Prescribed Haying for Pollinators and Prairie: Pollinator Monitoring Summary: 2015-2017

South Washington Conservation Corridor

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Partners: The Xerces Society & Great River Greening

A green sweat bee (*Augochlorini*) observed on butterfly milkweed at South Washington during this project. Photo by Sarah Foltz Jordan, Xerces Society.

Methods:

- 6 plots (each ~5 acres) were established, 3 treatments and 3 controls.
- Within each of these plots, two monitoring transects were established.
- All transects were 300 ft. long, running N-S.
- All transects were at least 50 ft. from an edge (75 or 100 ft. when possible).
- The 2 transects within each plot were at least 100 ft. from each other (usually 200 ft. except in one smaller plot (ES) where that wasn't possible).
- Transects were monitored once/per month from May to September, with visits spaced at least 3 (usually 4) weeks apart. Monthly monitoring typically took place in the last week of the month.
- Monitoring followed the protocol presented in the Xerces Society Upper Midwest Citizen Science Native Bee Monitoring Guide (Foltz Jordan, Lee-Mader, and Vaughan 2016).
- All floral visitors were recorded & identified to the highest taxonomic level without collection (usually genus).
- When possible, photographic "vouchers" were taken.
- Specimen vouchers were collected for select bumble bees that require microscopic examination for species level identification.
- All floral associations were recorded for each insect visitor.
- All blooming species in transect were recorded (whether or not there were floral visitors using them).

For further details on methods and survey protocol, see the [Xerces Society Upper Midwest Citizen Science Native Bee Monitoring Guide](#)(Foltz Jordan, Lee-Mader, and Vaughan 2016).

Results:

3-Year Relative Abundance and Diversity: A total of 3,759 floral visitors were observed on flowers during the three years of season-long monitoring at this site, including 1,039 native bees. Honey bees, bumble bees, soldier beetles, hover flies, paper wasps, and monarchs were the most abundant pollinator groups present (Figure 1). Native bees comprised 55% of the total bees present, 29% of the pollinators, and were represented by 12 different groups. Six groups of pollinating flies were observed; thirteen species of butterflies; eleven groups of wasps, seven groups of flower visiting beetles were observed; and five groups of predatory and herbaceous flower-visiting bugs.

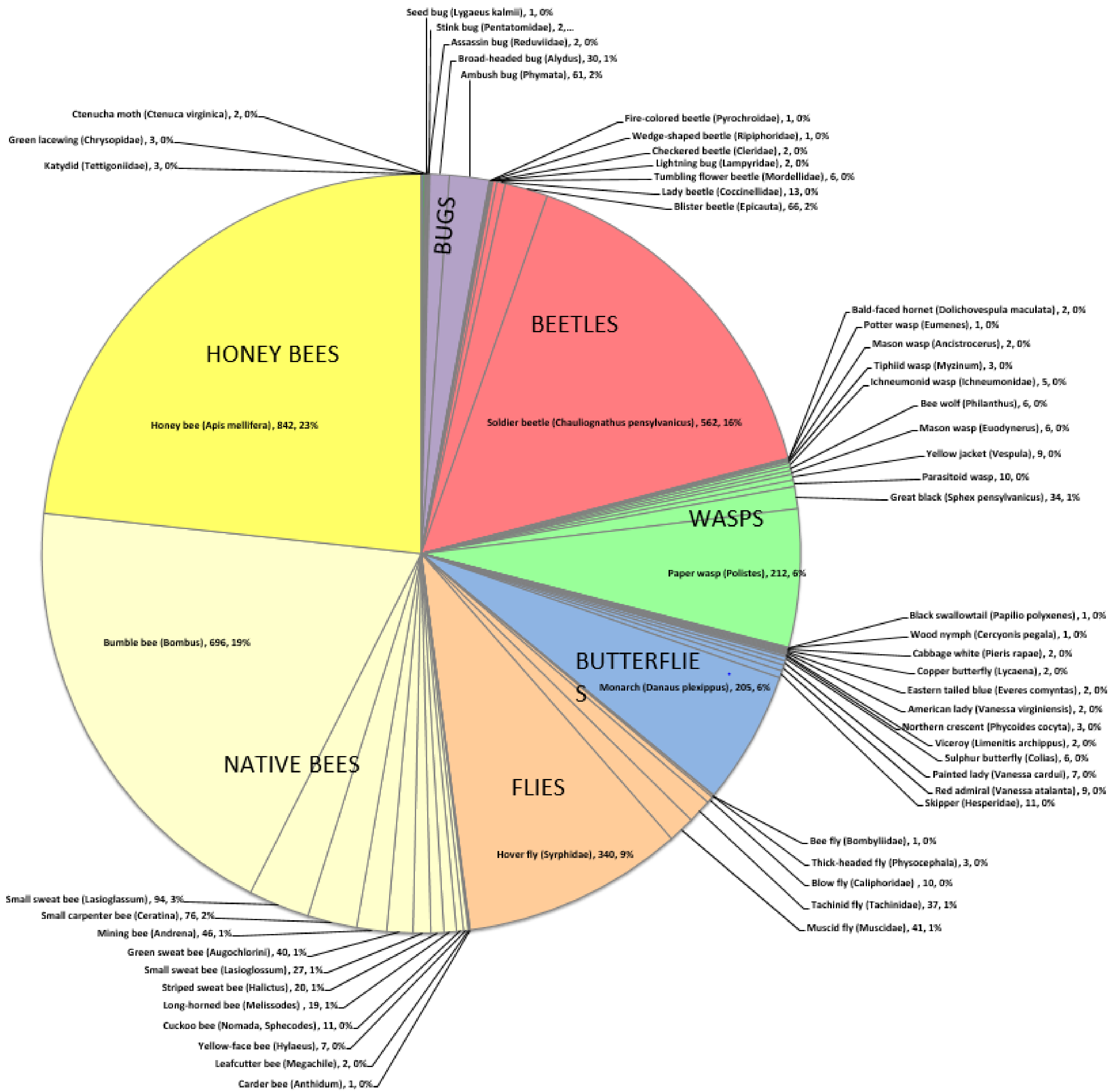


Figure 1. Relative abundance of insect floral visitors at South Washington Conservation Corridor over the three-year study period (all seasons and years combined).

Seasonal Variation in Abundance and Diversity of Pollinator Groups:

Pollinator abundance varied greatly by month, with the highest abundance of native bees observed in July, and the lowest in September (Figure 2). The highest abundance of floral visitors as a whole (including honey bees, and non-bee pollinators) was observed in August (Figure 2).

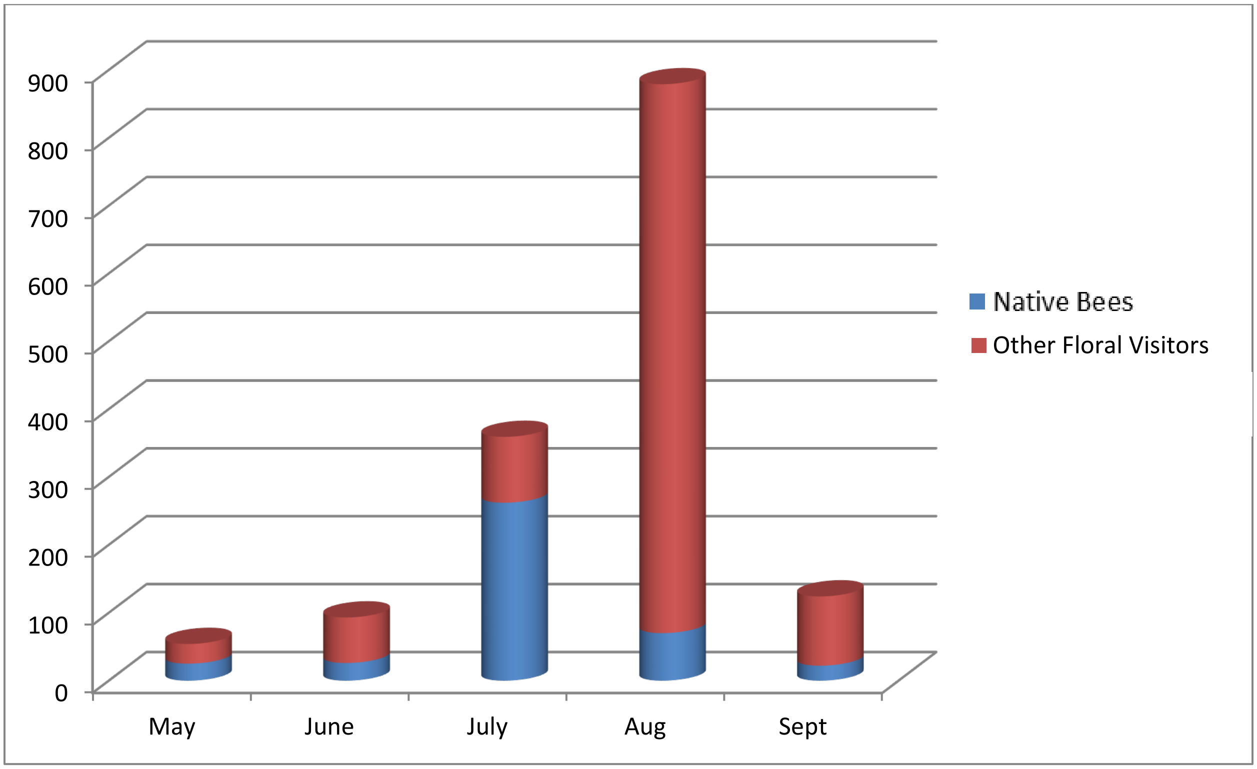
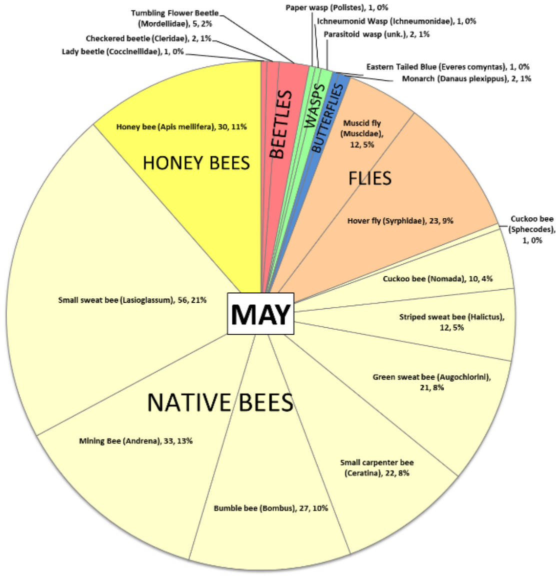
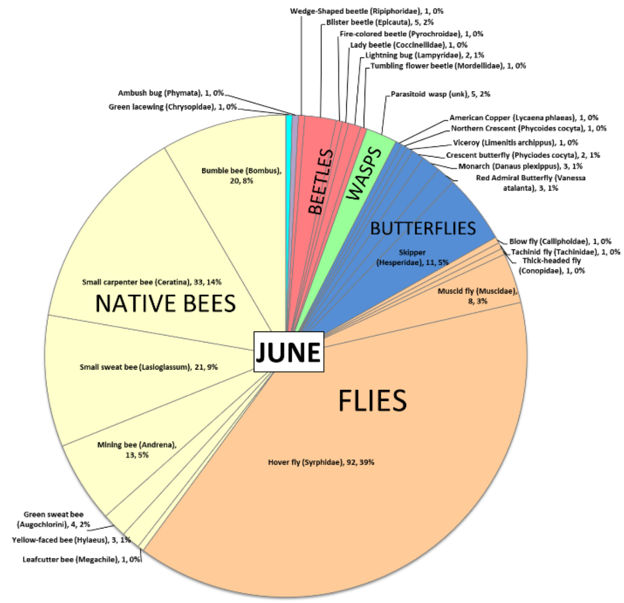
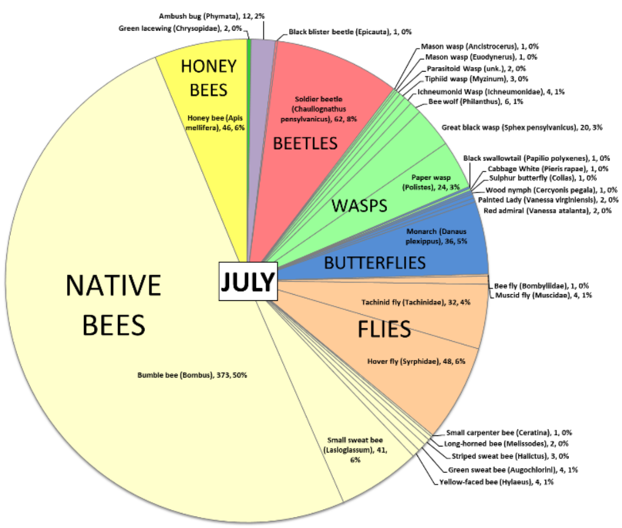


