Twenty-three bee genera were represented in our samples (Table 5), the most abundant being Apis (22.1% of total bees), Andrena (21.4%), Lasioglossum (19.6%), and Bombus (12.2%). Bee genus diversity index values ranged from 0 to 0.85 with an average of 0.52 (Table 3). The plants with the highest average genus diversity (1/D) were Abelia × grandiflora (0.74), Aesculus parviflora (0.71), Aesculus × carnea (0.70), Rosa setigera (0.70), and Oxydendrum arboreum (0.69). Plant species and plant family played a key role in genus diversity (Table 4), but there were no overall significant differences in genus diversity between trees and shrubs or natives and non-natives (Fig 2).

Cultivar comparisons

Snapshot counts were compared among four Hydrangea species, H. arborescens ‘Annabelle’ (native, shrub), H. macrophylla (non-native, shrub), H. paniculata (non-native, shrub), and H. quercifolia (native, shrub) which differ in their floral characteristics (Table 2). Most notably, H. paniculata has exposed fertile flowers while the other three species lack fertile flowers or have them hidden beneath showy sterile outer sepals (Dirr 2011). Non-native hydrangeas had higher average snapshot counts than native hydrangeas (14.0 and 2.8, respectively, \(F_{1,34} = 6.19, P = 0.02\)), but this was entirely because H. paniculata, a non-native, was the only species that was
highly attractive to bees. Bee genus diversity was not analyzed because *H. arborescens*, *H. macrophylla*, and *H. quercifolia* had extremely low bee visitation rates, and were not sampled for bees.

Snapshot counts and bee assemblages were compared between four *Ilex* species: *I. x attenuata* (native, shrub), *I. x meserveae* (non-native, tree), *I. opaca* (native, tree), and *I. verticillata* (native, shrub). All four had similar floral characteristics (Tables 1 and 2) and differed mainly by height and spread of the plant. There were no significant differences between the average snapshot counts of native and non-native *Ilex* (18.8 and 15.5, respectively, *F*$_{1,34}$ = 0.77, *P* = 0.39), nor were there significant differences between the average genus diversity of native and non-native *Ilex* species (0.56 and 0.60, respectively, *F*$_{1,18}$ = 0.28, *P* = 0.60).

Bee visitation to two species of roses (*Rosa*) was compared. *Rosa setigera*, a single-flowered native rose with pollen prominently displayed during most of its bloom, was sampled at five sites. Hybrid tea roses are non-native, and they are typically double- or triple-flowered and either lack stamens and pollen, or have pollen that is concealed by multiple layers of petals during bloom. We sampled a variety of hybrid tea roses which we divided into seven categories based on color and flower form: light pink with single petals, dark pink with single petals, red with single petals, white with double or triple-petals, light pink with double- or triple petals, dark pink with double or triple petals, or red with double or triple-petals. *Rosa setigera* had a significantly higher average snapshot count than all hybrid tea roses sampled (16.1 and 0.1, respectively, *F*$_{1,78}$ = 146.8, *P* < 0.001). Bee genus diversity was not analyzed because the hybrid tea roses, which had very low visitation rates, were not sampled for bees.

**Discussion**

To our knowledge, this is the first scientific study to quantify variation in bee-attractiveness and bee assemblages across a wide range of flowering woody landscape plants. We identified 45 species of trees and shrubs that could be useful for augmenting floral resources for bees in urban and suburban settings. Although all of our sampling took place in Kentucky and southern Ohio, most of the bee-attractive plants on our list should grow satisfactorily throughout USDA Plant Hardiness Zone 6, which covers extensive regions of the United States.

