The Intentional & the Accidental:
The Role of Cultivated and Uncultivated Flowers in Supporting Plant Diversity and Insect Abundance on Farms.

As an ancillary goal to production, farms can help support native plants and flower visitors. In some cases, those organisms play an integral or, at least, contributing role in farm production.

That support of native species can be intentional (such as seeded plants for crops or intentional pollinator habitat) and/or incidental (such as weedy or wild plants). In many people's minds, intentionally cultivated plants take precedence. Nonetheless, abundant wild-growing flowers also occur on many farms.

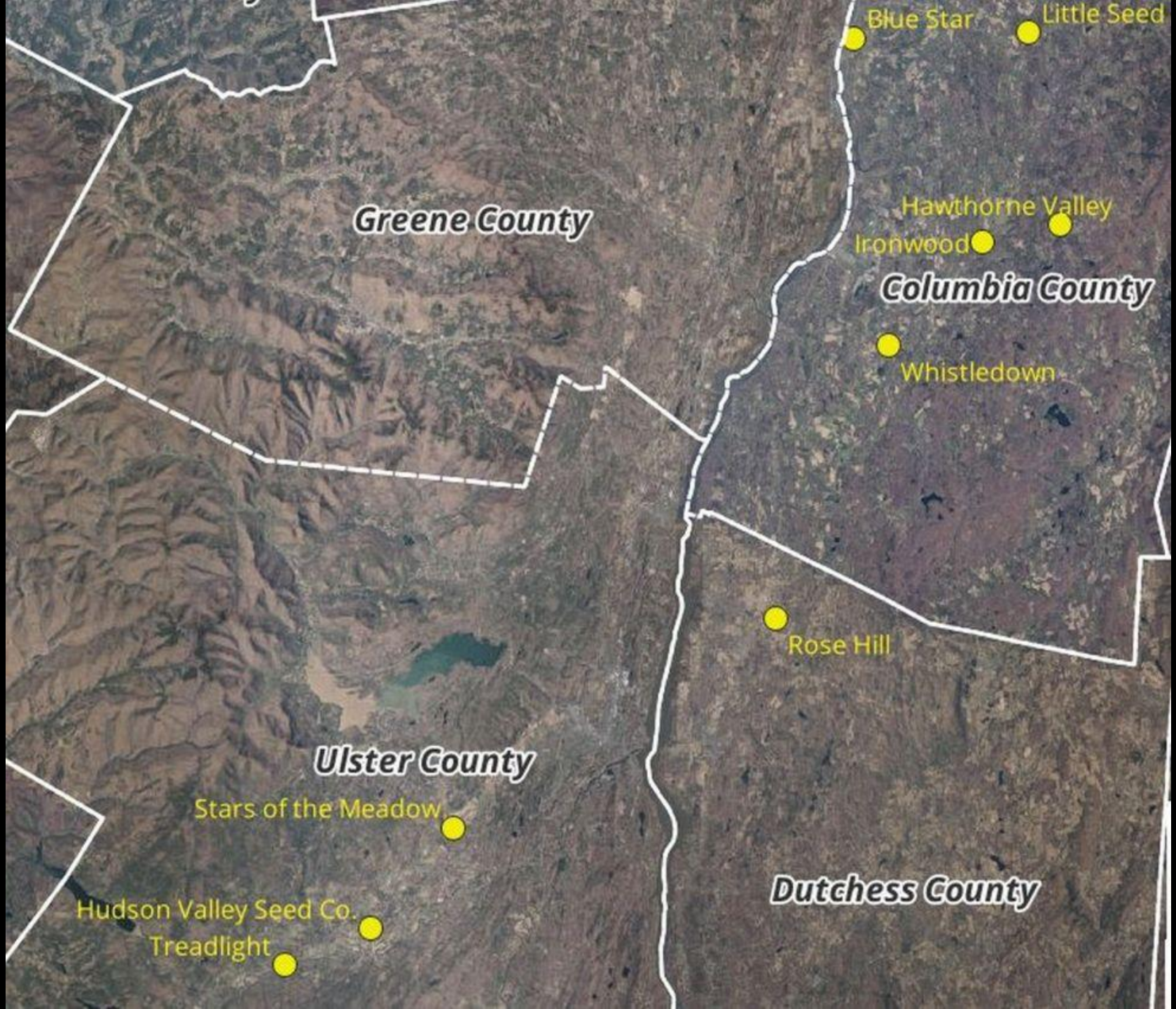
In this context, **our goals were the following:**

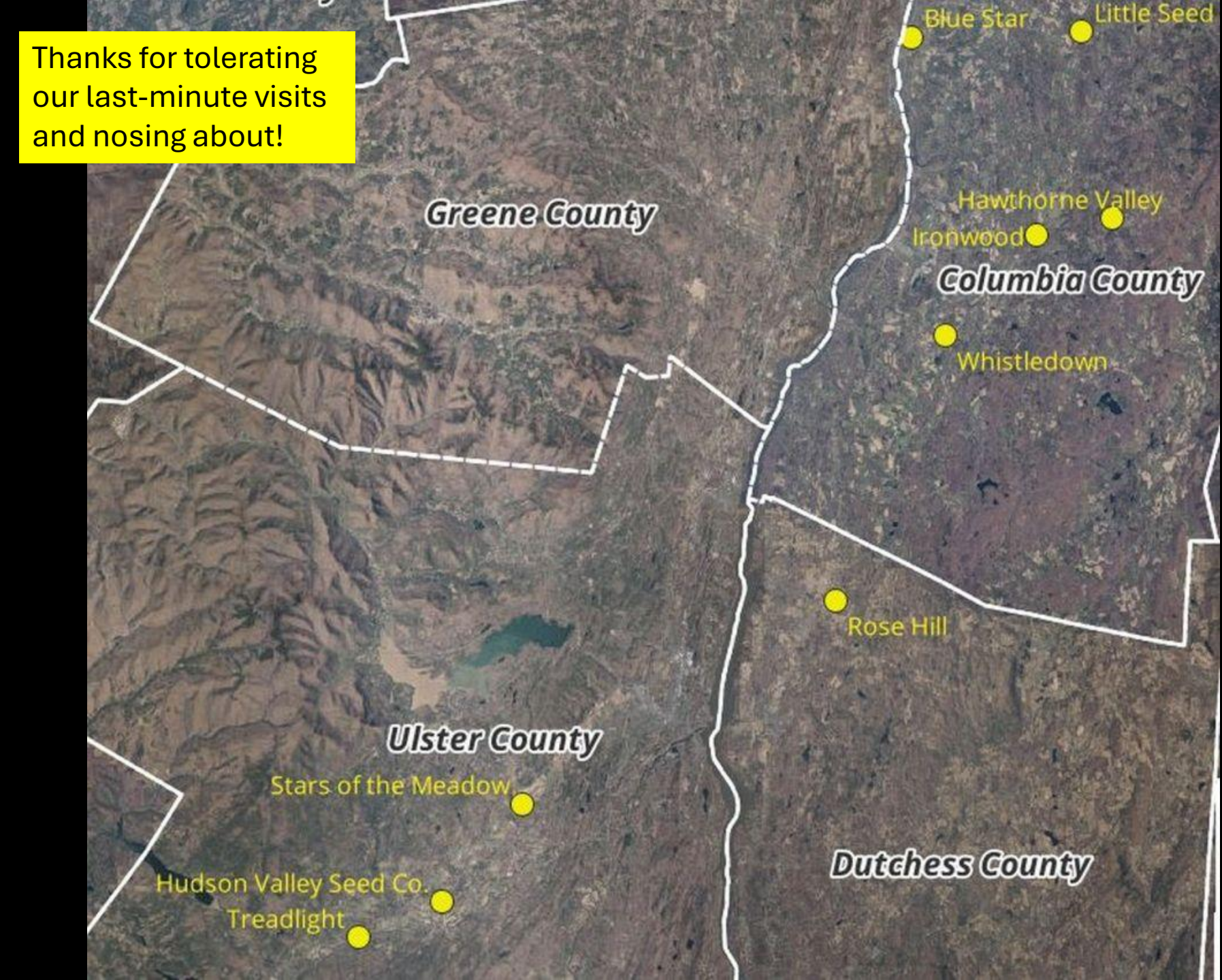
A. **Explore the spatial and seasonal distribution of flowers on nine farms.**

B. **Document the value of different flowers for flower-visiting insects.**

C. **By combining A & B, explore the spatial and seasonal distribution of habitat for flower-visiting insects.**

We hope these data can provide tools for broader thinking about the management of on-farm flowers and, by extension, flower visitors.


Blue Star
Little Seed
Greene County
Hawthorne Valley
Ironwood
Columbia County
Whistledown
Rose Hill
Ulster County
Stars of the Meadow
Hudson Valley Seed Co.
Treadlight
Dutchess County


Thanks for tolerating our last-minute visits and nosing about!
Blue Star
Little Seed
Greene County
Hawthorne Valley
Ironwood
Columbia County
Whistledown
Rose Hill
Ulster County
Stars of the Meadow
Hudson Valley Seed Co.
Treadlight
Dutchess County


Blue Star Farm

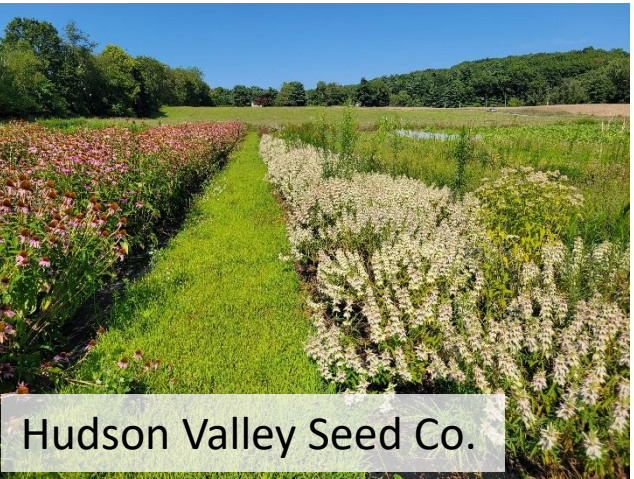

Little Seed Gardens


Ironwood


Hawthorne Valley F.


Rose Hill


Stars of the Meadow


Hudson Valley Seed Co.


Treadlight Farm


Whistledown Farm

The groundwork for this project was the identification and mapping of flowers. This both directly documented native and non-native flower diversity and provided the necessary basis for studying the flower-visiting insects.

Flower Diversity and Abundance on Nine Hudson Valley Farms in 2025

METHODS for Flower Surveys:

Blue Star Farm
3.9 acres; 19 units

Hawthorne Valley F.
2.1 acres; 26 units

Hudson Valley Seed Co.
8.6 acres; 24 units

Ironwood Farm
2.3 acres; 14 units

Little Seed Gardens
3.4 acres; 26 units

Rose Hill Farm (N) **Rose Hill Farm (S)**
Total sampled: 6.8 acres; 20 units

Stars of the Meadow F.
1.6 acres; 37 units

Treadlight Farm
10.4 acres; 26 units

Whistledown Farm
3.7 acres; 17 units

- Delineate sampling units
- Categorize sampling units by habitat (11 categories)
- Record flowers present in each unit => *Flower diversity*
- Assign *flower abundance* rank for each species per unit (A, B, C, D)
- Assign overall *flower abundance* rank for each unit A, B, C, D)
- Repeat three times throughout season (late June, late July, Aug./Sept.)


Cult. flowers


Cult. other crops


Mature field edge


Mature fallow


Mature cover crop


Orchard


Managed wildflowers, Mowed, Bare Grd.

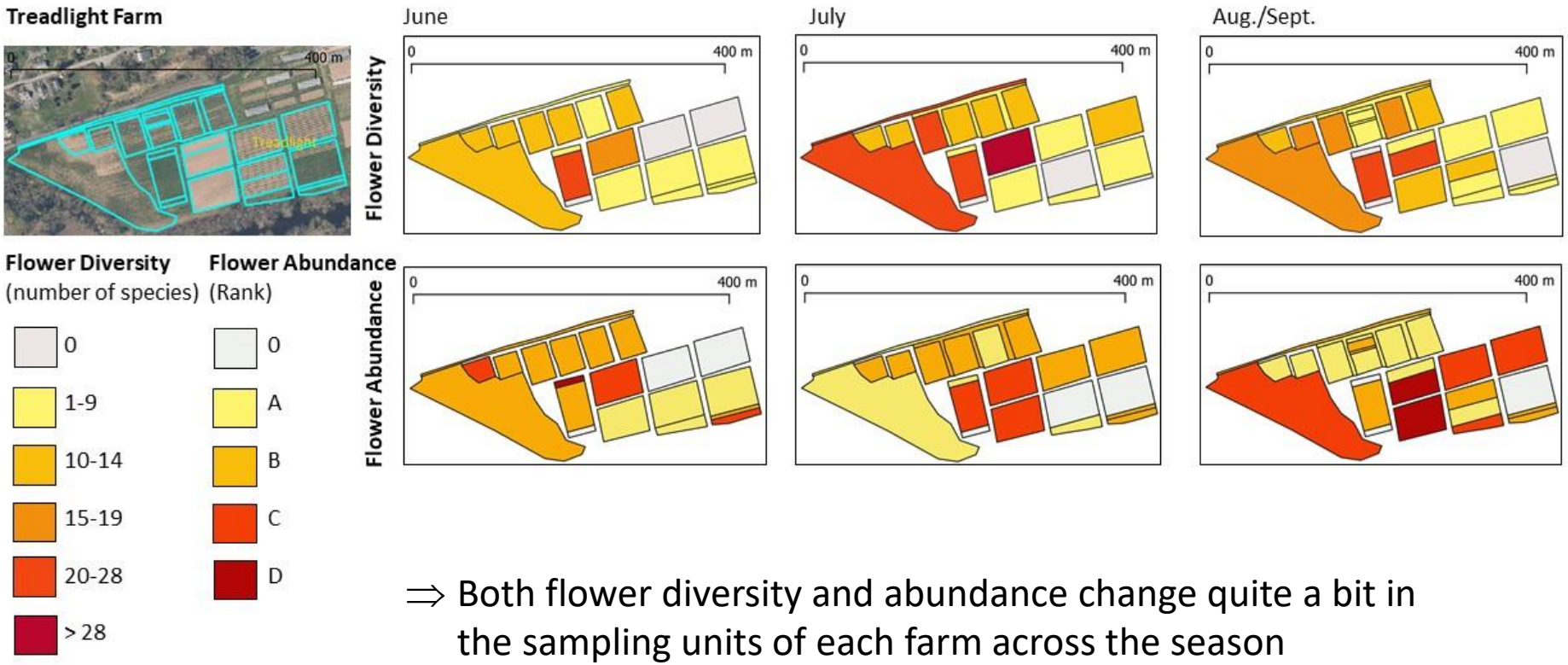

Wild


Fenceline, Mowed.