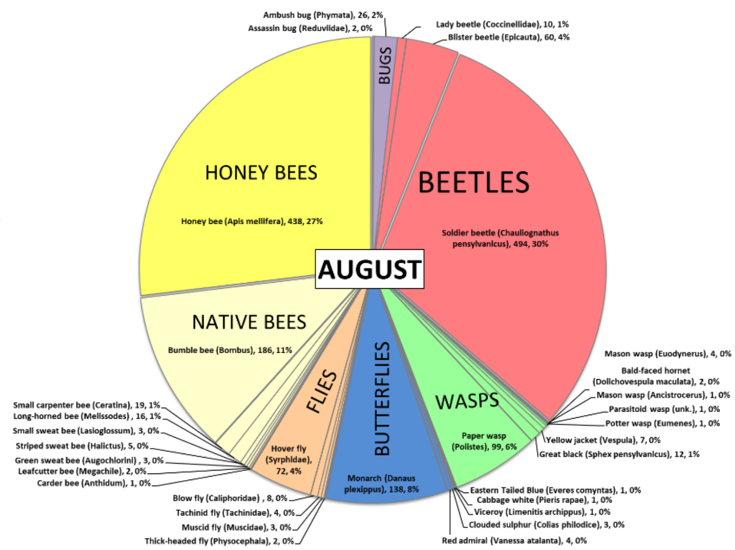
Figure 2. Total abundance of floral visitors by month, showing highest abundance of native bees in July, and of floral visitors as a whole in August. *(Note: this graph is based on 2015 data, but is reflective of findings in 2016 and 2017, also).*

Pollinator assemblages also varied greatly by month (Figure 3, May through September). In May, native bees (mostly small sweat bees) were the most abundant group, followed by flies and honey bees. In June, the majority of pollinators were hoverflies, followed by native bees (mostly small carpenter bees) and butterflies (mostly skippers). Honey bees were absent in June, and bumble bee numbers were low, despite high abundance of both of these groups in both May and July. This suggests that floral resources favored by these bees were lacking in the survey transects at this time (see Floral Associations summary, below). In July, native pollinators (primarily bumble bees) were the most abundant group, followed by flies (primarily hover flies and tachinids), with fairly even abundance of the other floral visitor groups. In August, soldier beetles were the most abundant group followed by honey bees; bumble bees, monarchs, and paper wasps were also well-represented. In September, honey bees were by far the most abundant group, followed by hover flies, native bees (primarily bumble bees), and wasps (primarily paper wasps) (Figure 3).


MAY
HONEY BEES
NATIVE BEES
BEETLES
WASPS
BUTTERFLIES
FLIES
Tumbling Flower Beetle (Mordellidae), 5, 2%
Checkered beetle (Cleridae), 2, 1%
Lady beetle (Coccinellidae), 1, 0%
Paper wasp (Polistes), 1, 0%
Ichneumonid Wasp (Ichneumonidae), 1, 0%
Parasitoid wasp (unk.), 2, 1%
Eastern Tailed Blue (Everes comyntas), 1, 0%
Monarch (Danaus plexippus), 2, 1%
Honey bee (Apis mellifera), 30, 11%
Muscid fly (Muscidae), 12, 5%
Hover fly (Syrphidae), 23, 9%
Cuckoo bee (Sphecodes), 1, 0%
Cuckoo bee (Nomada), 10, 4%
Striped sweat bee (Halictus), 12, 5%
Green sweat bee (Augochlorini), 21, 8%
Small carpenter bee (Ceratina), 22, 8%
Bumble bee (Bombus), 27, 10%
Mining Bee (Andrena), 33, 13%
Small sweat bee (Lasioglassum), 56, 21%


JUNE
NATIVE BEES
BEETLES
WASPS
BUTTERFLIES
FLIES
Wedge-Shaped beetle (Ripiphoridae), 1, 0%
Blister beetle (Epicauta), 5, 2%
Fire-colored beetle (Pyrochroidae), 1, 0%
Lady beetle (Coccinellidae), 1, 0%
Lightning bug (Lampyridae), 2, 1%
Tumbling flower beetle (Mordellidae), 1, 0%
Ambush bug (Phymata), 1, 0%
Green lacewing (Chrysopidae), 1, 0%
Parasitoid wasp (unk), 5, 2%
American Copper (Lycaena phlaeas), 1, 0%
Northern Crescent (Phycoides cocyta), 1, 0%
Viceroy (Limenitis archippus), 1, 0%
Crescent butterfly (Phyciodes cocyta), 2, 1%
Monarch (Danaus plexippus), 3, 1%
Red Admiral Butterfly (Vanessa atalanta), 3, 1%
Skipper (Hesperidae), 11, 5%
Blow fly (Calliphoidae), 1, 0%
Tachinid fly (Tachinidae), 1, 0%
Thick-headed fly (Conopidae), 1, 0%
Muscid fly (Muscidae), 8, 3%
Bumble bee (Bombus), 20, 8%
Small carpenter bee (Ceratina), 33, 14%
Small sweat bee (Lasioglassum), 21, 9%
Mining bee (Andrena), 13, 5%
Green sweat bee (Augochlorini), 4, 2%
Yellow-faced bee (Hylaeus), 3, 1%
Leafcutter bee (Megachile), 1, 0%
Hover fly (Syrphidae), 92, 39%


JULY
HONEY BEES
NATIVE BEES
BEETLES
WASPS
BUTTERFLIES
FLIES
Ambush bug (Phymata), 12, 2%
Green lacewing (Chrysopidae), 2, 0%
Black blister beetle (Epicauta), 1, 0%
Honey bee (Apis mellifera), 46, 6%
Soldier beetle (Chauliognathus pensylvanicus), 62, 8%
Mason wasp (Ancistrocerus), 1, 0%
Mason wasp (Euodynerus), 1, 0%
Parasitoid Wasp (unk.), 2, 0%
Tiphiid wasp (Myzinum), 3, 0%
Ichneumonid Wasp (Ichneumonidae), 4, 1%
Bee wolf (Philanthus), 6, 1%
Great black wasp (Sphex pensylvanicus), 20, 3%
Paper wasp (Polistes), 24, 3%
Black swallowtail (Papilio polyxenes), 1, 0%
Cabbage White (Pieris rapae), 1, 0%
Sulphur butterfly (Colias), 1, 0%
Wood nymph (Cercyonis pegala), 1, 0%
Painted Lady (Vanessa virginiensis), 2, 0%
Red admiral (Vanessa atalanta), 2, 0%
Monarch (Danaus plexippus), 36, 5%
Bee fly (Bombyliidae), 1, 0%
Muscid fly (Muscidae), 4, 1%
Tachinid fly (Tachinidae), 32, 4%
Hover fly (Syrphidae), 48, 6%
Bumble bee (Bombus), 373, 50%
Small sweat bee (Lasioglassum), 41, 6%
Small carpenter bee (Ceratina), 1, 0%
Long-horned bee (Melissodes), 2, 0%
Striped sweat bee (Halictus), 3, 0%
Green sweat bee (Augochlorini), 4, 1%
Yellow-faced bee (Hylaeus), 4, 1%