As with all studies assessing diversity of bees [*56*], our sampling methodology has limits and biases. Counting bees on the wing, as in our snapshot counts, leaves room for misidentification (e.g., counting bee mimics as bees) and miscounting, but we attempted to reduce this by replicating counts and using skilled observers with training in bee identification. Snapshot counts and 50-bee samples were based on one visit to each site because of the large number of sample sites, the distances between sites (up to 145 km), and the relatively short bloom periods of some plants. While it is unlikely that a sample of 250 bees collected from five sites would capture the full bee species richness and diversity of a given plant species during the entirety of its bloom, our data do provide a measure of which tree and shrub species attract and support robust bee assemblages. Although some studies have used replicated plots with similar-aged plants to compare bee visitation rates [*16,42*], establishing 72 species of trees and shrubs in a replicated common garden plot for eventual pollinator sampling would have been impractical because of the cost, space, and time required for establishment. Moreover, results from common garden experiments can be location-specific, reflecting the relative abundance of different pollinator taxa at that particular site. Our sampling from multiple (in most cases five) plantings of each species across hundreds of existing urban landscape sites doubtless encompassed more of the variation in soil conditions, potential nesting sites, and other landscape-level factors that would affect bee diversity than if all sampling had been done at a single location.

The premise that augmenting floral resources benefits bees is based on the assumption that local bee populations are often food-limited. Floral resource availability is thought to be a major driver of population abundance and diversity of wild bees [*7*]. Long-term abundance of bumble bees and other wild bees has declined in parallel with widespread declines in floral abundance and diversity in Europe [*1,4*], and populations of solitary bees are enhanced by mass-flowering crops, suggesting that floral resources are indeed limiting [*57,58*]. There is some debate [*59*] that the dense, high-resource displays of wildflower mixes or other urban plantings intended to augment resources for bees might have unintended ecological consequences for remnant native plant biodiversity (e.g., by competing for generalist pollinators, functioning as hubs for pollinator-transmitted plant pathogens, or decreasing he likelihood of conspecific pollen transfer). However, such plantings might also increase pollination of remnant native plants through a spillover effect [*59*] similar to that observed in agricultural crops bordered by wildflower strips [*60*]. Although those types of potential ecological interactions warrant future research, they are beyond the scope of this study. Together with studies documenting that four common city tree species attracted a fifth of all native bee species occurring in Berlin, Germany [*22*], and that nine of the main tree species planted along streets of European cities, including some non-native species and hybrids, provide nectar and pollen of high nutritional suitability for pollinators [*45*] our results suggest that urban landscapes can be made even more valuable as refuges for pollinators by incorporating additional bee-attractive woody plants.

Urban and suburban landscapes typically consist of a diverse mix of native and non-native plant species [*16,44,61–65*]. Recently, the long-standing debate [*66,67*] about whether or not there is any role for non-invasive exotic plants in conservation biology has spurred a fervent movement in gardening circles advocating that urban landscapes be constructed predominantly or exclusively with native plants [*68*]. One of the main arguments against landscaping with non-
late September when most other plants in those landscapes were done blooming. blooming, non-native plants that were heavily visited by bumble bee "magnets" were hand, all of the seven nests of native species. Other than the sometimes negative ecological impacts of the non-native trees and shrubs attract and support disproportionate numbers of non-native bee species. Without identifying all of the >11,000 bees to species, it is impossible to know whether equivalent usefulness for urban bee conservation is the genus-level taxonomic resolution of our bee data. Without identifying all of the >11,000 bees to species, it is impossible to know whether equivalent usefulness for urban bee conservation is the genus-level taxonomic resolution of our bee data. Without identifying all of the >11,000 bees to species, it is impossible to know whether equivalent usefulness for urban bee conservation is the genus-level taxonomic resolution of our...
Another caveat is that, besides being used to inform decisions about woody landscape plants that may promote bee conservation, our data will be used by stakeholders wishing to identify and avoid planting trees and shrubs that attract bees, either to reduce hazard to persons having anaphylactic allergies to bee stings or general hazard and liability around residences or in public settings, or because of general fear of bees. We acknowledge that highly bee-attractive trees and shrubs that are suitable for most landscape settings might be poor choices for sites such as primary school playgrounds, yards frequented by small children, or outdoor public outdoor eating spaces.