Mature
field edge


Habitat Unit
Date:
Number:
Obs.:
Swamp Rose
Swamp Milkweed
Bird's-foot trefoil
Wild Madder
Black-eyed S.
Indian Hemp
Spotted Jw
Wild Carrot
Oxalis
Red Clover
Healall
English Plant
Wild Clover
Dandelion
Bird Ivd Plant
Ye Stargrass
Tufted vetch
Spotted J-Pye-Weed
Smooth Alk
Hedge Bindweed
New York Ironweed
P. caespitosa
Monkeyflower
Indian Tobacco
Alsike Clover
Lady's Thumb
Field Bindweed

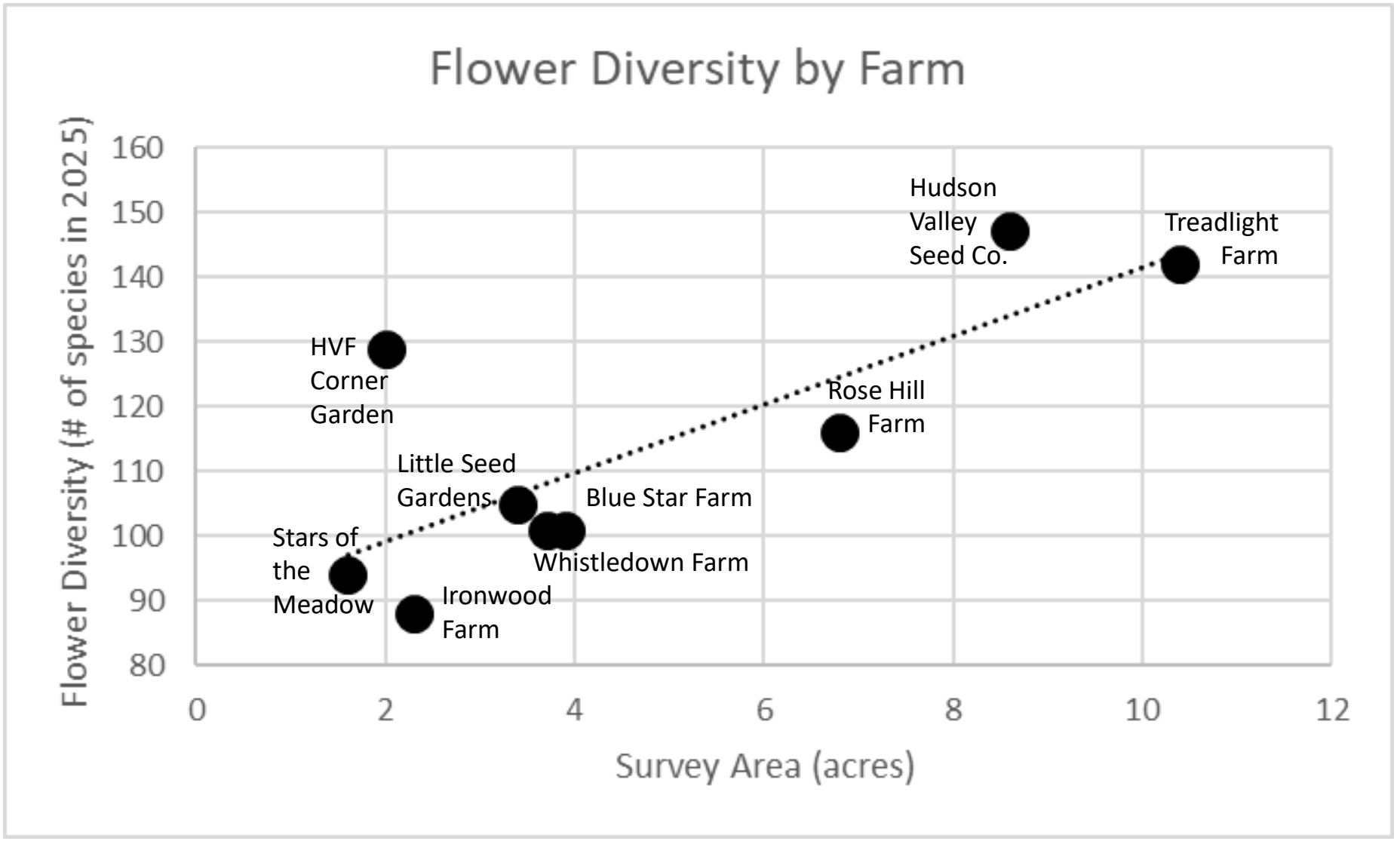
Flower Diversity and Abundance Maps => Maps for each of the farms with sampling units color-coded by flower diversity and abundance in each month



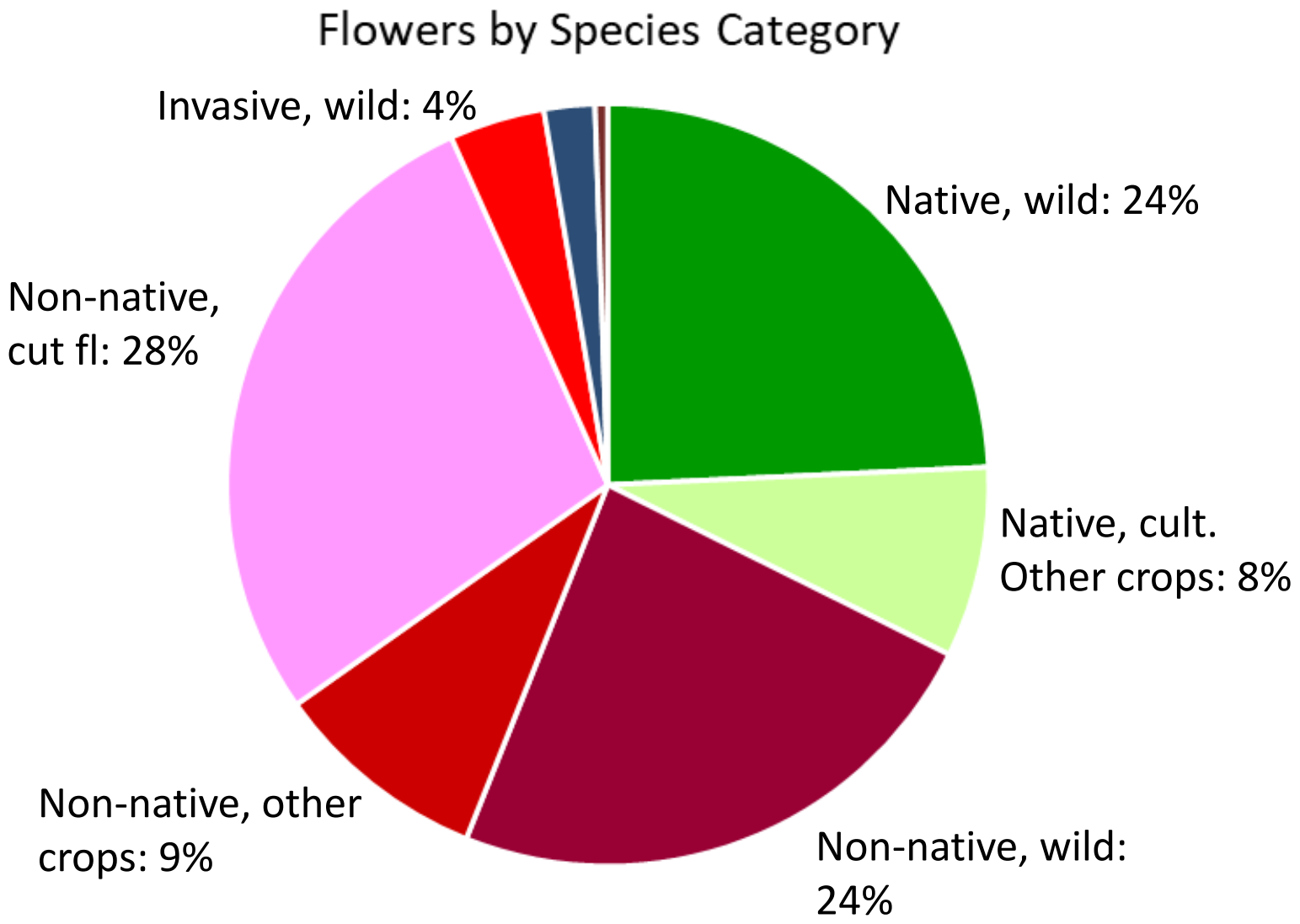
⇒ Both flower diversity and abundance change quite a bit in the sampling units of each farm across the season

⇒ Flower diversity and abundance are two different metrics for floral resources which are not tightly correlated

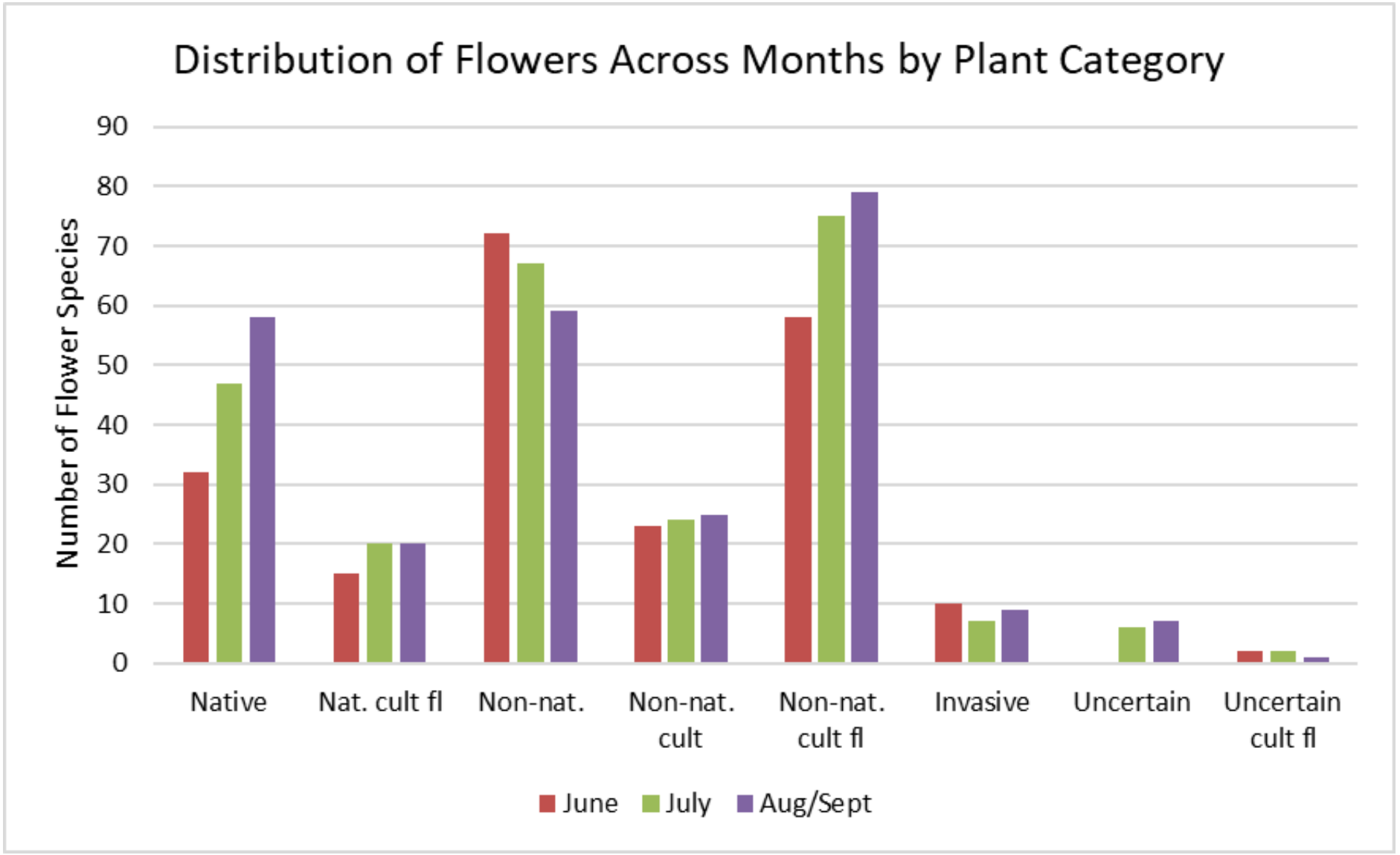
Flower Diversity & Survey Area => Farm-wide, all-season flower diversity tended to be higher at the farms where were we surveyed a larger area



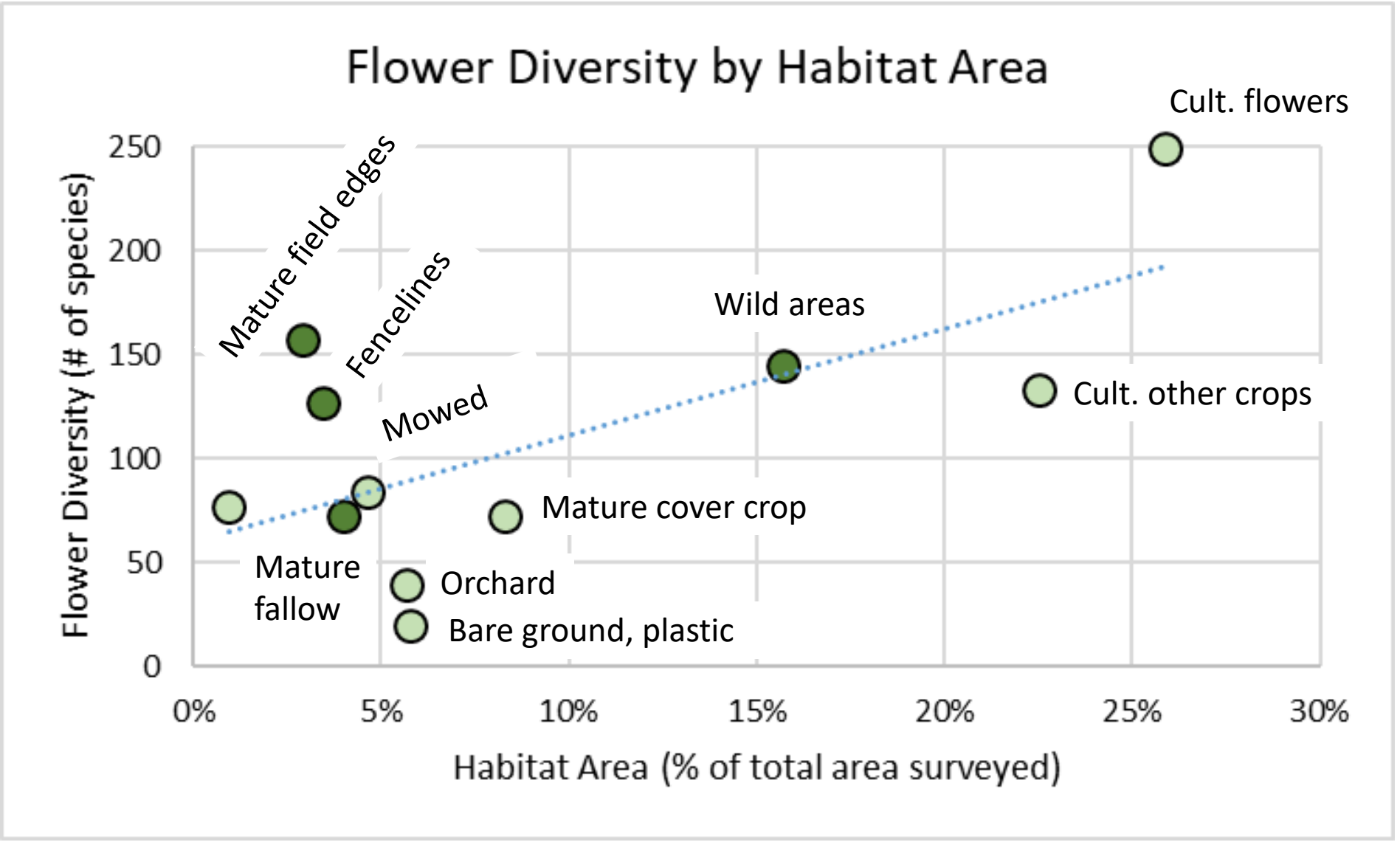
Number of Flower Species => We found a total of 371 flower species at nine farms in 2025