AUGUST
HONEY BEES
NATIVE BEES
BUGS
BEETLES
WASPS
BUTTERFLIES
FLIES
Ambush bug (Phymata), 26, 2%
Assassin bug (Reduviidae), 2, 0%
Lady beetle (Coccinellidae), 10, 1%
Blister beetle (Epicauta), 60, 4%
Honey bee (Apis mellifera), 438, 27%
Soldier beetle (Chauliognathus pensylvanicus), 494, 30%
Bumble bee (Bombus), 186, 11%
Mason wasp (Euodynerus), 4, 0%
Bald-faced hornet (Dolichovespula maculata), 2, 0%
Mason wasp (Ancistrocerus), 1, 0%
Parasitoid wasp (unk.), 1, 0%
Potter wasp (Eumenes), 1, 0%
Yellow jacket (Vespula), 7, 0%
Great black (Sphex pensylvanicus), 12, 1%
Paper wasp (Polistes), 99, 6%
Small carpenter bee (Ceratina), 19, 1%
Long-horned bee (Melissodes), 16, 1%
Small sweat bee (Lasioglossum), 3, 0%
Striped sweat bee (Halictus), 5, 0%
Green sweat bee (Augochlorini), 3, 0%
Leafcutter bee (Megachile), 2, 0%
Carder bee (Anthidium), 1, 0%
Hover fly (Syrphidae), 72, 4%
Monarch (Danaus plexippus), 138, 8%
Blow fly (Caliphoridae), 8, 0%
Tachinid fly (Tachinidae), 4, 0%
Muscid fly (Muscidae), 3, 0%
Thick-headed fly (Physocephala), 2, 0%
Eastern Tailed Blue (Everes comyntas), 1, 0%
Cabbage white (Pieris rapae), 1, 0%
Viceroy (Limenitis archippus), 1, 0%
Clouded sulphur (Colias philodice), 3, 0%
Red admiral (Vanessa atalanta), 4, 0%

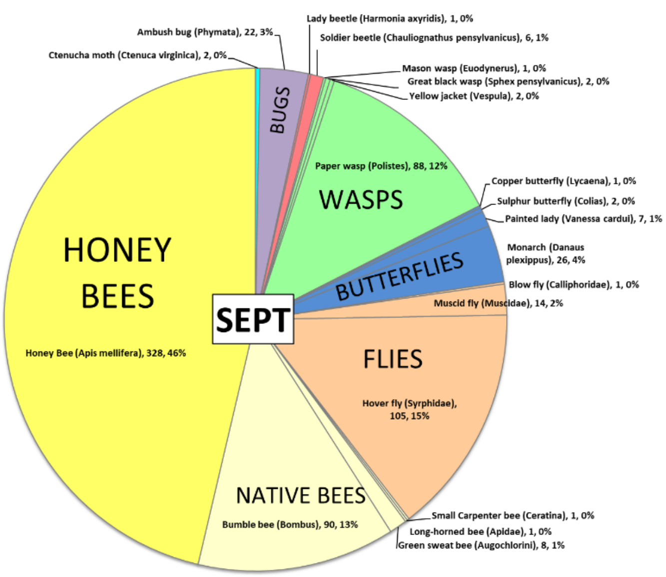

SEPT
HONEY BEES
NATIVE BEES
BUGS
WASPS
BUTTERFLIES
FLIES
Ctenucha moth (Ctenuca virginica), 2, 0%
Ambush bug (Phymata), 22, 3%
Lady beetle (Harmonia axyridis), 1, 0%
Soldier beetle (Chauliognathus pensylvanicus), 6, 1%
Mason wasp (Euodynerus), 1, 0%
Great black wasp (Sphex pensylvanicus), 2, 0%
Yellow jacket (Vespula), 2, 0%
Paper wasp (Polistes), 88, 12%
Copper butterfly (Lycaena), 1, 0%
Sulphur butterfly (Colias), 2, 0%
Painted lady (Vanessa cardui), 7, 1%
Monarch (Danaus plexippus), 26, 4%
Blow fly (Calliphoridae), 1, 0%
Muscid fly (Muscidae), 14, 2%
Honey Bee (Apis mellifera), 328, 46%
Hover fly (Syrphidae), 105, 15%
Bumble bee (Bombus), 90, 13%
Small Carpenter bee (Ceratina), 1, 0%
Long-horned bee (Apidae), 1, 0%
Green sweat bee (Augochlorini), 8, 1%

Figure 3. Assemblages of floral visitors by month (all years combined). Graphs were grouped together on this page to help visualize changes in floral visitor assemblages by month. For larger versions of each of these graphs, see Appendix.

Floral Associations of Native Bees and other Pollinators:

May: A total of 269 pollinators were observed on flowers during this monitoring period (Figure 2). Native bees (including small sweat bees, mining bees, bumble bees, and a diversity of other bee groups) were the most abundant floral visitors present (Figure 3). Native bees comprised 86% of the bees, and 69% of the pollinators. The majority of floral visits in May were on golden Alexanders (*Zizia aurea*) (188) and wild lupine (*Lupinus perennis*) (73). The lupine was most attractive to honey bees and bumble bees, while the golden Alexanders was frequented by a diversity of small native bees, including small sweat bees (*Lasioglossum*), small carpenter bees (*Ceratina*), mining bees (*Andrena*), sweat bees (*Halictus*), and cuckoo bees (*Nomada* & *Sphecodes*). A diversity of flies and wasps were also especially common on golden Alexanders at this time.

June: A total of 250 insects were observed on flowers during this monitoring period (Figure 2). Hover flies were the most abundant pollinator present, and small carpenter bees (*Ceratina*) were the most abundant bee group present (Figure 3). Native bees comprised 100% of the bees, and 40% of the pollinators. No honey bees and few bumble bees were present during this time period. Floral visits by native bees, hover flies, and other insects were fairly evenly divided between a number of native and non-native plants (Table 1). Native blooms were relatively limited during this time period, calling our attention to a bloom gap that should be addressed by interseeding or plugging additional forbs that bloom during this period (see bumble bee section, below).

Table 1. June floral visits by native bees, hover flies, and other insects primarily occurred on the following native and exotic plants (2015-2017). Foraging resources (and bumble bee visits) were very limited during this monitoring period.

Scientific Name	Common Name	Status	# Visits
Potentilla arguta	Prairie cinquefoil	Native	33
Achillea millefolium	Yarrow	Native	26
Securigera varia	Crown vetch	Exotic	22
Coreopsis palmata	Prairie coreopsis	Native	22
Tradescantia occidentalis	Prairie spiderwort	Native	19
Erigeron sp.	Fleabane	Unclear	17
Berteroa incana	Hoary alyssum	Exotic	16
Trifolium pratense	Red clover	Exotic	14
Heliopsis helianthoides	Early sunflower	Native	10
Medicago sativa	Alfalfa	Exotic	10

July: A total of 853 insects were observed on flowers during this monitoring period (Figure 2). Native bees comprised 90% of the bees, and 58% of the pollinators. The majority of visits during this time period were on *Monarda fistulosa* (436), *Pycnanthemum virginianum* (151), *Agastache foeniculum* (100), and *Ratibida pinnata* (72). Bumble bees were the most abundant bee group at this time (Figure 3), and were primarily observed on *M. fistulosa.*

August: A total of 1674 insects were observed on flowers during this monitoring period (Figure 2). Native bees comprised 35% of the bees, and 14% of the floral visitors. Soldier beetles were the most abundant floral visitor (Figure 3), the vast majority of which were visiting *Solidago rigida*. Honey bees (*Apis mellifera*) were the most abundant bee group present, followed by bumble bees (Figure 3). *Solidago rigida* hosted the most insect visitors (1077), followed by *S. canadensis* (228), *S. speciosa* (154), *Liatris ligulistylis* (52), *S. nemoralis* (48), and *Cirsium discolor* (29).

September: A total of 712 insects were observed on flowers during this monitoring period (Figure 2). Native bees comprised 23% of the bees, and 14% of the floral visitors. Honey bees (*Apis mellifera*) were the most abundant bee group present, followed by hoverflies, bumble bees (*Bombus*), and paper wasps (*Polistes*) (Figure 3). The majority of floral visits were to *Solidago speciosa* (381), *Symphyotrichum ericoides* (171) and *S. novae-angliae* (99), and *S. laeve* (32).

Bumble Bee Community Structure:

A total of 697 bumble bees representing ten different species were observed during all surveys (monthly May through September over 3 years) (Figure 4). Representative photographs were taken of all species at the site.