Although some plant varieties with double flowers or showy sterile outer sepals that inhibit access to central, fertile flowers may not provide sufficient floral rewards to attract bees [46, 86], many horticulturally-modified plants, including hybrids, can be as attractive, or more attractive, than their wild-type counterparts [16, 44]. In our study, neither of the native Hydrangea species, having been bred for large clusters of showy sterile sepals, was bee-attractive whereas the open-flowered, non-native H. paniculata had the highest average snapshot count of the 36 shrub species we sampled. Similarly, R. setigera, a native single-flowered rose, was highly attractive to bees, whereas none of the double- and triple-flowered hybrid tea rose cultivars attracted more than a single bee. All four of the flex species we compared, representing a mix of native, non-native, and hybrid species, offer easily accessible floral rewards, and all four were attractive to bees. This further illustrates that cultivars and non-native species can be equally attractive to bees as long as floral rewards have not been bred out or obscured. Similar patterns were seen within other plant genera; e.g., Prunus subhirtella and P. virginiana that have single, open flowers, were highly bee-attractive, whereas P. kanzan, a double-flowered species, attracted almost no bees.

In conclusion, this study identified many species of flowering trees and shrubs that are highly attractive to bees and documented the types of bees that visit them. Even so, we did not come close to capturing the enormous diversity of flowering woody landscape plants available in the marketplace [62], so there is great potential for identifying additional plants that could have value for urban bee conservation. Recommendations for bee-attractive plants that are based on empirical data are preferable to the large number of plant lists available to the public that are based only on informal observations or anecdotes [85]. Our data should help to inform and augment existing lists of bee-attractive plants in addition to encouraging the use of sustainable, bee-attractive woody landscape plants to conserve and restore resources for urban pollinators.

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These urban trees might offer important floral resources to pollinating insects. To examine the suitability of urban trees as resources for pollinating insects, we investigated the chemical composition of pollen and nectar as well as the amount of nectar produced by the nine major insect-pollinated tree species planted in cities of Western Europe, namely Acer pseudoplatanus, Aesculus carnea, A. hippocastanum, Robinia pseudoacacia, Tilia cordata, T. x euchlora, T. x europaea, T. platyphyllos and T. tomentosa. Quantifying bee assemblages and attractiveness of flowering woody landscape plants for urban pollinator conservation. Bernadette M Mach, D. A. Potter. PLoS one 2018. 13. Bees feed on the nectar and pollen of flowering plants, which provide them with carbohydrates and proteins. A single shrub or tree may grow hundreds or thousands of flowers during its lifespan. If bees have uninterrupted access to food sources with high-quality nutrients, they may recover their numbers and flourish anew. (Related: Wild bees are ESSENTIAL for producing larger and better blueberries.) Finding out what flowering plants attract bees. Potter presented a summarized version of his team’s findings in the webcast “Woody Plants for Urban Bee Conservation.” Potter found that both native and introduced plants drew various communities of bees. He noted how higan cherry drew the attention of leaf-cutter bees, mason bees, mining bees, and sweat bees. The first pollinators accidentally spread pollen while feeding on flowers. In the millions of years since, bees and flowers coevolved for mutual success. Although most bees are pollen generalists, capable of foraging on many plant species, many are specialists that forage on only a small group of specific flowers. What Makes a Good Pollinator Plant? A flower’s color, odor, shape, size, timing, and reward (nectar or pollen) can increase or decrease the number of visits by specific pollinators. Some examples of how plants “reach out” to bees and others: ULTRAVIOLET INVITATIONS. Bees can see ultraviolet light but not red light; thus, flowers in the ultraviolet range attract more bee visits, while red-hued flowers reduce them. COLOR PHASES. Urban and suburban landscapes can be refuges for biodiversity of bees and other pollinators. Public awareness of declining pollinator populations has increased interest in growing plants that provide floral resources for bees. We quantified bee visitation to 72 species of flowering woody landscape plants across 373 urban and suburban sites in Kentucky and southern Ohio, USA, sampling and identifying the bee assemblages associated with 45 of the most bee-attractive species. We found strong plant species effects and variation in seasonal activity of particular bee taxa, but no overall differences in extent of bee visitation or bee genus diversity between native and non-native species, trees and shrubs, or early-, mid-, and late-season blooming plants.