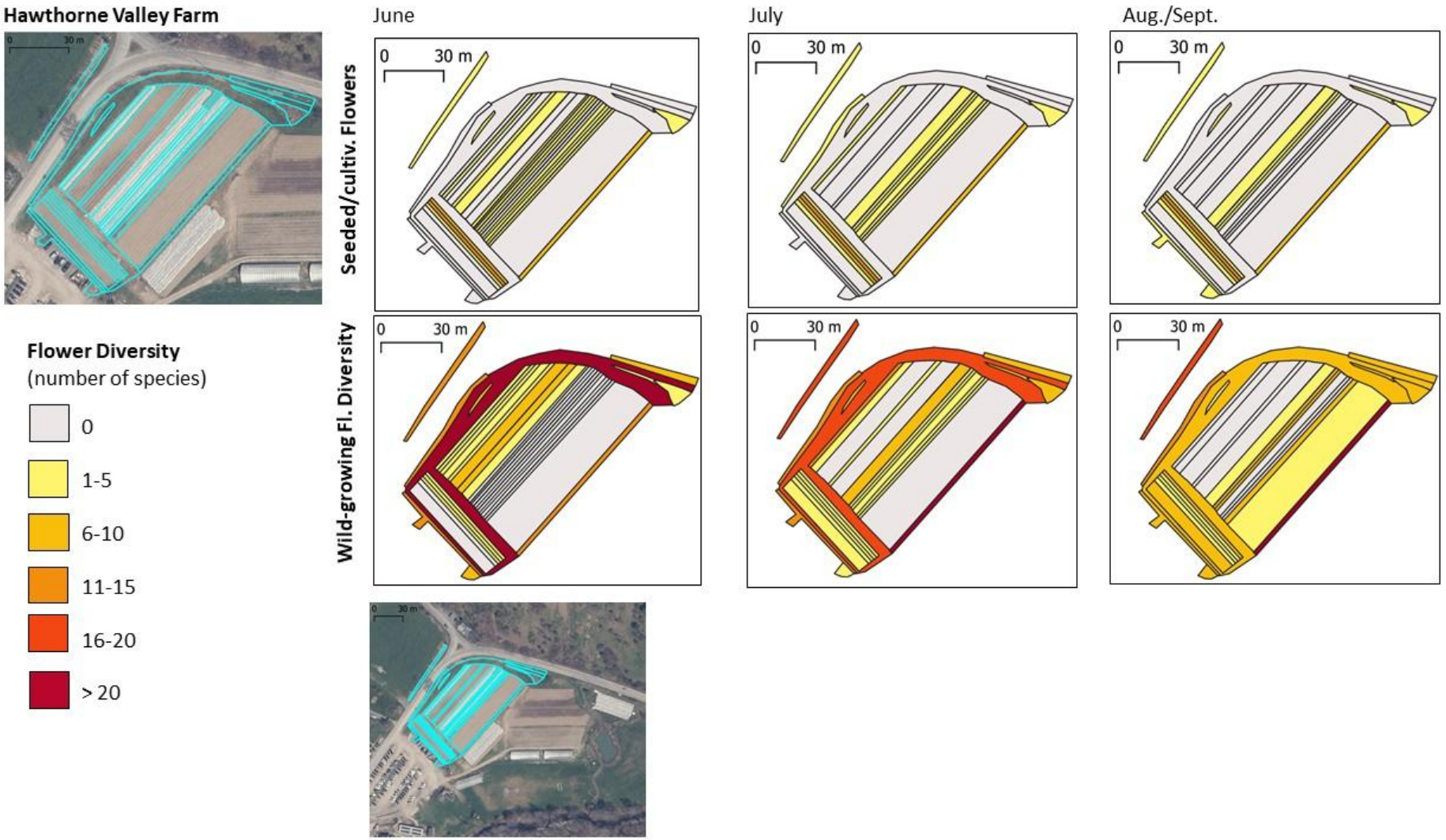
Seasonal Flower Diversity by Plant Category => Wild-growing native and non-native, cultivated flowers increased in diversity across the season; while the diversity of wild-growing non-native flowers decreased



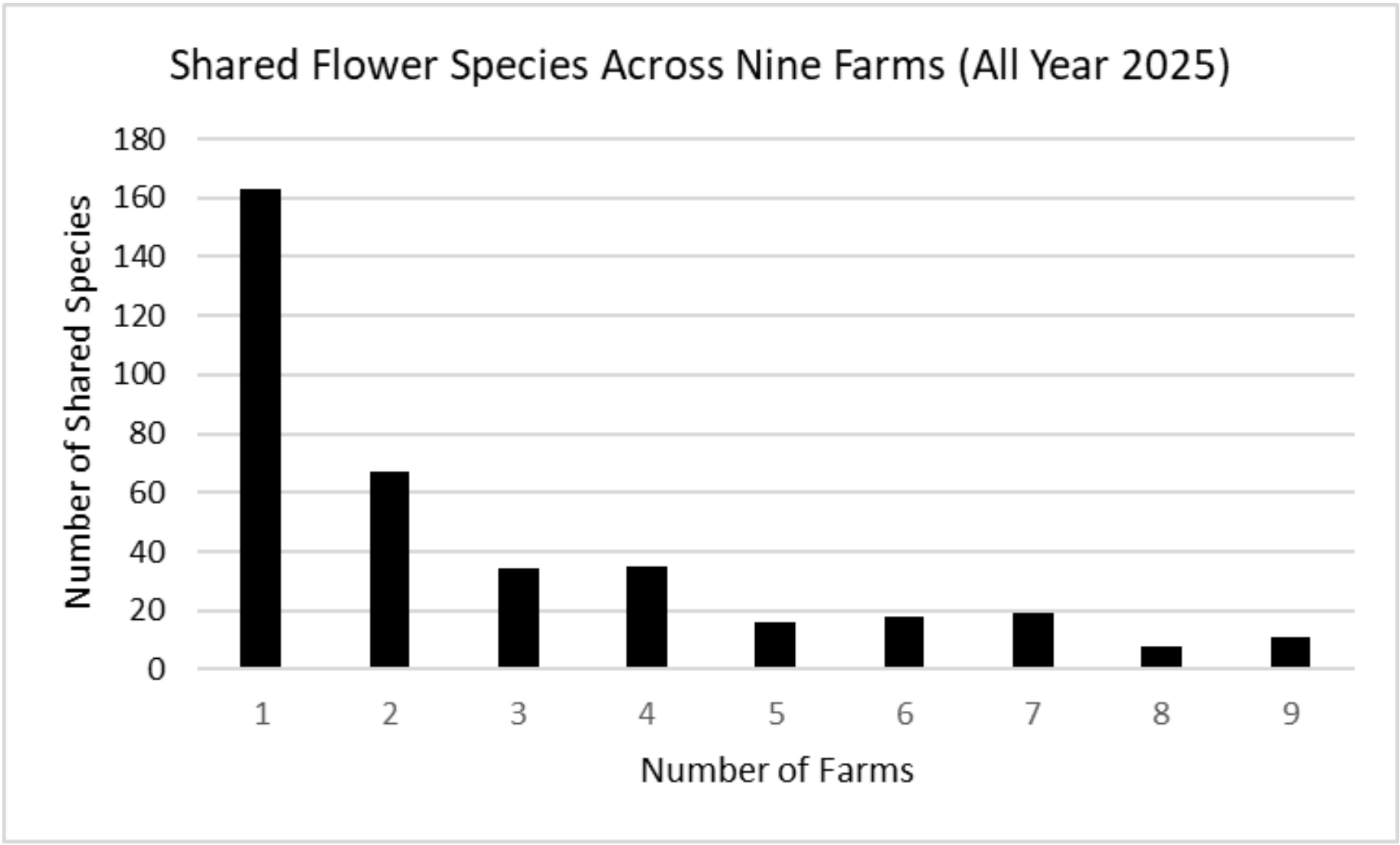
Flower Diversity by Habitat => Of the unmanaged or lightly-managed habitats, mature field edges and fencelines had a disproportionate diversity of flowers compared to the sample area they represented, while wild areas and mature fallow fell right on the trendline



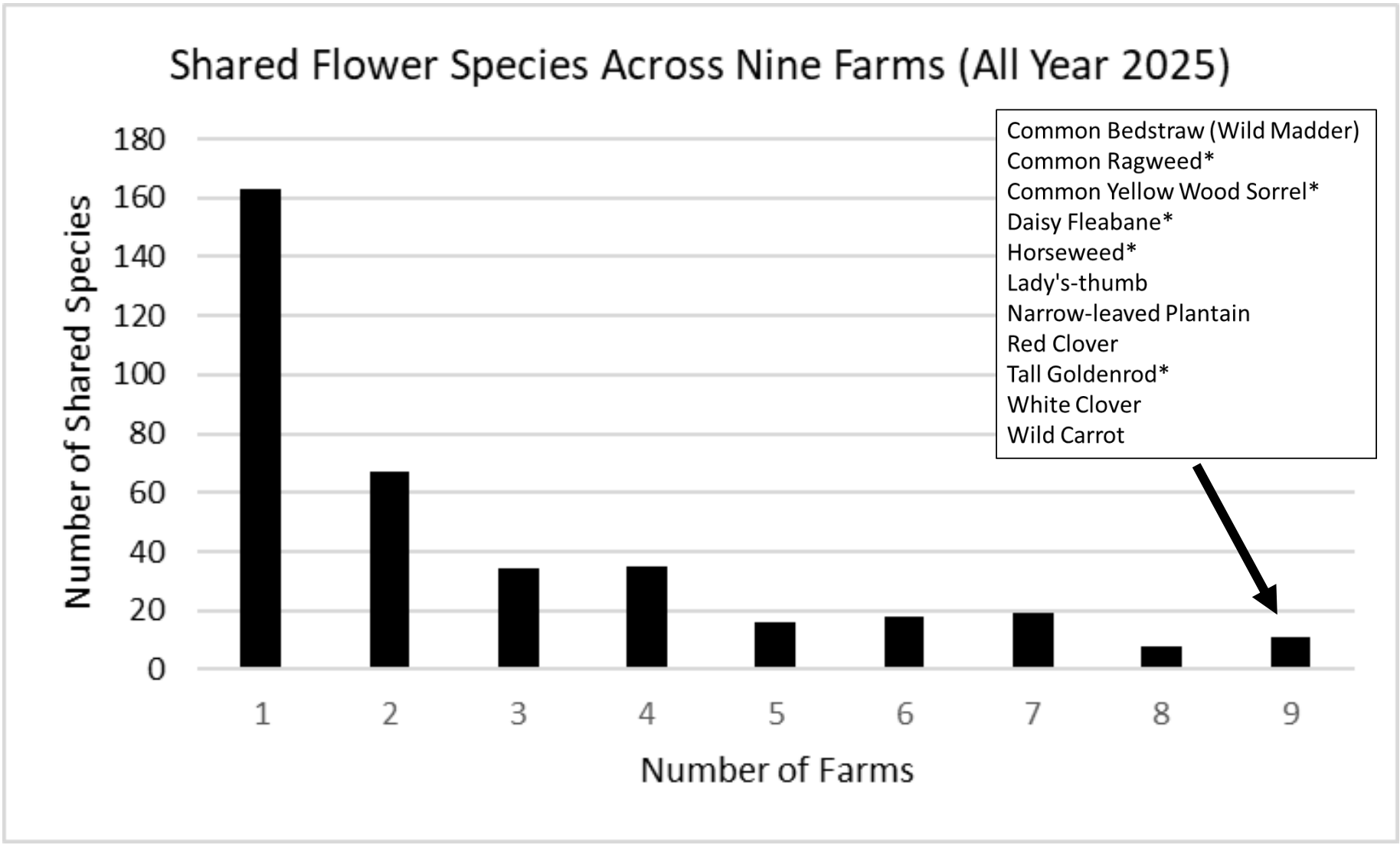
Diversity of Wild-growing vs. Seeded/Cultivated Flowers => These maps remind us of the fact that, even on farms with relatively high diversity of cultivated flowers, most survey units had significantly more wild-growing flowers. That was true not only for the fencelines and field margins, but also for more intensively-managed habitat units.



Similarity of Flowers Across Farms => Almost half of the flower species were found only at a single farm (and almost half of those were non-native, cultivated flowers)



Similarity of Flowers Across Farms => There were nine ubiquitous flower species found at all farms



Examples of Native Plants Found at a Single Farm

Northern Tubercled Orchid
Rose Hill; wild

Yellow Stargrass
Rose Hill; wild, mowed

Spiked Lobelia
Rose Hill; mowed

Southern Slender Lady's-tresses
Rose Hill; mowed

More Examples of Native Plants Found at a Single Farm

False Pimpernel
Blue Star; growing wild in a tilled bed of cult. flowers

Hollow Joe-Pye-weed
Treadlight; wild

Pasture Rose
Rose Hill; wild

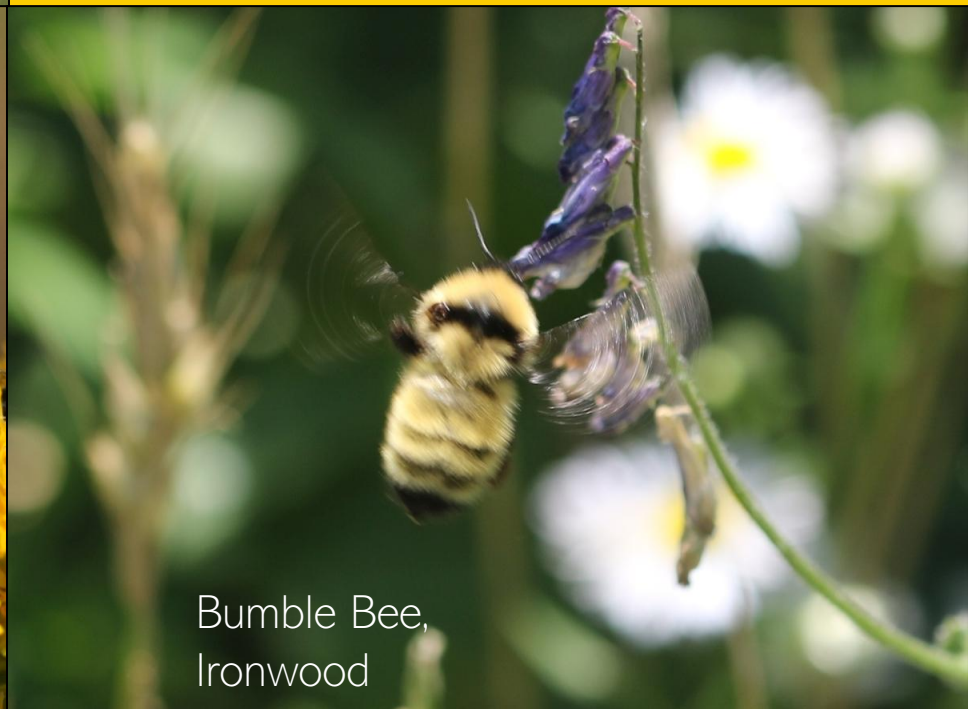
Small-flowered Agalinis
Rose Hill; wild


This information is interesting in its own right and illustrates the role that farms can play in native plant conservation. It also provides the foundation for studying flower-visiting insects.
Hudson Valley Seed Co.