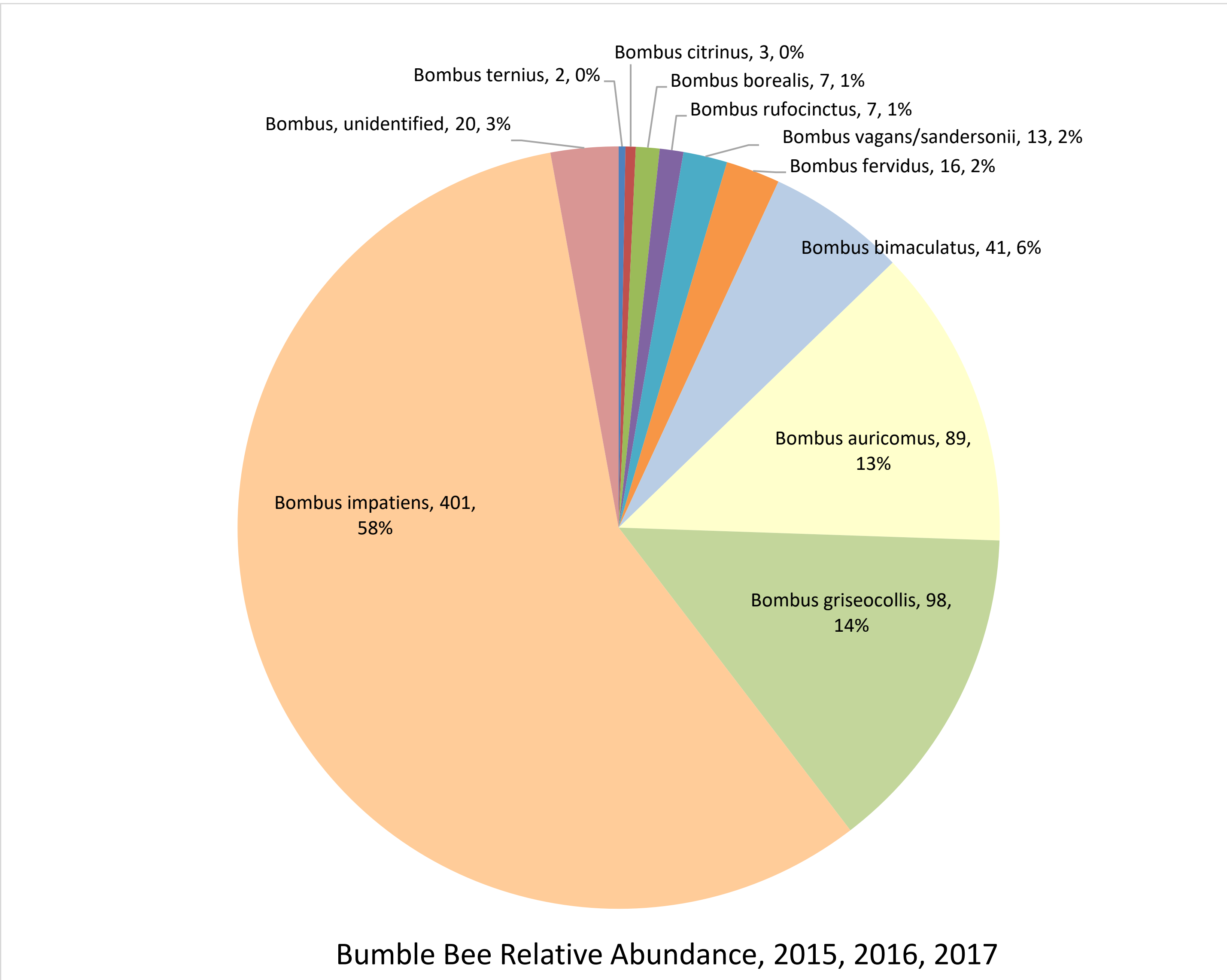


Figure 4. Relative abundance of bumble bees at South Washington (Central Corridor) in 2015, 2016, and 2017. The number of observed individuals of each species is listed after the species name. **Bombus vagans* (common) and *B. sandersoni* (relatively rare) are difficult to distinguish without microscopic examination. One individual of this morphotype was collected, examined microscopically, and determined to be *B. vagans*. As such, it is likely (but not certain) that the other individuals of this morphotype also represent *B. vagans*. Similarly, *B. auricomus* (common) is very similar to *B. pensylvanicus* (very rare); numerous individuals of this morphotype were examined in hand, and all were determined to be *B. auricomus.* We will continue to look for *B. pensylvanicus* at the site, but currently do not have evidence of this species' presence.

A total of 689 floral associations were recorded, representing interactions between ten different bumble bee species and 33 different flowers. The plant species found to support the highest number of bumble bee visits are shown in Table 2.

Table 2. Flowers visited by bumble bees during the course of our 3 years of surveys, monthly May through September. The "other" category is composed of 21 plant species for which four or less bumble bee visits were recorded: *Astragalus canadensis, Boltonia asteroides, Cirsium discolor, Coronilla varia, Dalea candida, Echinacea purpurea, Helenium autumnale, Lespedeza leptostachya, Liatris ligulistylis, Mimulus glabratus, Mimulus ringens, Ratibida pinnata, Rudbeckia hirta, Scrophularia lancelolata, Solidago nemoralis, Symphyotrichum sericeum, Tradescantia occidentalis, Trifolium pratense, Verbena stricta,* and *Zizia aurea*.

Flower Species	Predominant Bloom Time	# Visits
Monarda fistulosa	July	331
Solidago rigida	September	94
Solidago speciosa	August, Sept	77
Solidago canadensis	August	40
Lupinus perennis	May	23
Agastache foeniculum	July	20
Symphyotrichum novae-angliae	September	18
Symphyotrichum ericoides	September	13
Symphyotricum laeve	September	12
Securigera varia	June	9
Dalea purpurea	July	7
Pycnanthemum virginianum	July	7
Other (species with 4 or less visits)	-	21
Total		**689**

It should be noted that *Cirsium discolor* was also found to be highly attractive to bumble bees during late August. Although poorly represented in our transects, this plant was abundant in dense patches outside of our transect areas. We did not attempt to quantify bumble bee visits to *C. discolor* in these areas, however, during a 15 minute-observation of one dense patch of blooming *C. discolor* in August 2013, it was noted that nearly every bloom had one or more bumble bee visitors at any given moment. In contrast, bumble bees were relatively sparse in our transects this same day (just 62 bumble bees were observed during our August 2013 survey compared to 233 during the July survey), presumably due to the higher attractiveness of the *C. discolor* patches relative to the *Solidago* blooming in our transects. Attempts to better quantify the use of *C. discolor* by *Bombus* and other pollinators are underway at other sites.

In general, June observations of bumble bees over the 3 years were lower than expected (based on May bumble bee abundance) across the site, presumably due to low forage availability at that time.

Table 3. Bumble bee observations per month, over 3 years (a few of these observations were in flight or on the ground, not on flowers).

May	27
June	20
July	373
August	187
September	90

Across all years, only 16 bumble bee were observed on flowers in June, visiting just four species *(Scrophularia lanceolata, Secuigera varia, Tradescantia occidentalis, Trifolium pretense*). This finding suggests that there may be a gap in bumble bee floral resources (particularly natives) post-*Lupinus/Zizia* bloom (late May), and pre-*Monarda /Agastache* bloom (July). Plants with potential to fill or partially fill this bloom gap include (but are not limited to): additional spiderwort (*Tradescantia* spp.), additional figwort (*Scrophularia* spp.), prairie phlox, upland white goldenrod, common milkweed, butterfly weed, smooth/foxglove penstemon (but nativity remains uncertain), slender penstemon, yarrow, flat-topped aster (wet areas), *Coreopsis* spp., fireweed, *Rosa* spp., and native loosestrife (wet areas).

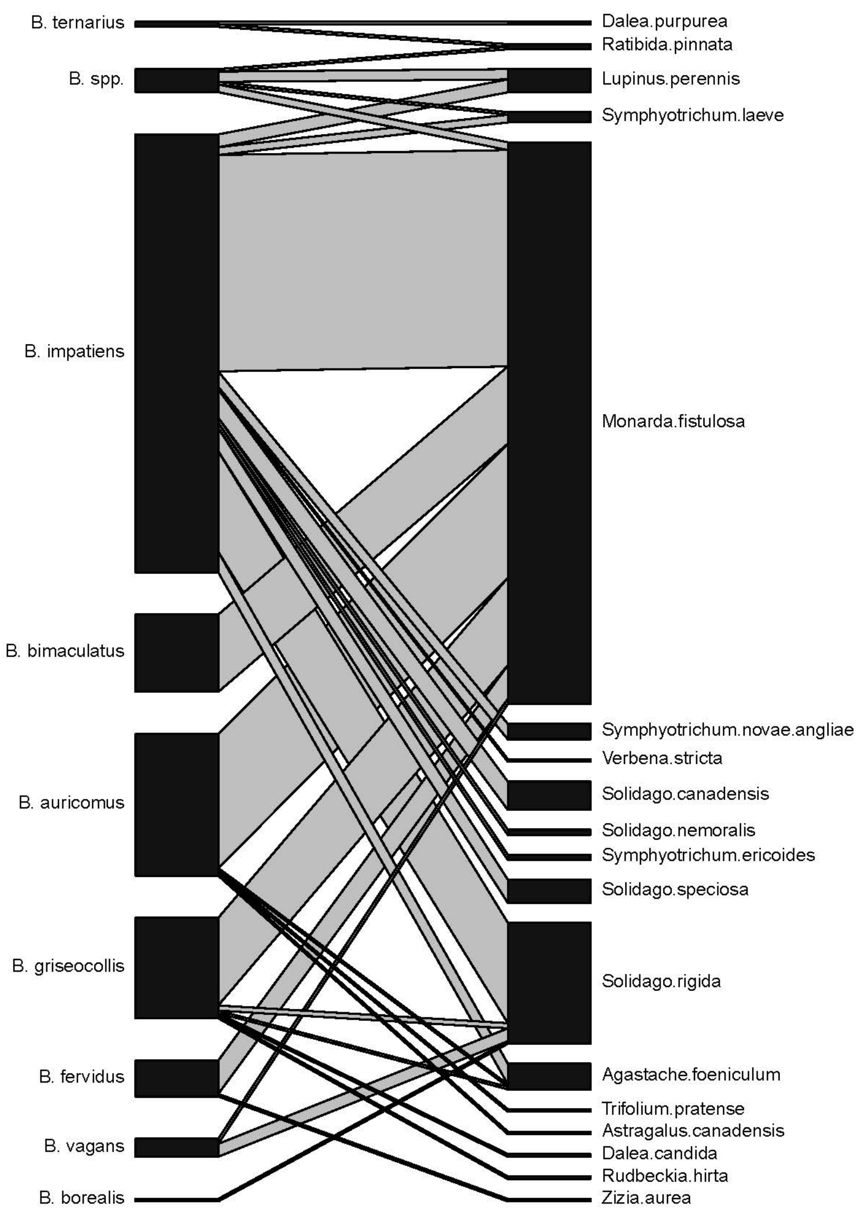


Figure 5. Floral associations of bumble bees at South Washington (Central Corridor) in 2015. Although the majority of bumble bee observations were on *Monarda fistulosa*, a few species (*B. ternarius, B. borealis,* and *B. vagans*) were detected only (or primarily) on other plant species (namely, *Solidago rigida, Dalea purpurea,* and *Ratibida pinnata*).

Monarch Nectar Plant Associations:

Nectaring associations of adult monarchs are presented below. *Solidago rigida* was the most-visited plant by adult monarchs (67 visits, 35%), followed by *Liatris ligulistylis* (56 visits, 29%) and *Syphyotrichum novae-angliae* (19 visits, 10%) (Figure 6). Although three *Liatris* species are common on site (*L. aspera, L. pycnostachya,* and *L. ligulistylis*), the latter was by far the most attractive to monarchs (Figure 6).

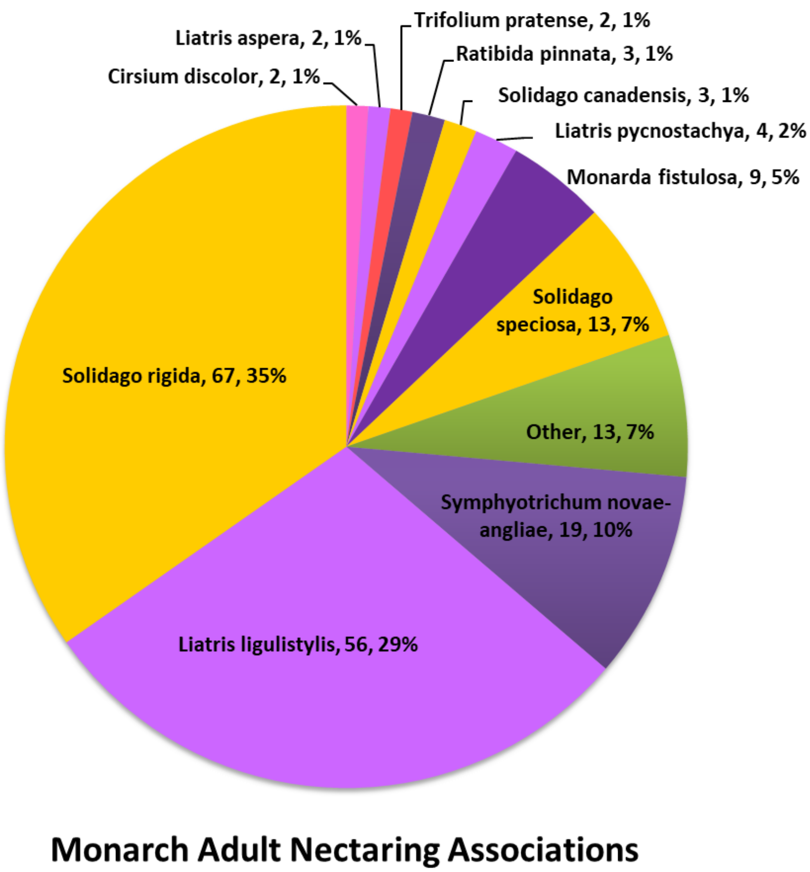


Figure 6. Floral associations of nectaring adult monarchs at South Washington over the three-year monitoring period. The colors in the graph roughly approximate the flower color. Additional plant species that were documented with nectaring monarchs on only one occasion were combined into the “other” category. The majority of these observations occurred in late August, followed by late September.

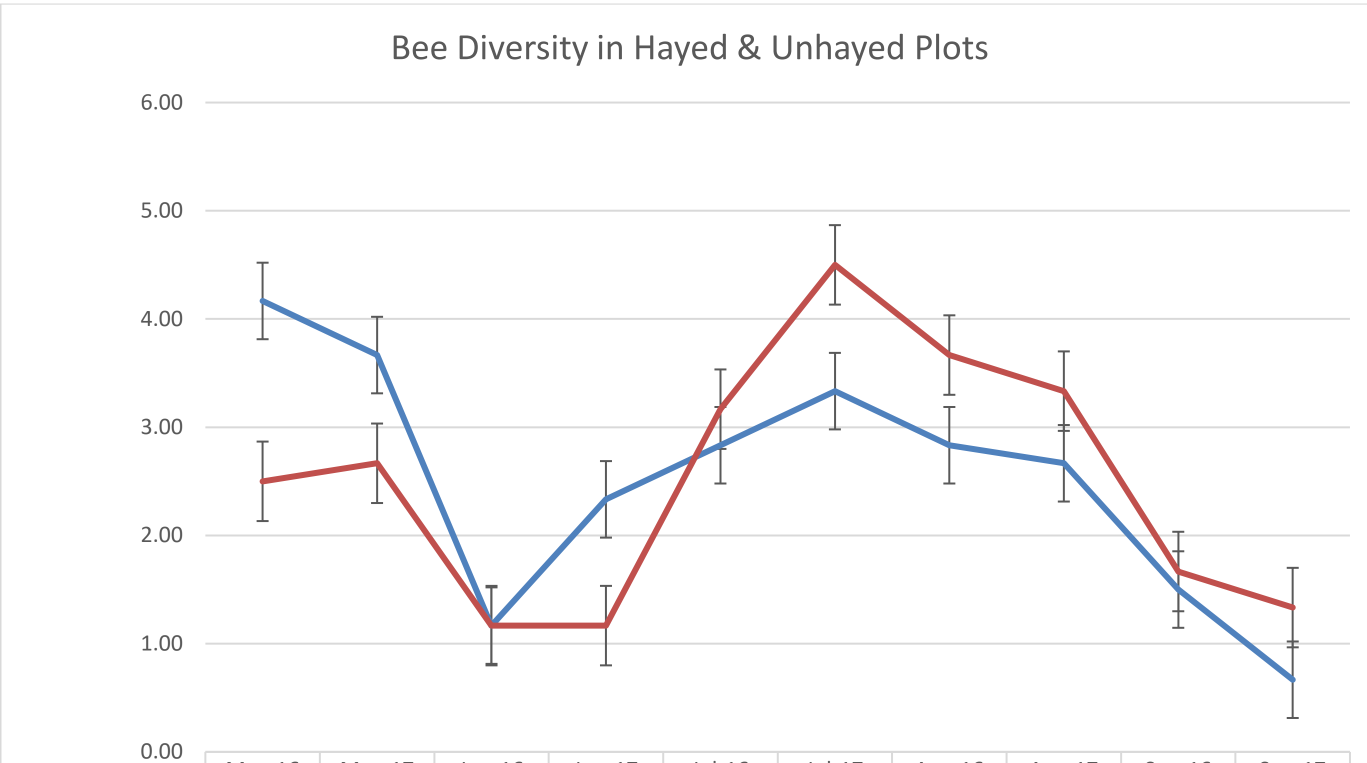
Monitoring Implications:

In this study, our surveys were conducted monthly from May to September, typically the last week of the month. Native bees exhibited the highest diversity in May and August (8 genera represented), compared to other months, especially September. Native bees also had the highest *relative abundance* in May (69%), relative to other flower visitors (Figure 3). The greatest *total abundance* of native bees was observed in July, followed by August (Figure 2). June revealed low numbers, but moderate diversity, of native bees (7 groups represented, including one not seen in other months). By late September, relative abundance of native bees had tapered down to 14%, and no new bee groups/genera were detected at that time. **These findings suggest that May, June, July, and August should be prioritized for native bee monitoring, due to the highest diversity, abundance, and relative abundance of native bees on flowers at these times.** If funding/time is limited, September monitoring could be omitted in this region, unless monarchs, honey bees, or other groups are considered priority for the study (Figure 3).

Impact of Haying on Native Bee Abundance and Diversity:

One of the objectives of this study was to examine potential impacts of haying on native bees. To do this, we calculated the mean abundance and diversity values for hayed and for unhayed transects on each survey date following the fall 2015 haying, and performed two-tailed paired T-tests to evaluate differences. We also examined abundance differences specifically in cavity nesting bees, since these bees are likely to be the most negatively impacted by haying due to removal of nest sites.

Bee diversity in hayed vs. unhayed plots (all months / years combined) was not significantly different ($p = 0.5$). However, on our May survey dates, bee diversity was consistently higher in hayed plots ($p = .018$), Figure 7).