Honey Bee,
Little Seed

Many types of insects visit flowers, we only focused on a few and, given our visual methods, we lumped these into larger taxonomic groups: **Butterflies, Hover Flies, Wasps, Honey Bees, Bumble Bees, Eastern Carpenter Bees and "Other"** (largely but not entirely native) **Bees**. Some of these are important crop pollinators, others may be pest predators, and others are innocuous/mysterious visitors.

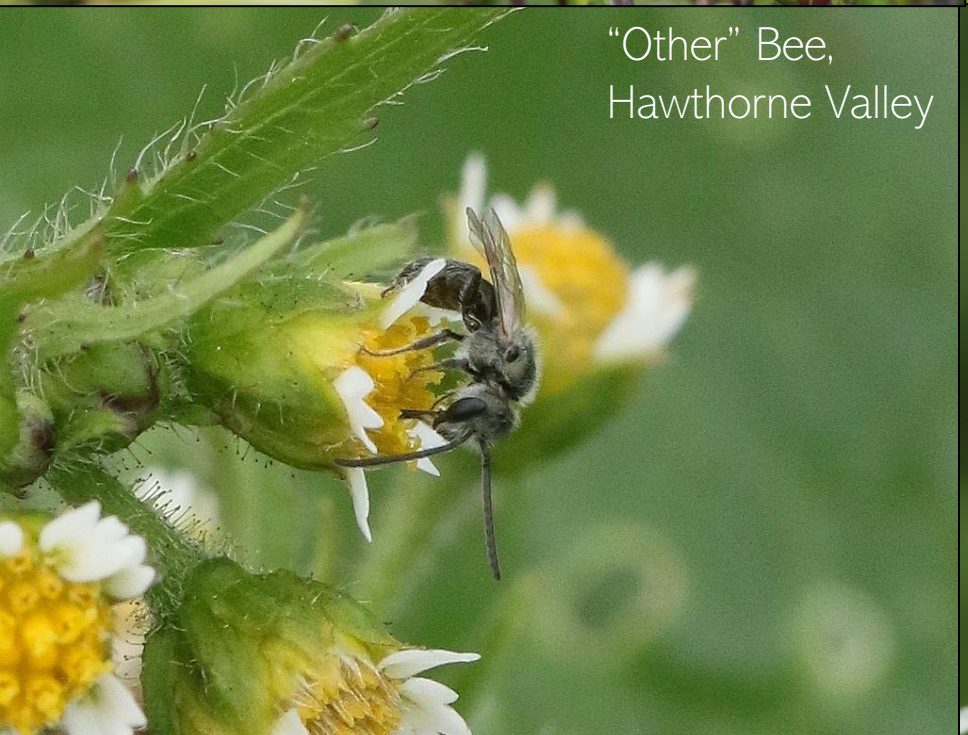
Wasp,
Hudson Valley
Seed Company

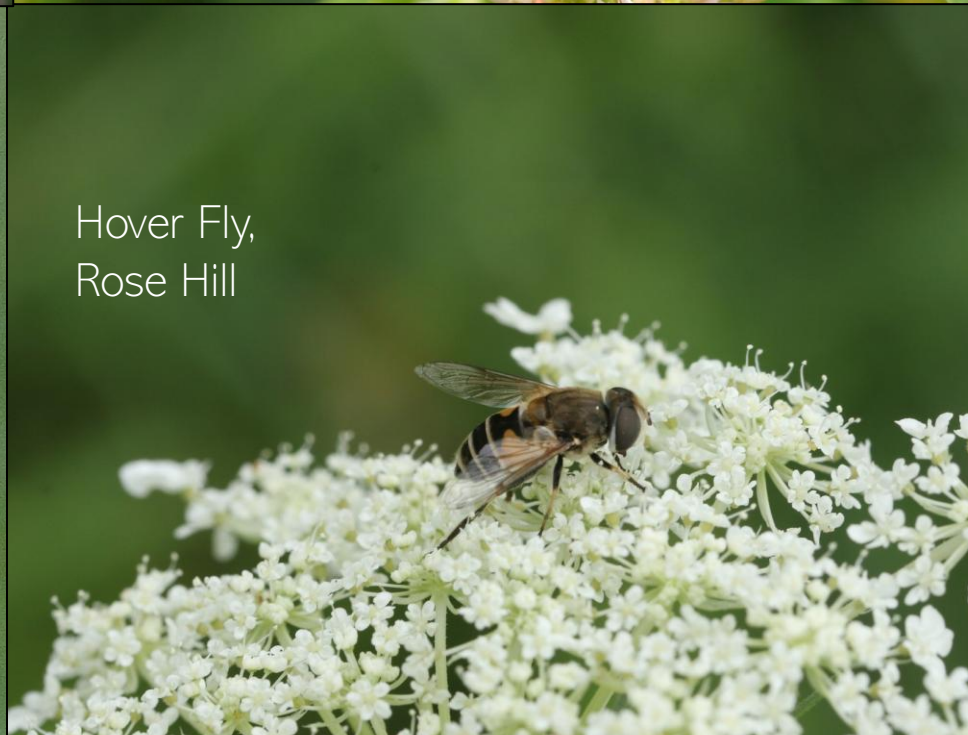


Bumble Bee,
Ironwood


Butterfly,
Hudson
Valley
Seed Co.


Eastern Carpenter Bee,
Stars of the Meadow


“Other” Bee,
Hawthorne Valley


Hover Fly,
Rose Hill

The flower foundation affects flower visitors in a variety of ways:

Flower abundance helps determine the amount of available resources such as nectar & pollen.

Flower diversity affects the diversity of insects attracted to a farm's flowers. Different flowers attract different visitors for a variety of reasons: physical accessibility (e.g., tongue length vs corolla length), biochemical co-evolution, color preferences, etc..

A Word of Caution: A variety of factors in addition to the flower diversity and abundance within the study site on a given visit determine the abundance and diversity of flower-visitors therein. These include:

- Flowers outside of the study site.
- The continuity of flower resources across the year.
- Past and present land use in the surroundings (e.g., use of pesticides)
- Availability of important non-flower resources such as caterpillar food for butterflies, maggot food for hover flies, and nesting sites for bees and wasps.

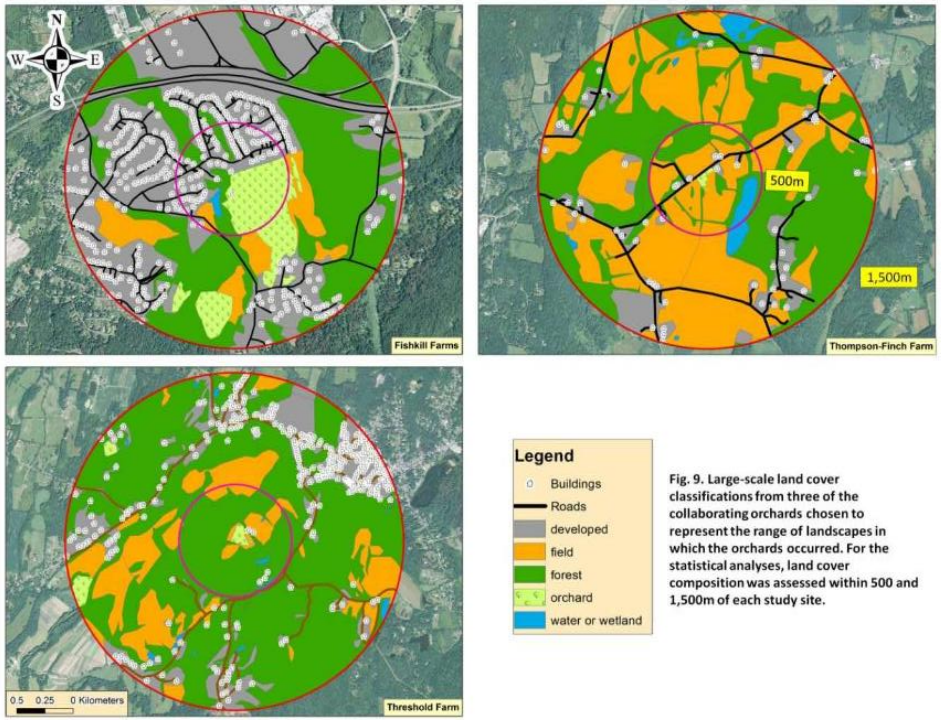
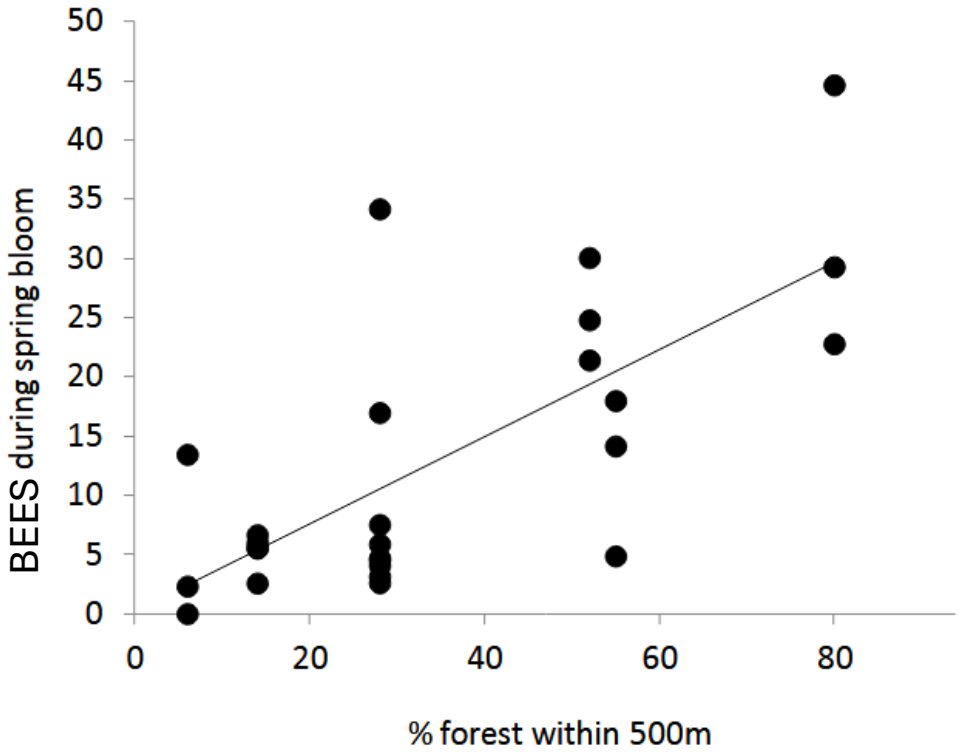


Fig. 9. Large-scale land cover classifications from three of the collaborating orchards chosen to represent the range of landscapes in which the orchards occurred. For the statistical analyses, land cover composition was assessed within 500 and 1,500m of each study site.



DRY DETAILS (p1, time to go get a snack, go to the bathroom….)

On each of the nine farms that we visited in June, July & Aug/Sept, I tried to spend 5 mins visual tallying flower visitors on each of the common flowers. The clock only ran when I had one or more flowers of the given species in my view and, especially with truly wild flowers, that sometimes resulted in my wandering around clicking the timer on and off as I visited random flower clusters. In general, I only tallied insects into the gross classes mentioned above.

Thus, for each farm on each outing I had (after checking plant IDs with Claudia) tallies of who visited each type of flower, expressed as visitations per minute for each insect group.

I then standardized a given flower's visitation rates on a given farm by dividing by the average for a particular insect group across all flower types at that farm on that date.

DRY DETAILS (p1, time to come back from getting a snack, going to the bathroom….)

For example,
if I saw 1 Honey Bee per minute on Daisy Fleabane during my June visit to Little Seed, I then divided that by the average Honey Bee visitation ***across all flowers*** at Little Seed on that date. Supposing that average were 5 Honey Bees per minute, then Fleabane's value became 1/5 or .2.

I repeated this for all farms on all dates and then, for a given flower type and insect group, averaged across all data. So, if I saw Daisy Fleabane during five other farm outings during the summer, and the standardized rates on each of those outings were 0, .75, 1, .33 and .25. Then the overall preferability rating for Daisy Fleabane was (.2 + 0 +.75 +1 +.33 +.25)/6 or ca. .42.

A value of exactly one would indicate that the given plant had an average visitation rate relative to other flowers, while <1 indicates less than average and >1 means more than average.

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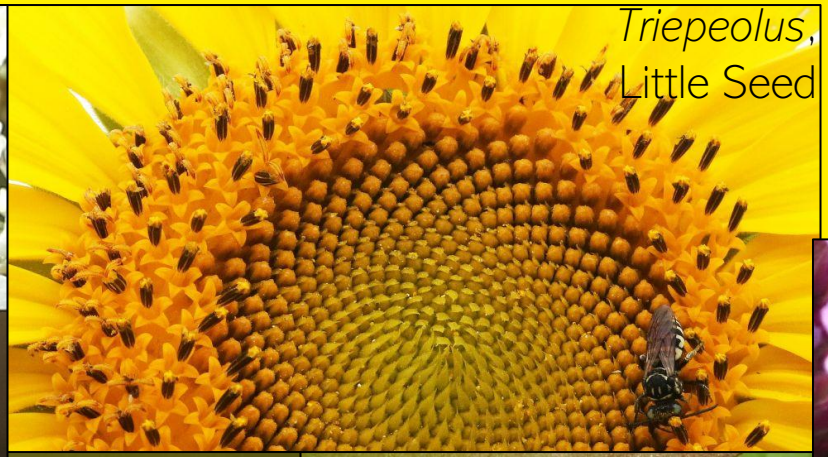
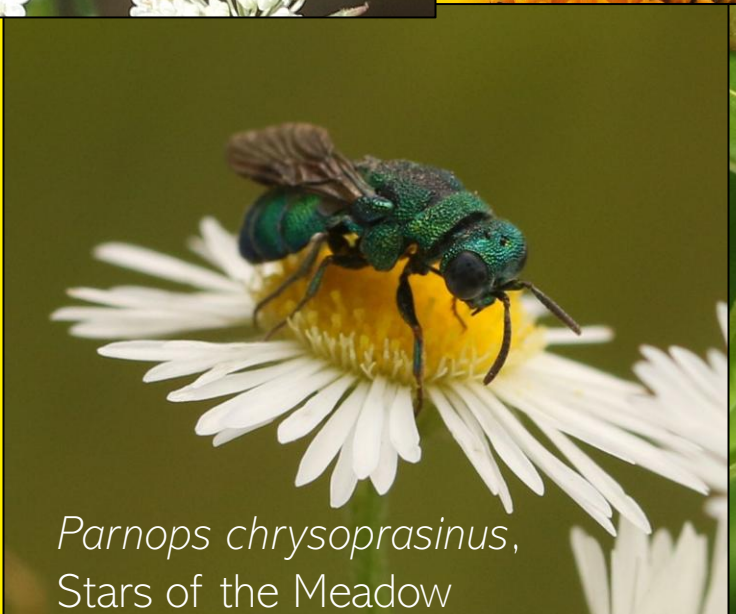
CHOCOLATE ICE CREAM!