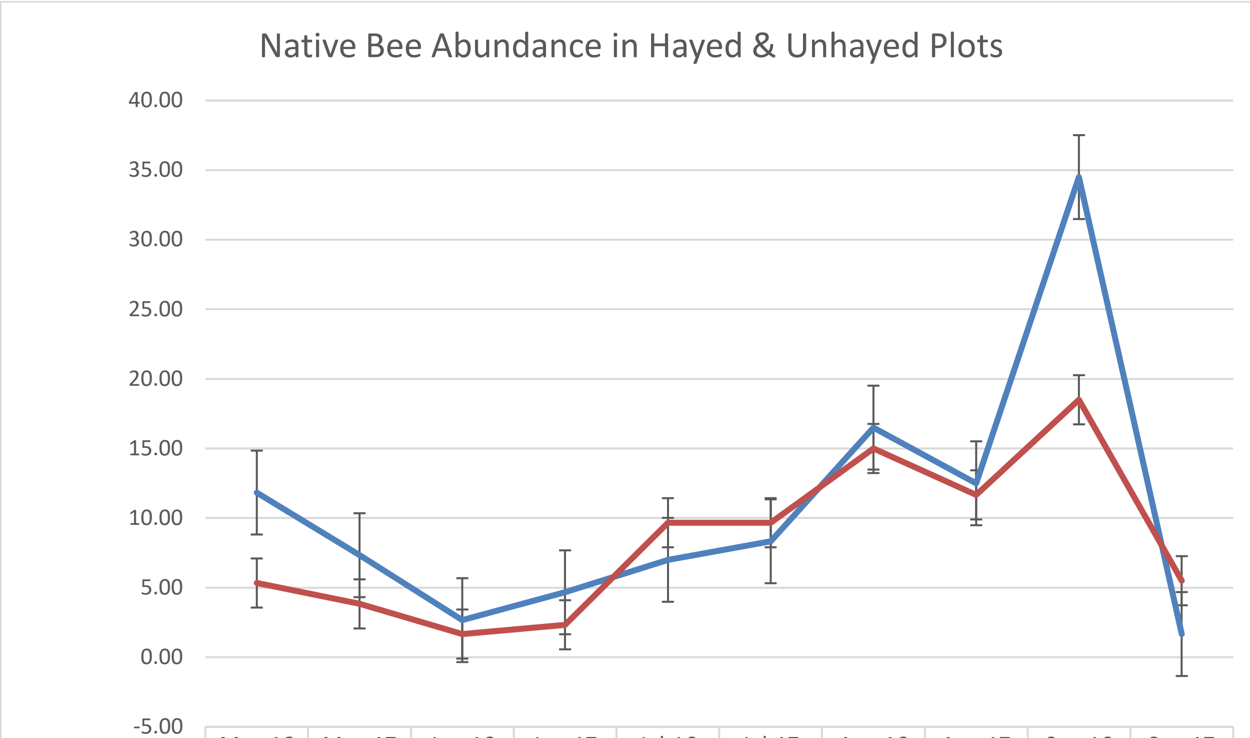


	May-16	May-17	Jun-16	Jun-17	Jul-16	Jul-17	Aug-16	Aug-17	Sep-16	Sep-17
Hayed	4.17	3.67	1.17	2.33	2.83	3.33	2.83	2.67	1.50	0.67
Unhayed	2.50	2.67	1.17	1.17	3.17	4.50	3.67	3.33	1.67	1.33

Figure 7. Average bee diversity in hayed vs. unhayed transects. Hayed transects had significantly higher diversity in May, consistent across years.

Similarly, bee abundance in hayed vs. unhayed plots (all months / years combined) was not significantly different (p = 0.21). However, on our May survey dates, bee abundance was higher in hayed plots, although significance was not consistent across all survey years (p = .09), Figure 8). Higher abundance and diversity of bees in hayed plots in May was likely driven by increased wildflower bloom, and/or increased visibility of wildflowers in the hayed plots at that time, since the grass canopy and thatch had been removed.

Bee abundance was also higher in hayed plots in September of the first study year, although this was not consistent across both years.



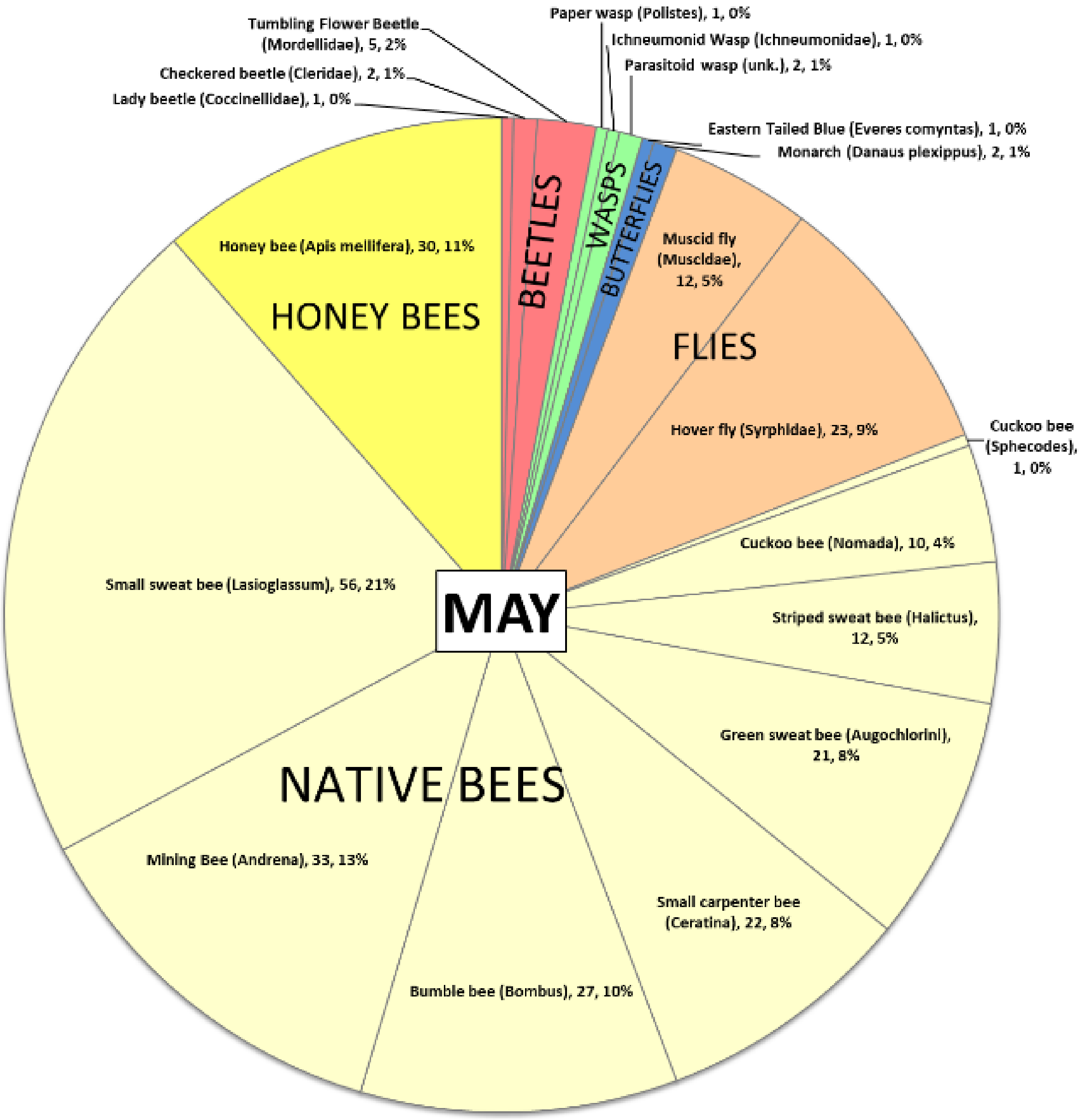
	May-16	May-17	Jun-16	Jun-17	Jul-16	Jul-17	Aug-16	Aug-17	Sep-16	Sep-17
Hayed	11.83	7.33	2.67	4.67	7.00	8.33	16.50	12.50	34.50	1.67
Unhayed	5.33	3.83	1.67	2.33	9.67	9.67	15.00	11.67	18.50	5.50

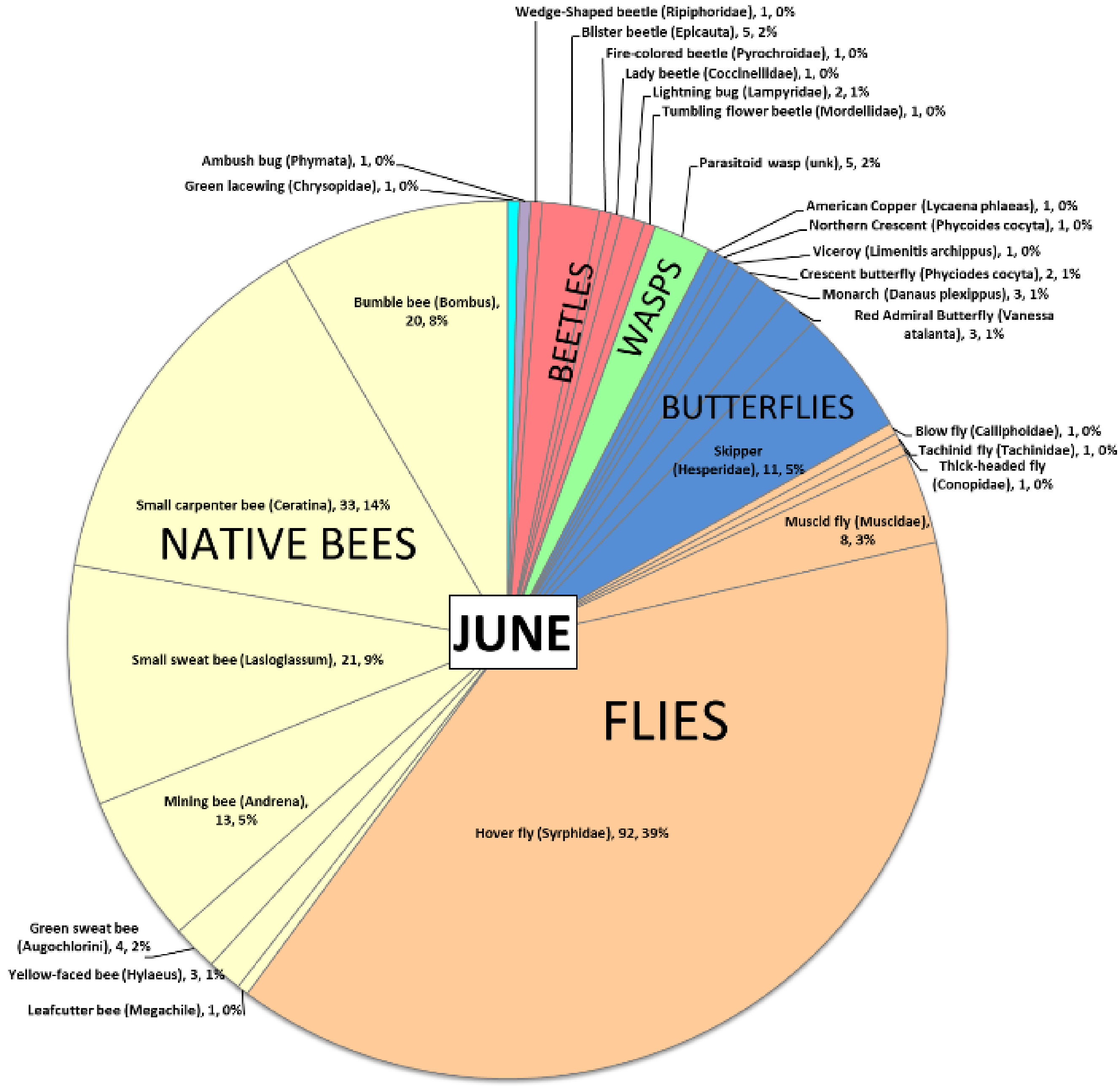
Figure 8. Average bee abundance in hayed vs. unhayed transects.