So what did I find?

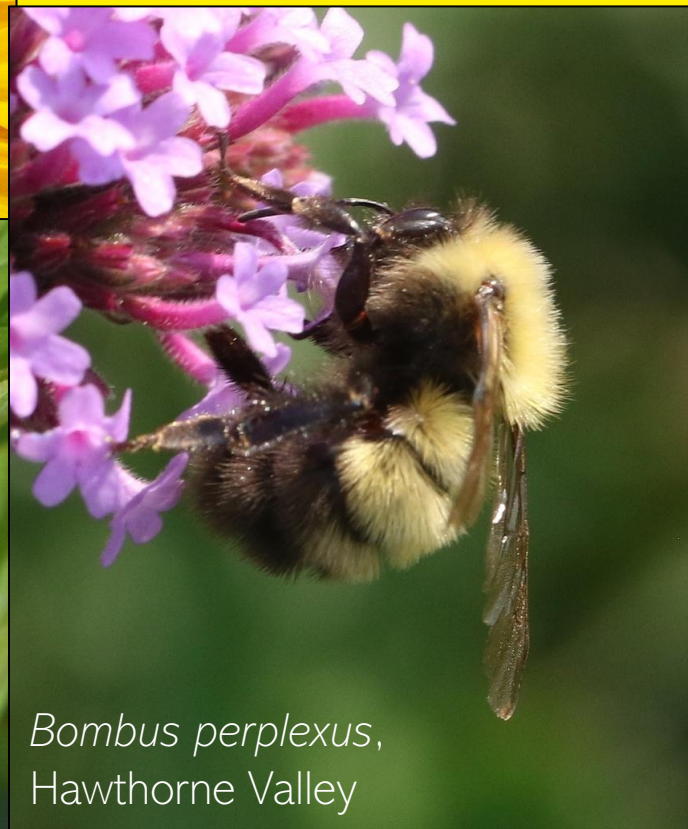
There were some incidental sightings of some rarer bees and wasps, such as *Macropis* on Loosestrife and a surprising abundance of *Bombus fervidus* and of *Triepeolus*. However, I will save most of those details for the blog.


Aphilanthops frigidus, Ironwood


Triepeolus, Little Seed


Parnops chrysoprasinus, Stars of the Meadow


Macropis, Treadlight


Bombus perplexus, Hawthorne Valley

TOP FLOWERS (in alphabetical order)

Wasp

- Bachelor Buttons
- Broad-leaved Mountain Mint
- Calico Aster
- Cilantro
- Common Boneset
- Common Elder
- Garden Strawflower
- Goldenrod
- Grass-leaved Goldenrod
- Narrow-leaved Mountain Mint
- Oxeye Daisy
- Partridge Pea
- Rose
- Smooth Blue Aster
- Spotted Bee Balm
- Tall Buttercup
- Watermelon
- Wild Carrot

Butterflies

- Appalachian Mountain-mint
- Asian Greens
- Beans
- Blackberry
- Black-eyed Susan
- Canada Thistle
- Chicory
- Clustered Mountain-mint
- Common Dandelion
- Common Milkweed
- Common St. John's-wort
- Feather Celosia
- Globe Amaranth
- Grass-leaved Goldenrod
- Heal All
- Joe-Pye Weed
- Knapweed
- Marigold
- Oxeye Daisy
- Pincushion
- Purple Loosestrife
- Purple-stemmed Aster
- Purpletop Vervain
- Red Clover
- Rocket Larkspur
- Smooth Blue Aster
- Statice
- Sweet William
- Tufted/Hairy Vetch
- Tumble/Tall Hedge Mustard
- Viper's Bugloss
- Wild Bergamot
- Zinnia

Hover Flies

- Appalachian Mountain-mint
- Arugala
- Asian Greens
- Bachelor Buttons
- Common Ragweed
- Common St. John's-wort
- Common Yarrow
- Coreopsis
- Corn Chamomile
- Curly Dock
- Dill
- Persicaria spp
- Quickweed
- Spotted Jewelweed
- Sulphur Cinquefoil
- Viper's Bugloss
- White Japanese Burnet
- White Lace Flower
- Whorled Tickseed
- Wild Bergamot
- Wild Madder

Colored boxes indicate flowers found on three or more of these lists.

TOP FLOWERS

Bumble Bees

Anise Hyssop
Appalachian Mountain-mint
Basil
Beach Rose
Blackberry
Common Milkweed
Hairy/Foxglove Beard Tongue
Hedge Bindweed
Long-leaved Speedwell
Pincushion
Purpletop Vervain
Red Clover
Rocket Larkspur
Spotted Bee Balm
Statice
Tomatillo
Tufted/Hairy Vetch
Viper's Bugloss
Virginia Mountain-mint
Wild Bergamot

Honey Bee

Arugala
Basil
Brocolli
Canada Thistle
Cilantro
Clustered Mountain-mint
Common Milkweed
Garden Asparagus
Goldenrod
Knapweed
Lambsquarters
Narrow-leaved Mountain Mint
Purple Loosestrife
Sedum, Orpine
Smooth Blue Aster
Spotted Bee Balm
Tumble/Tall Hedge Mustard
Viper's Bugloss
Virginia Mountain-mint
Watermelon
White Foxglove
White Japanese Burnet

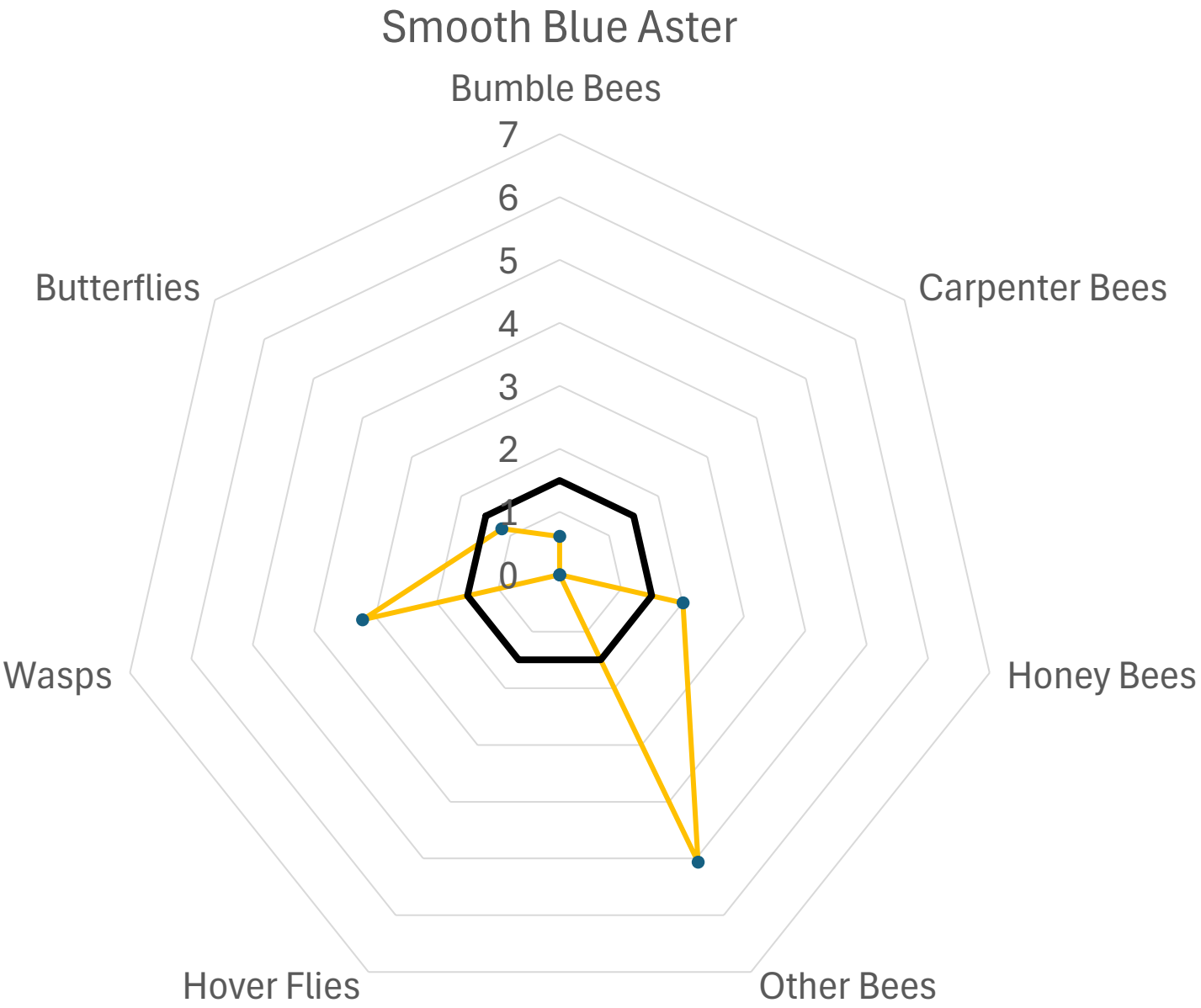
Other Bees

Anise Hyssop
Asian Greens
Bachelor Buttons
Common Sunflower
Coreopsis
Corn Chamomile
Field Bindweed
Goldenrod
Large Hop Clover
Long-leaved Speedwell
Oxeye Daisy
Quickweed
Sedum, Orpine
Smooth Blue Aster
Sulphur Cinquefoil
Summer Squash
Viper's Bugloss
White Lace Flower

TOP FLOWERS

Bumble Bees	Honey Bee	Other Bees
Anise Hyssop	Arugala	Anise Hyssop
Appalachian Mountain-mint	Basil	Asian Greens
Basil	Brocolli	Bachelor Buttons
Beach Rose	Canada Thistle	Common Sunflower
Blackberry	Cilantro	Coreopsis
Common Milkweed	Clustered Mountain-mint	Corn Chamomile
Hairy/Foxglove Beard Tongue	Common Milkweed	Field Bindweed
Hedge Bindweed	Garden Asparagus	Goldenrod
Long-leaved Speedwell	Goldenrod	Large Hop Clover
Pincushion	Knapweed	Long-leaved Speedwell
Purpletop Vervain	Lambsquarters	Oxeye Daisy
Red Clover	Narrow-leaved Mountain Mint	Quickweed
Rocket Larkspur	Purple Loosestrife	Sedum, Orpine
Spotted Bee Balm	Sedum, Orpine	Smooth Blue Aster
Statice	Smooth Blue Aster	Sulphur Cinquefoil
Tomatillo	Spotted Bee Balm	Summer Squash
Tufted/Hairy Vetch	Tumble/Tall Hedge Mustard	Viper's Bugloss
Viper's Bugloss	Viper's Bugloss	White Lace Flower
Virginia Mountain-mint	Virginia Mountain-mint	
Wild Bergamot	Watermelon	
	White Foxglove	
	White Japanese Burnet	

First, it was clear that in terms of flower and flower visitors, it's a case of different strokes for different folks. That is, some flowers seemed particularly attractive to one group of creatures while other flowers attracted a different set of species.


Smooth Blue Aster
Bumble Bees
Carpenter Bees
Honey Bees
Other Bees
Hover Flies
Wasps
Butterflies
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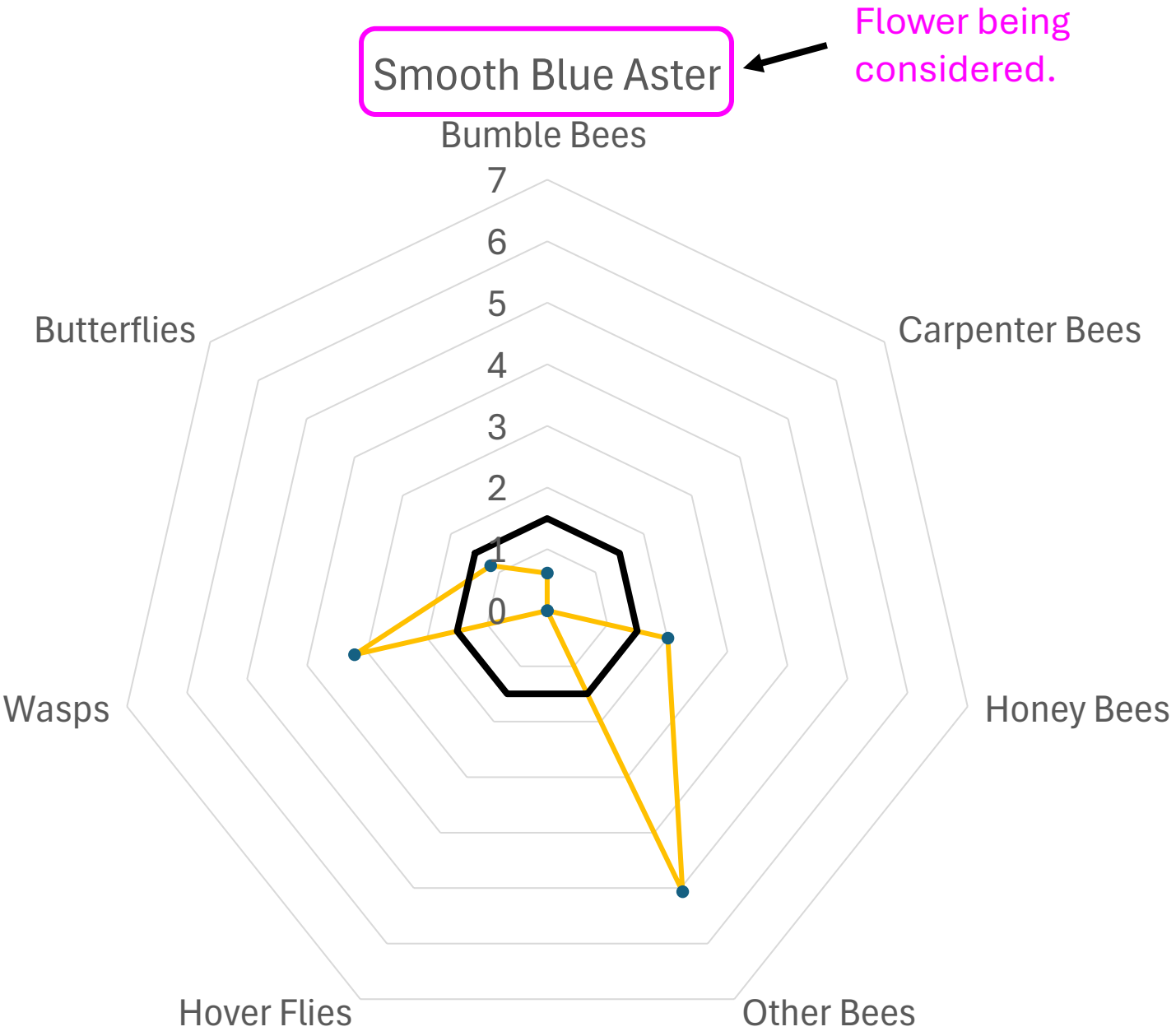
Smooth Blue Aster
Flower being considered.
Bumble Bees
Carpenter Bees
Honey Bees
Other Bees
Hover Flies
Wasps
Butterflies
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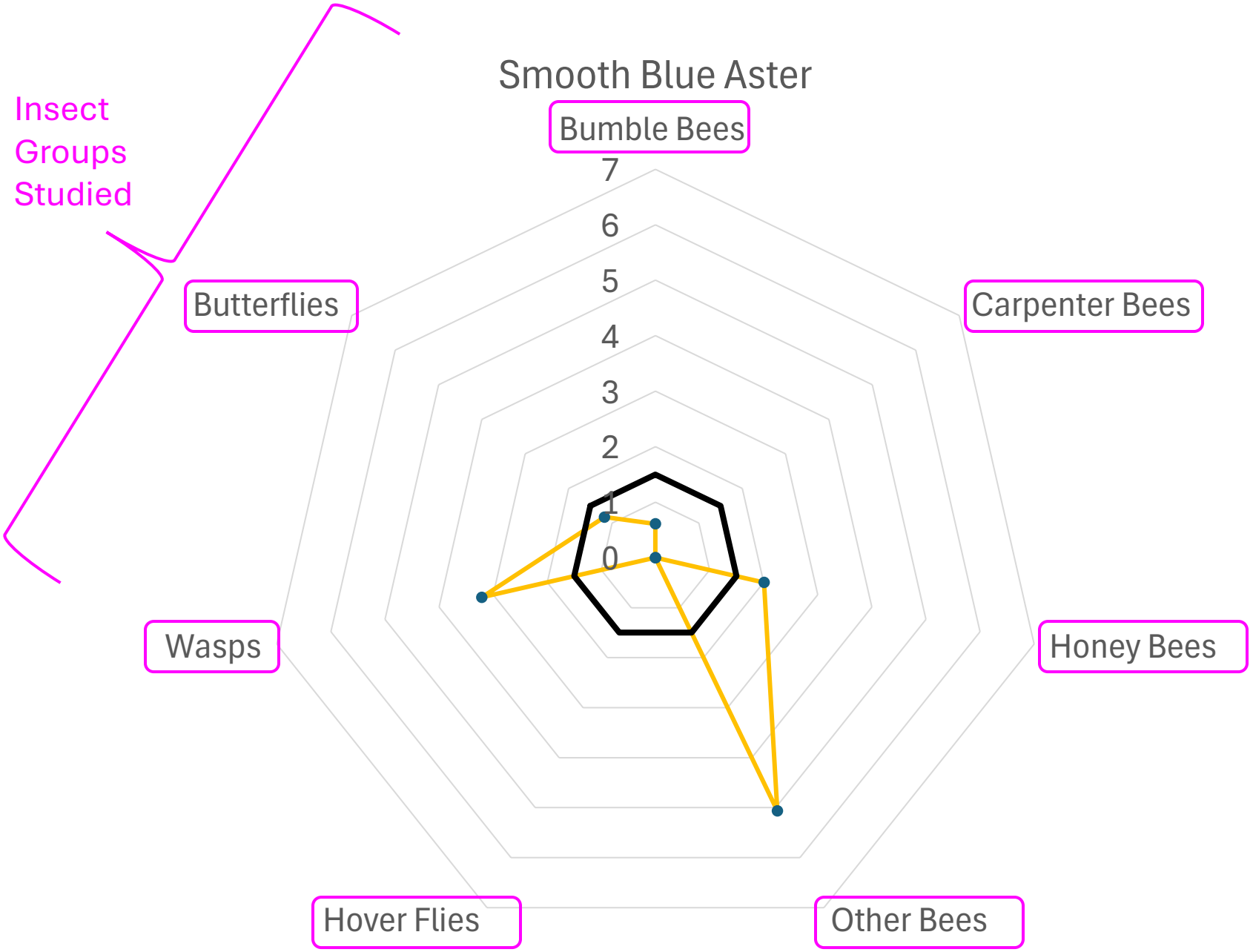
Insect Groups Studied
Smooth Blue Aster
Bumble Bees
Carpenter Bees
Honey Bees
Other Bees
Hover Flies
Wasps
Butterflies
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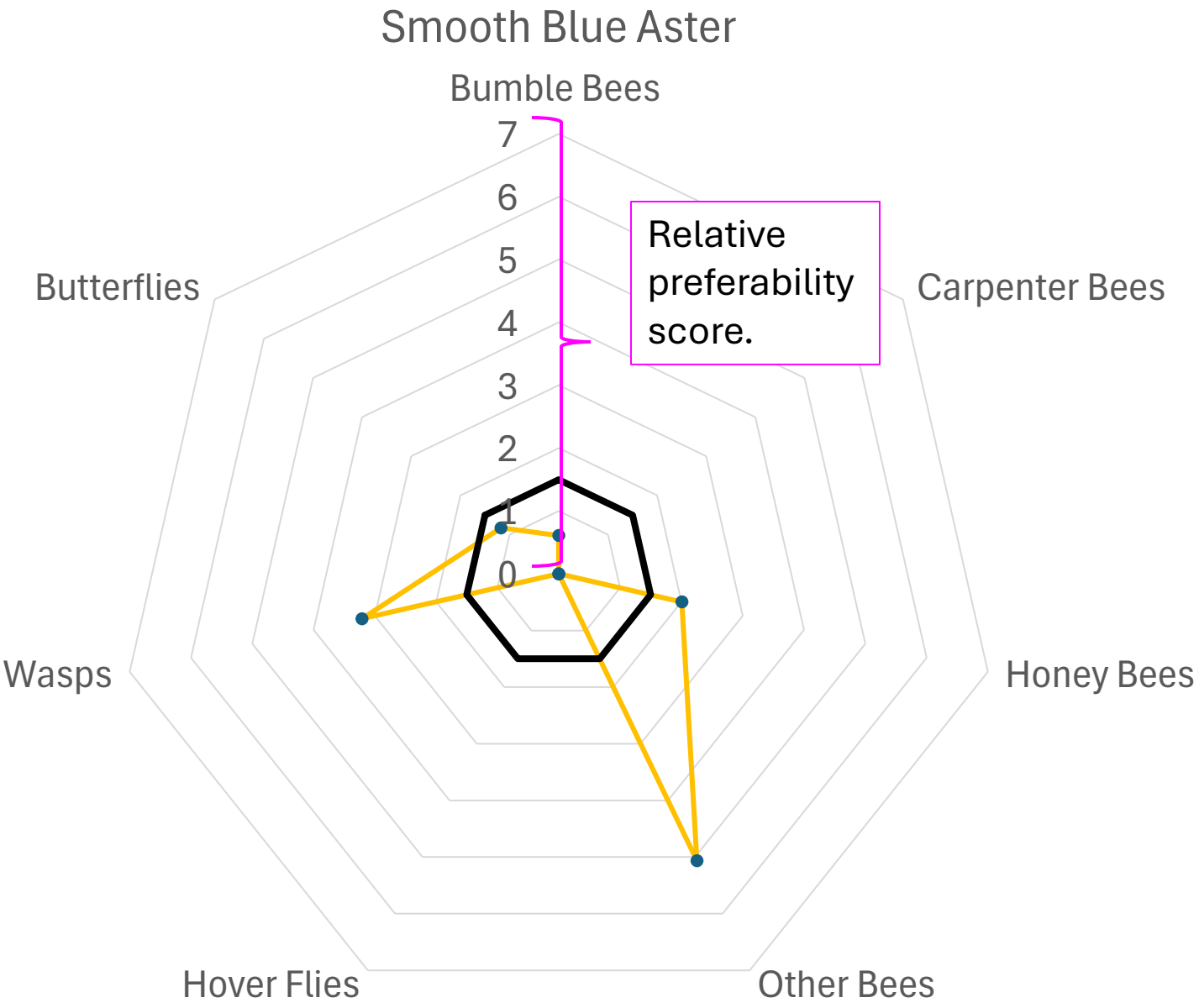
Smooth Blue Aster
Bumble Bees
Carpenter Bees
Honey Bees
Other Bees
Hover Flies
Wasps
Butterflies
7
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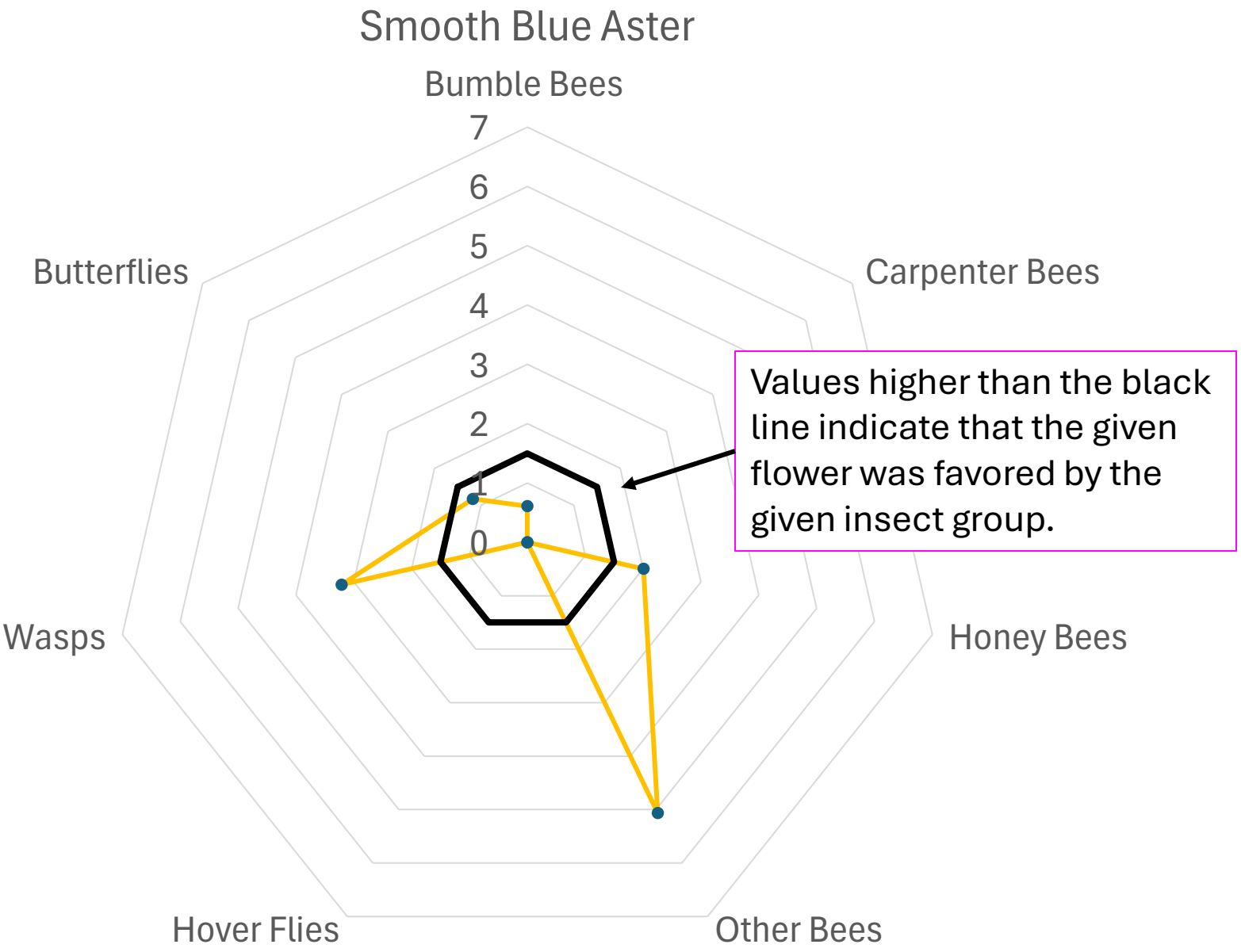
1
0
Relative preferability score.


Smooth Blue Aster
Bumble Bees
Carpenter Bees
Honey Bees
Other Bees
Hover Flies
Wasps
Butterflies
7
6
5
4
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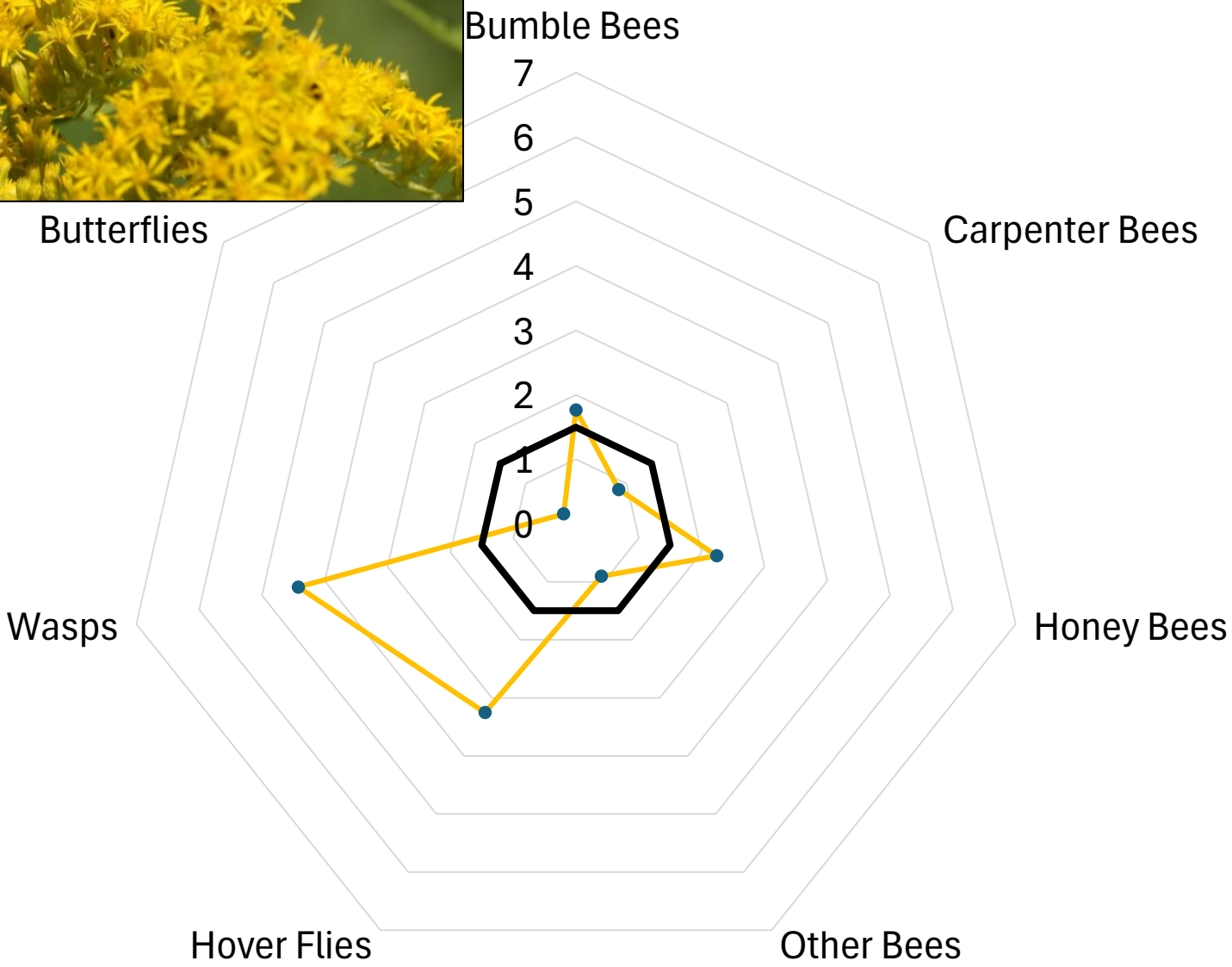
1
0
Values higher than the black line indicate that the given flower was favored by the given insect group.