Cavity-nesting bee abundance was not significantly different in hayed vs. unhayed plots (all months/years combined) (p = 0.5).

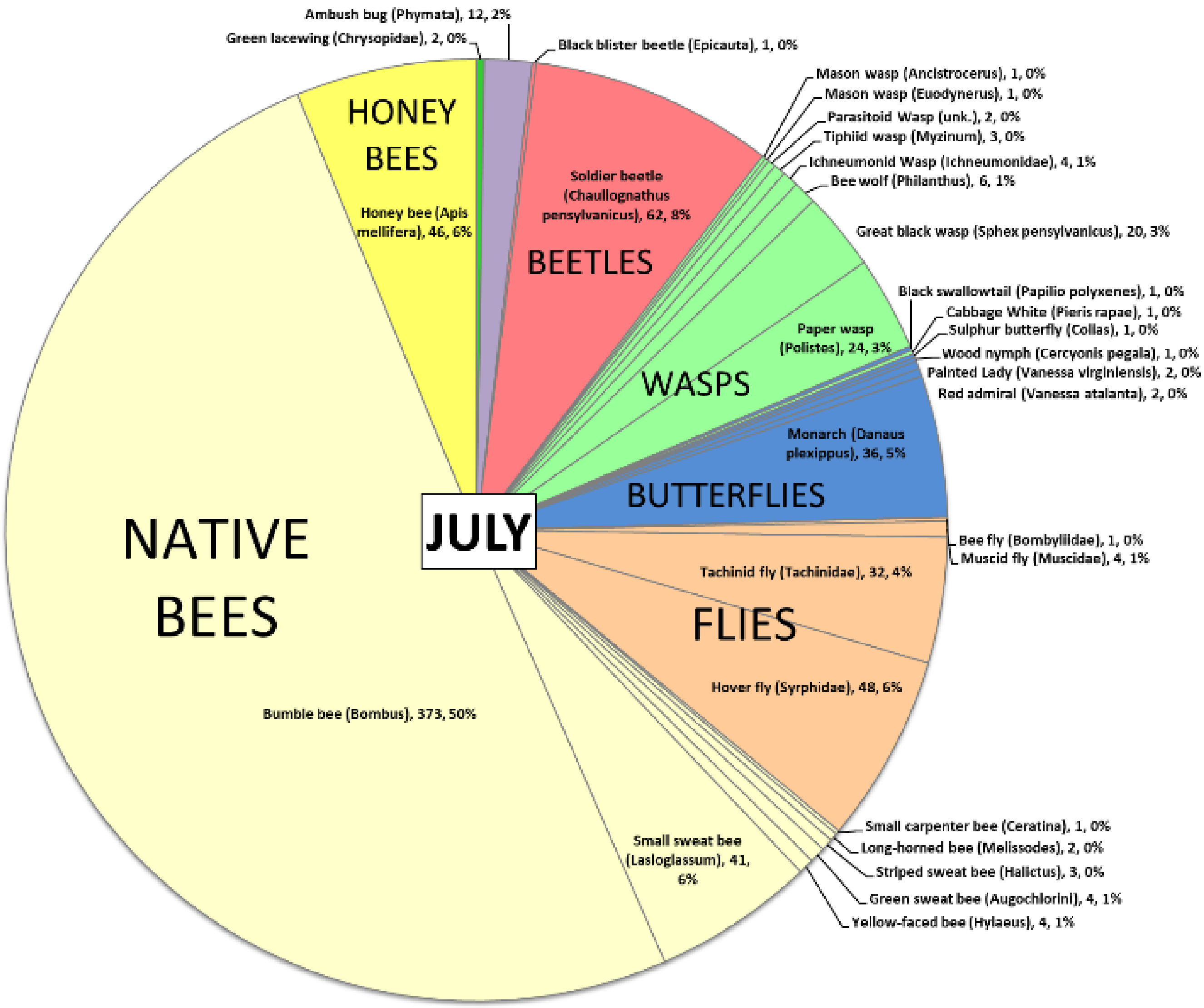
Appendix:

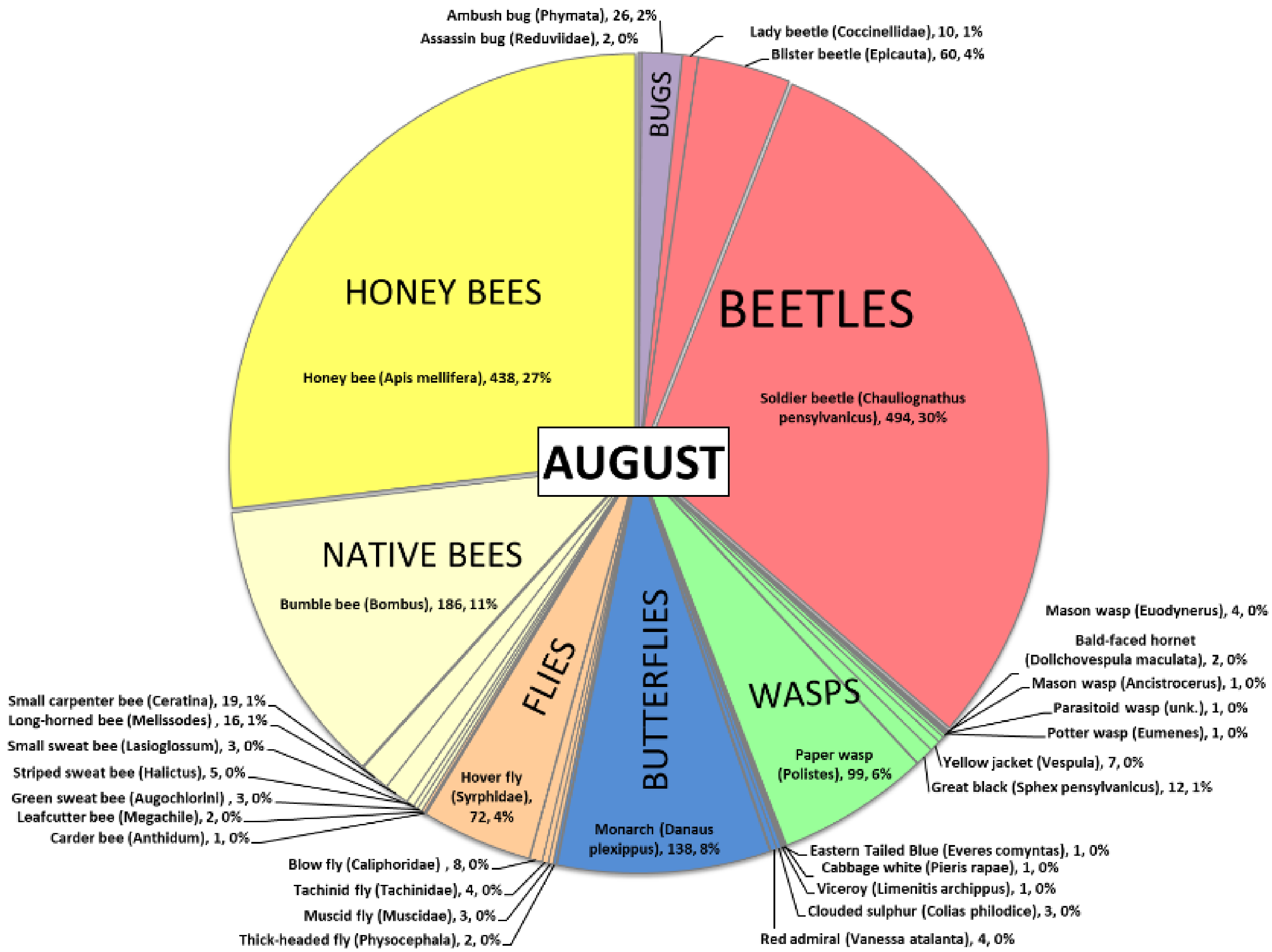
Larger versions of graphs shown in Figure 3 in the text, showing assemblages of floral visitors by month (all years combined).