Smooth Blue Aster

Photo & farm where photographed


Whistledown

Goldenrod


Bumble Bees
Carpenter Bees
Honey Bees
Other Bees
Hover Flies
Wasps
Butterflies
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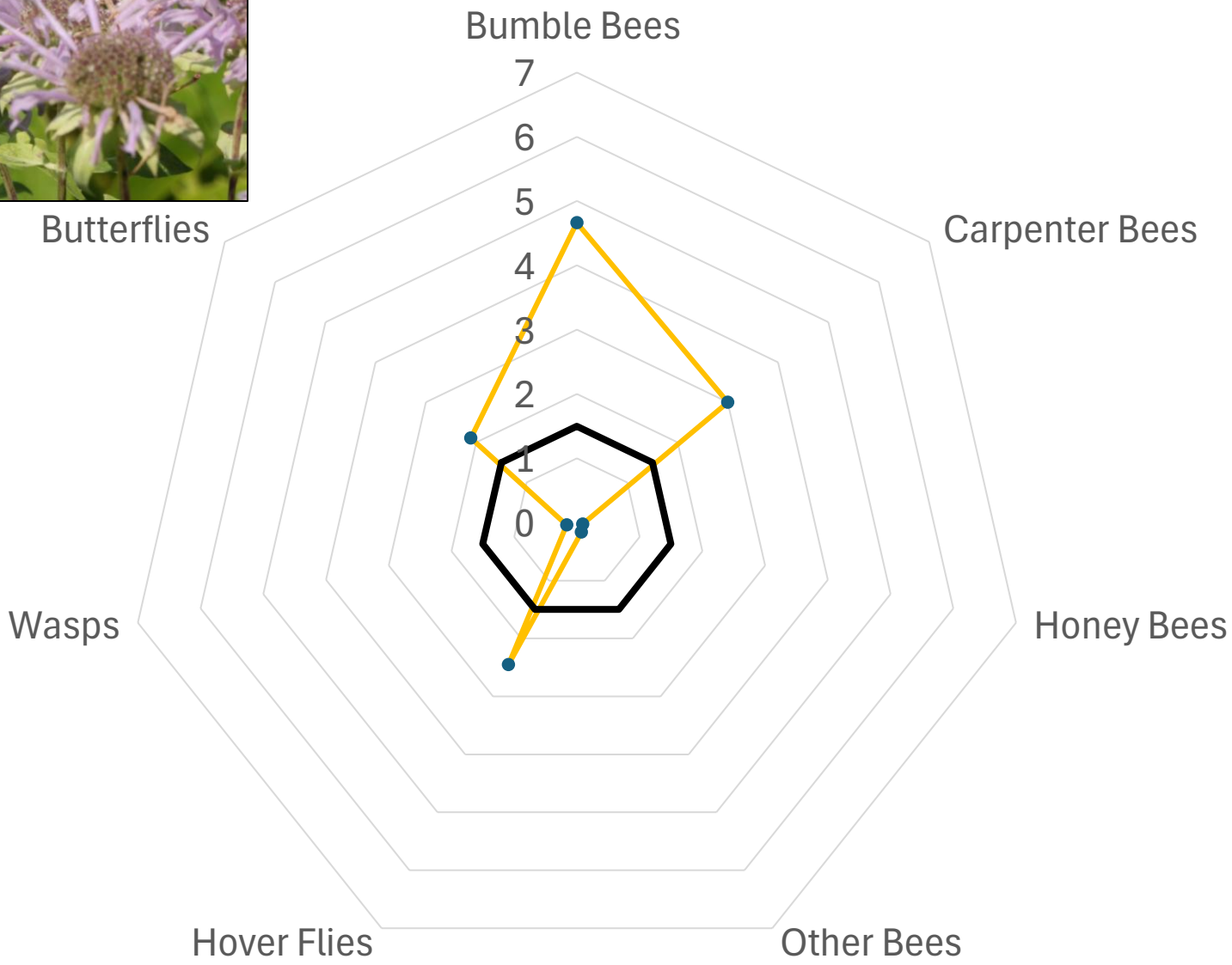
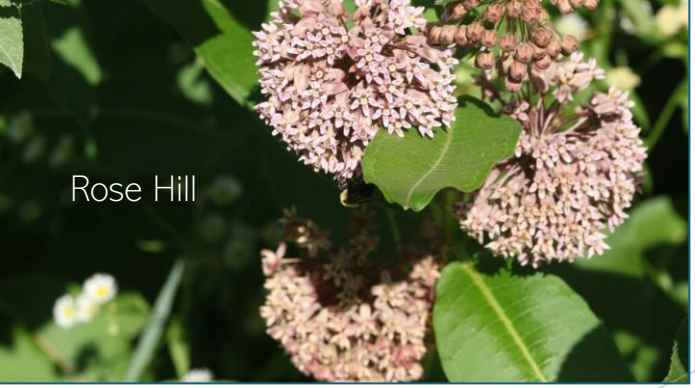
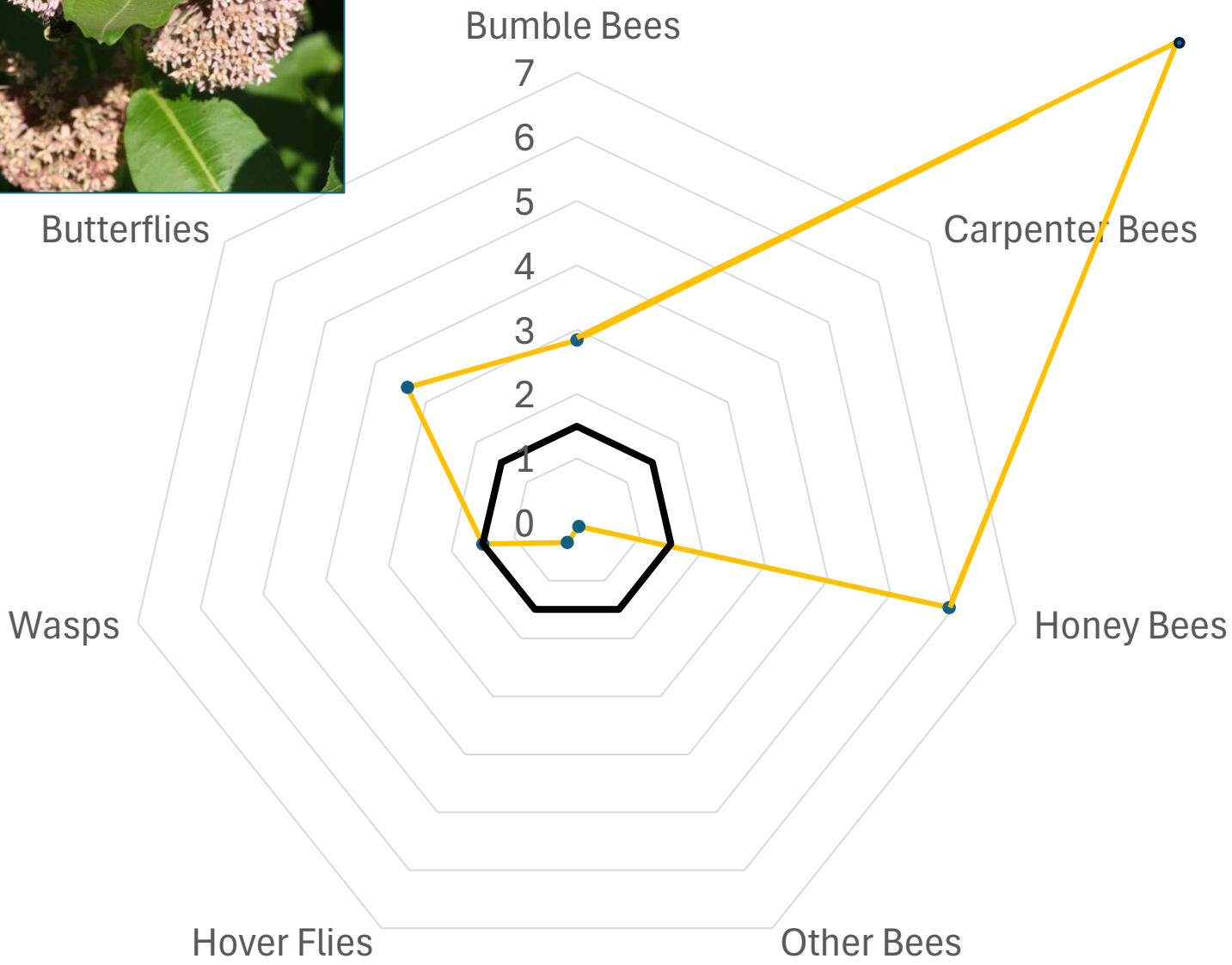
Wild Bergamot





Common Milkweed



Viper's Bugloss (little data)