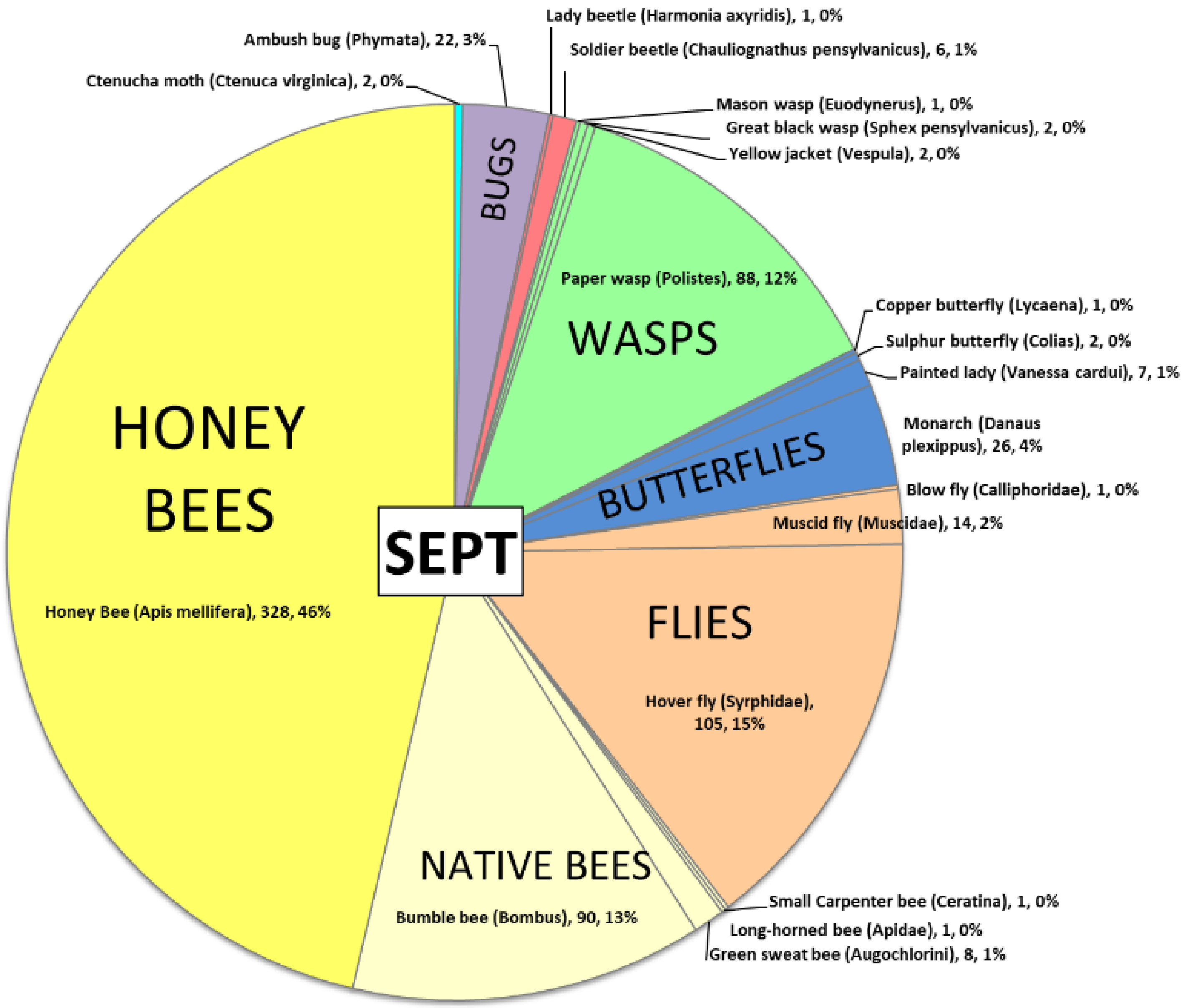

Tumbling Flower Beetle (Mordellidae), 5, 2%
Checkered beetle (Cleridae), 2, 1%
Lady beetle (Coccinellidae), 1, 0%
Paper wasp (Polistes), 1, 0%
Ichneumonid Wasp (Ichneumonidae), 1, 0%
Parasitoid wasp (unk.), 2, 1%
Eastern Tailed Blue (Everes comyntas), 1, 0%
Monarch (Danaus plexippus), 2, 1%
BEETLES
WASPS
BUTTERFLIES
Muscid fly (Muscidae), 12, 5%
FLIES
Hover fly (Syrphidae), 23, 9%
Cuckoo bee (Sphecodes), 1, 0%
Cuckoo bee (Nomada), 10, 4%
Striped sweat bee (Halictus), 12, 5%
Green sweat bee (Augochlorini), 21, 8%
Small carpenter bee (Ceratina), 22, 8%
Bumble bee (Bombus), 27, 10%
Mining Bee (Andrena), 33, 13%
NATIVE BEES
Small sweat bee (Lasioglassum), 56, 21%
Honey bee (Apis mellifera), 30, 11%
HONEY BEES
MAY



Wedge-Shaped beetle (Ripiphoridae), 1, 0%
Blister beetle (Epicauta), 5, 2%
Fire-colored beetle (Pyrochroidae), 1, 0%
Lady beetle (Coccinellidae), 1, 0%
Lightning bug (Lampyridae), 2, 1%
Tumbling flower beetle (Mordellidae), 1, 0%
Parasitoid wasp (unk), 5, 2%
Ambush bug (Phymata), 1, 0%
Green lacewing (Chrysopidae), 1, 0%
American Copper (Lycaena phlaeas), 1, 0%
Northern Crescent (Phycoides cocyta), 1, 0%
Viceroy (Limenitis archippus), 1, 0%
Crescent butterfly (Phyciodes cocyta), 2, 1%
Monarch (Danaus plexippus), 3, 1%
Red Admiral Butterfly (Vanessa atalanta), 3, 1%
BEETLES
WASPS
BUTTERFLIES
Bumble bee (Bombus), 20, 8%
Skipper (Hesperidae), 11, 5%
Blow fly (Calliphoidae), 1, 0%
Tachinid fly (Tachinidae), 1, 0%
Thick-headed fly (Conopidae), 1, 0%
Muscid fly (Muscidae), 8, 3%
Small carpenter bee (Ceratina), 33, 14%
NATIVE BEES
JUNE
Small sweat bee (Lasioglassum), 21, 9%
FLIES
Mining bee (Andrena), 13, 5%
Hover fly (Syrphidae), 92, 39%
Green sweat bee (Augochlorini), 4, 2%
Yellow-faced bee (Hylaeus), 3, 1%
Leafcutter bee (Megachile), 1, 0%


JULY
NATIVE BEES
HONEY BEES
BEETLES
WASPS
BUTTERFLIES
FLIES
Ambush bug (Phymata), 12, 2%
Green lacewing (Chrysopidae), 2, 0%
Black blister beetle (Epicauta), 1, 0%
Mason wasp (Ancistrocerus), 1, 0%
Mason wasp (Euodynerus), 1, 0%
Parasitoid Wasp (unk.), 2, 0%
Tiphiid wasp (Myzinum), 3, 0%
Ichneumonid Wasp (Ichneumonidae), 4, 1%
Bee wolf (Philanthus), 6, 1%
Great black wasp (Sphex pensylvanicus), 20, 3%
Black swallowtail (Papilio polyxenes), 1, 0%
Cabbage White (Pieris rapae), 1, 0%
Sulphur butterfly (Colias), 1, 0%
Wood nymph (Cercyonis pegala), 1, 0%
Painted Lady (Vanessa virginiensis), 2, 0%
Red admiral (Vanessa atalanta), 2, 0%
Honey bee (Apis mellifera), 46, 6%
Soldier beetle (Chauliognathus pensylvanicus), 62, 8%
Paper wasp (Polistes), 24, 3%
Monarch (Danaus plexippus), 36, 5%
Bee fly (Bombyliidae), 1, 0%
Muscid fly (Muscidae), 4, 1%
Tachinid fly (Tachinidae), 32, 4%
Hover fly (Syrphidae), 48, 6%
Bumble bee (Bombus), 373, 50%
Small sweat bee (Lasioglossum), 41, 6%
Small carpenter bee (Ceratina), 1, 0%
Long-horned bee (Melissodes), 2, 0%
Striped sweat bee (Halictus), 3, 0%
Green sweat bee (Augochlorini), 4, 1%
Yellow-faced bee (Hylaeus), 4, 1%


Ambush bug (Phymata), 26, 2%
Assassin bug (Reduviidae), 2, 0%
Lady beetle (Coccinellidae), 10, 1%
Blister beetle (Epicauta), 60, 4%
BUGS
HONEY BEES
Honey bee (Apis mellifera), 438, 27%
BEETLES
Soldier beetle (Chauliognathus pensylvanicus), 494, 30%
AUGUST
NATIVE BEES
Bumble bee (Bombus), 186, 11%
FLIES
BUTTERFLIES
WASPS
Mason wasp (Euodynerus), 4, 0%
Bald-faced hornet (Dolichovespula maculata), 2, 0%
Mason wasp (Ancistrocerus), 1, 0%
Parasitoid wasp (unk.), 1, 0%
Potter wasp (Eumenes), 1, 0%
Yellow jacket (Vespula), 7, 0%
Great black (Sphex pensylvanicus), 12, 1%
Paper wasp (Polistes), 99, 6%
Small carpenter bee (Ceratina), 19, 1%
Long-horned bee (Melissodes) , 16, 1%
Small sweat bee (Lasioglossum), 3, 0%
Striped sweat bee (Halictus), 5, 0%
Green sweat bee (Augochlorini) , 3, 0%
Leafcutter bee (Megachile), 2, 0%
Carder bee (Anthidum), 1, 0%
Hover fly (Syrphidae), 72, 4%
Monarch (Danaus plexippus), 138, 8%
Blow fly (Caliphoridae) , 8, 0%
Tachinid fly (Tachinidae), 4, 0%
Muscid fly (Muscidae), 3, 0%
Thick-headed fly (Physocephala), 2, 0%
Eastern Tailed Blue (Everes comyntas), 1, 0%
Cabbage white (Pieris rapae), 1, 0%
Viceroy (Limenitis archippus), 1, 0%
Clouded sulphur (Colias philodice), 3, 0%
Red admiral (Vanessa atalanta), 4, 0%



Lady beetle (Harmonia axyridis), 1, 0%
Ambush bug (Phymata), 22, 3%
Soldier beetle (Chauliognathus pensylvanicus), 6, 1%
Ctenucha moth (Ctenuca virginica), 2, 0%
Mason wasp (Euodynerus), 1, 0%
Great black wasp (Sphex pensylvanicus), 2, 0%
Yellow jacket (Vespula), 2, 0%
BUGS
Paper wasp (Polistes), 88, 12%
Copper butterfly (Lycaena), 1, 0%
WASPS
Sulphur butterfly (Colias), 2, 0%
Painted lady (Vanessa cardui), 7, 1%
HONEY BEES
Monarch (Danaus plexippus), 26, 4%
BUTTERFLIES
Blow fly (Calliphoridae), 1, 0%
SEPT
Muscid fly (Muscidae), 14, 2%
Honey Bee (Apis mellifera), 328, 46%
FLIES
Hover fly (Syrphidae), 105, 15%
NATIVE BEES
Small Carpenter bee (Ceratina), 1, 0%
Bumble bee (Bombus), 90, 13%
Long-horned bee (Apidae), 1, 0%
Green sweat bee (Augochlorini), 8, 1%