Bumble Bees

Carpenter Bees

Honey Bees

Other Bees

Hover Flies

Wasps

Butterflies

7

6

5

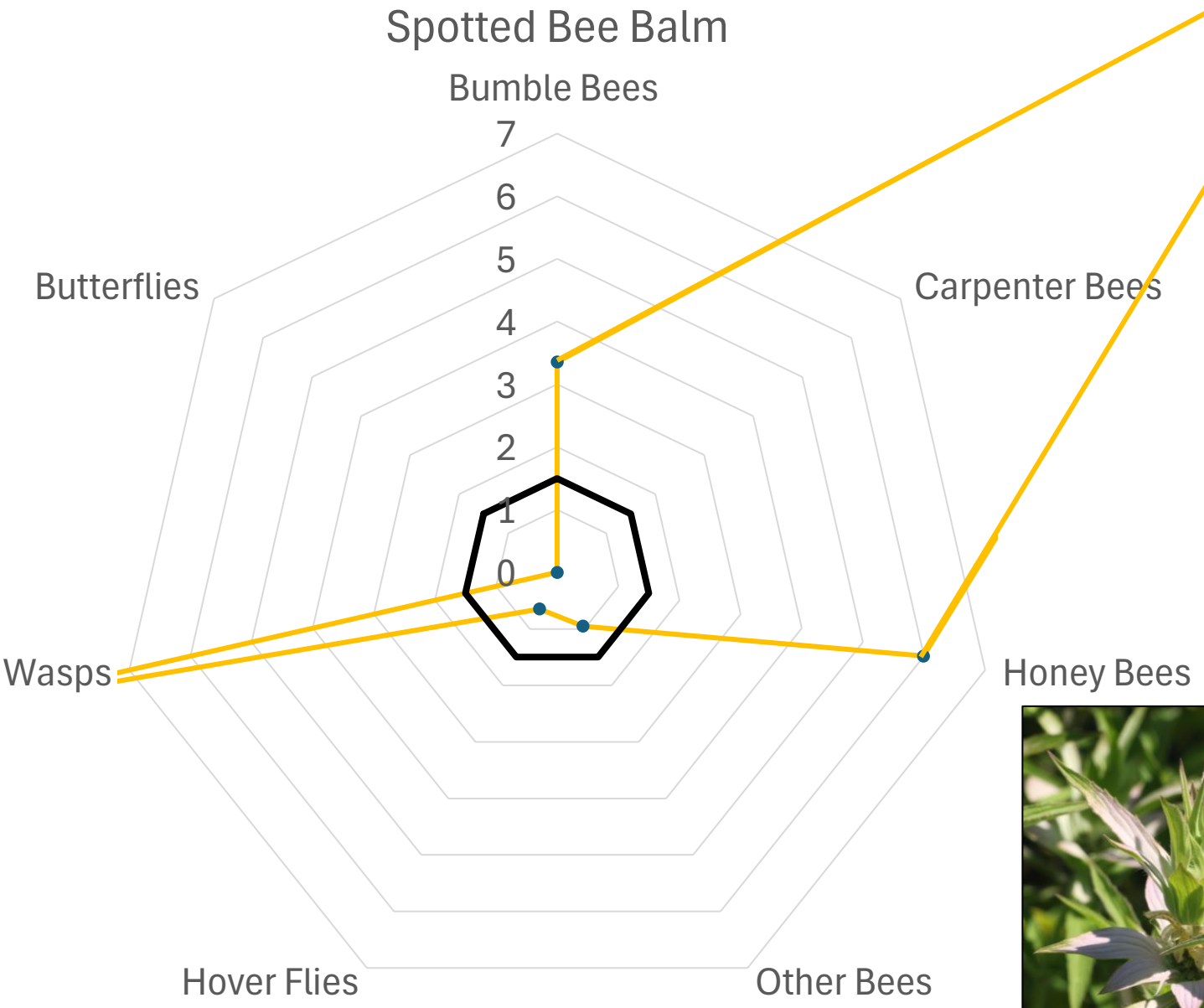
4

3

2

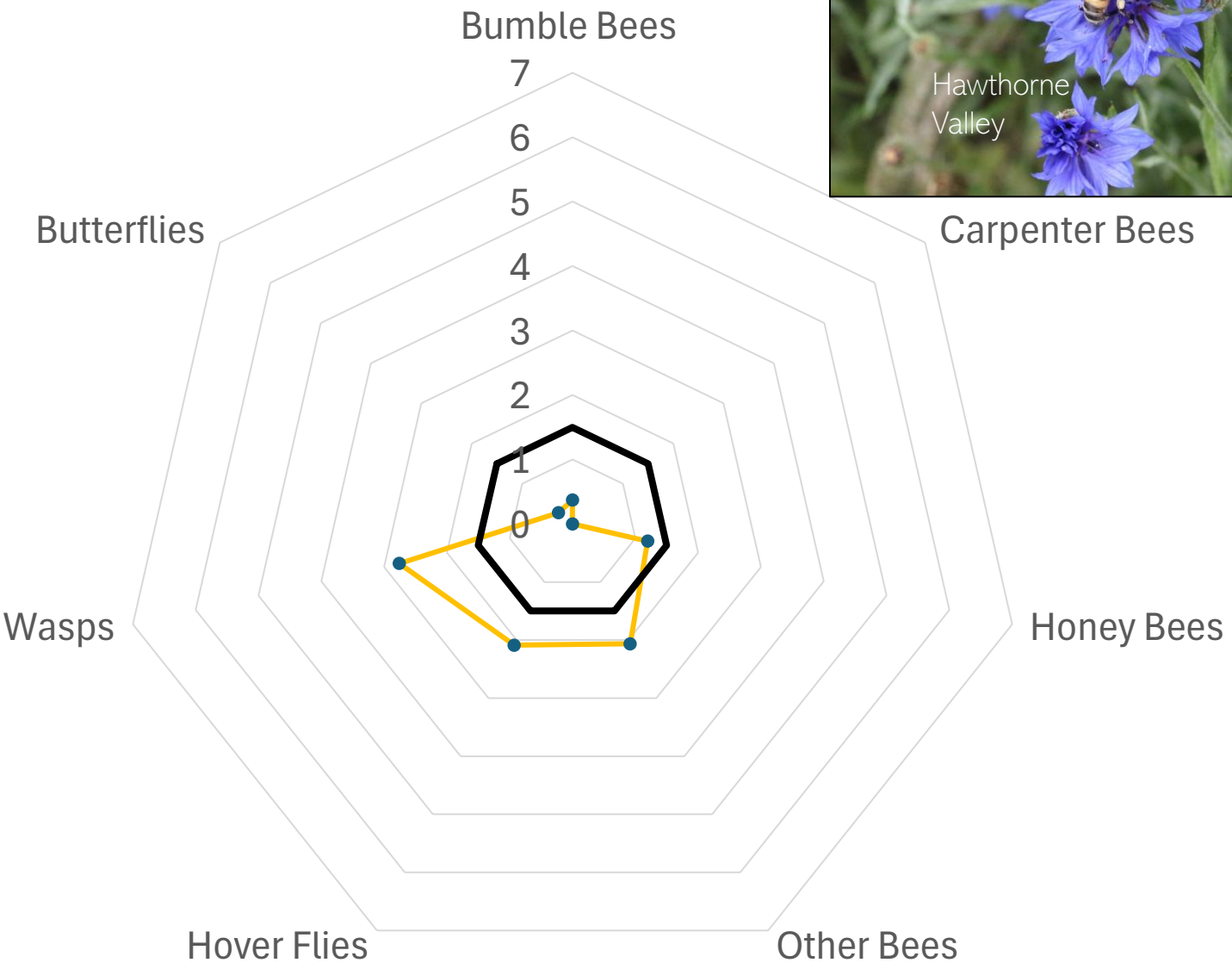
1

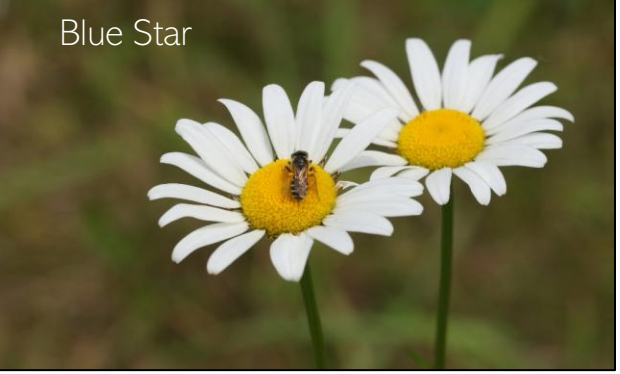
0

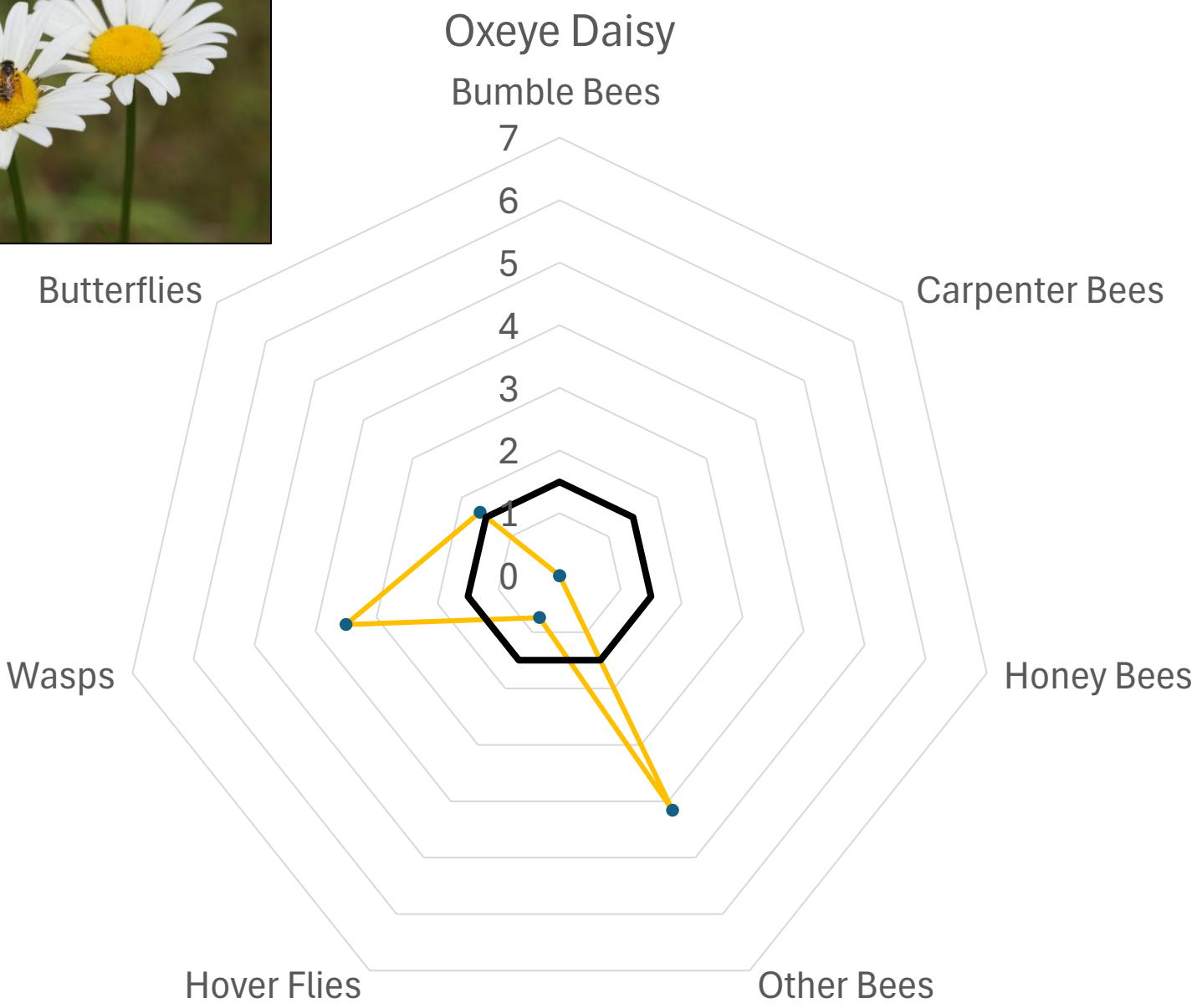

Spotted Bee Balm
Bumble Bees
7
6
5
4
3
2
1
0
Carpenter Bees
Honey Bees
Other Bees
Hover Flies
Wasps
Butterflies


Hudson
Valley
Seed Co.

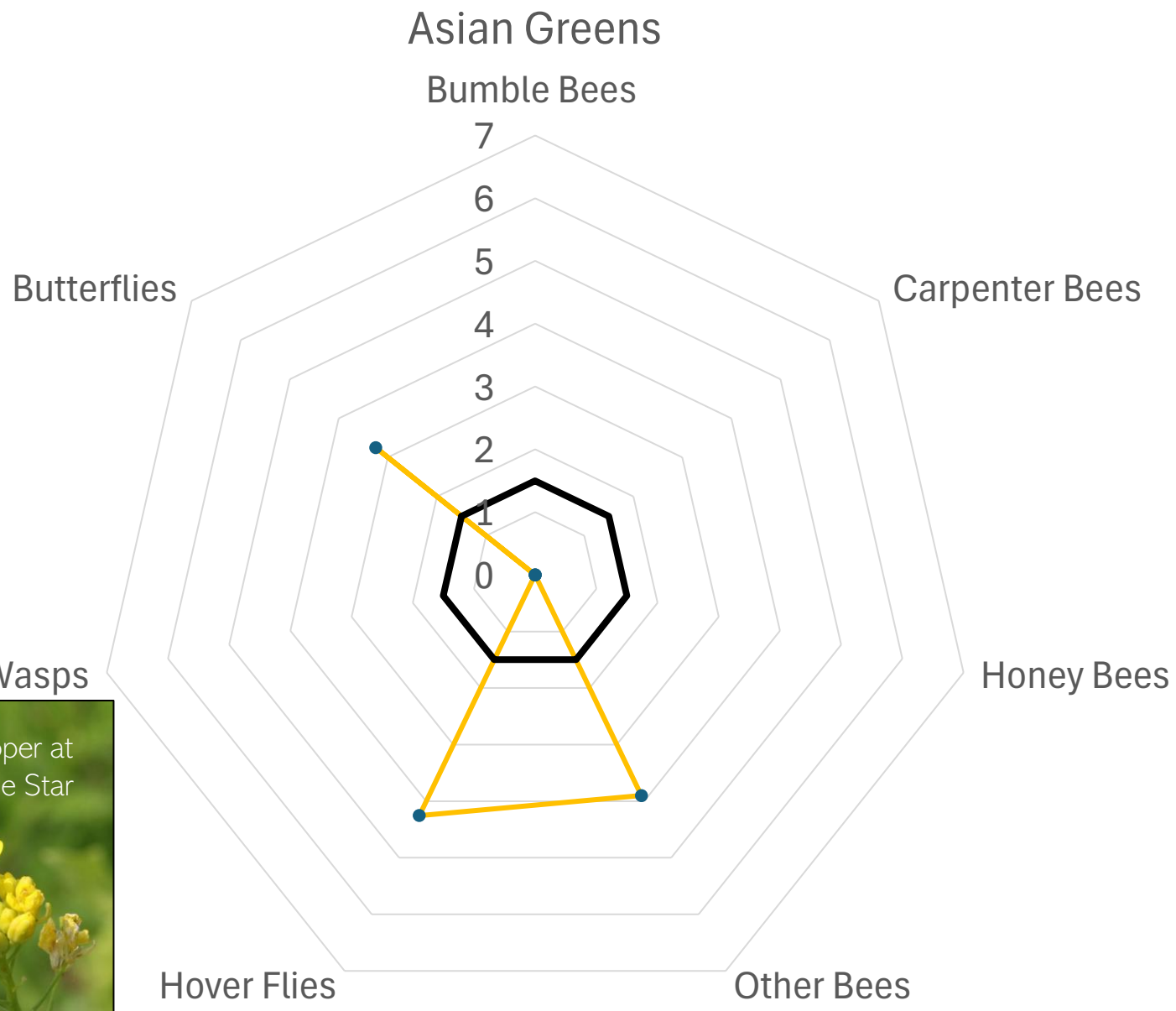
Bachelor Buttons



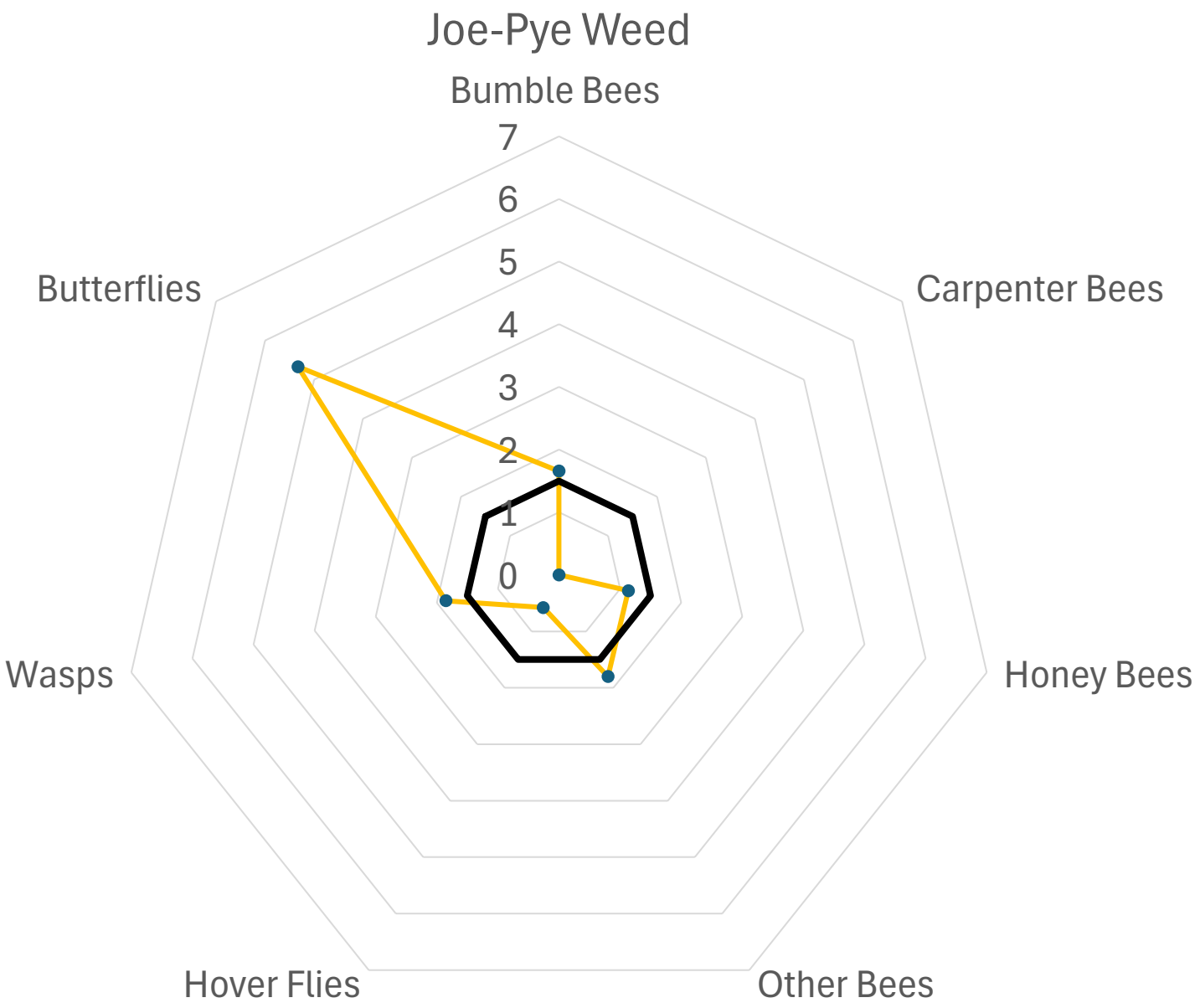

Blue Star


Oxeye Daisy
Bumble Bees
Carpenter Bees
Honey Bees
Other Bees
Hover Flies
Wasps
Butterflies
7
6
5
4
3
2
1
0

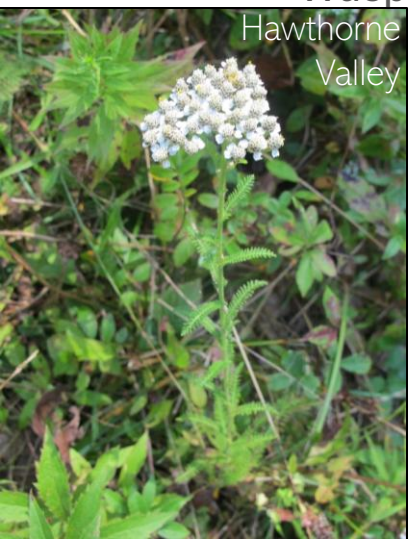

Bronze Copper at
Blue Star

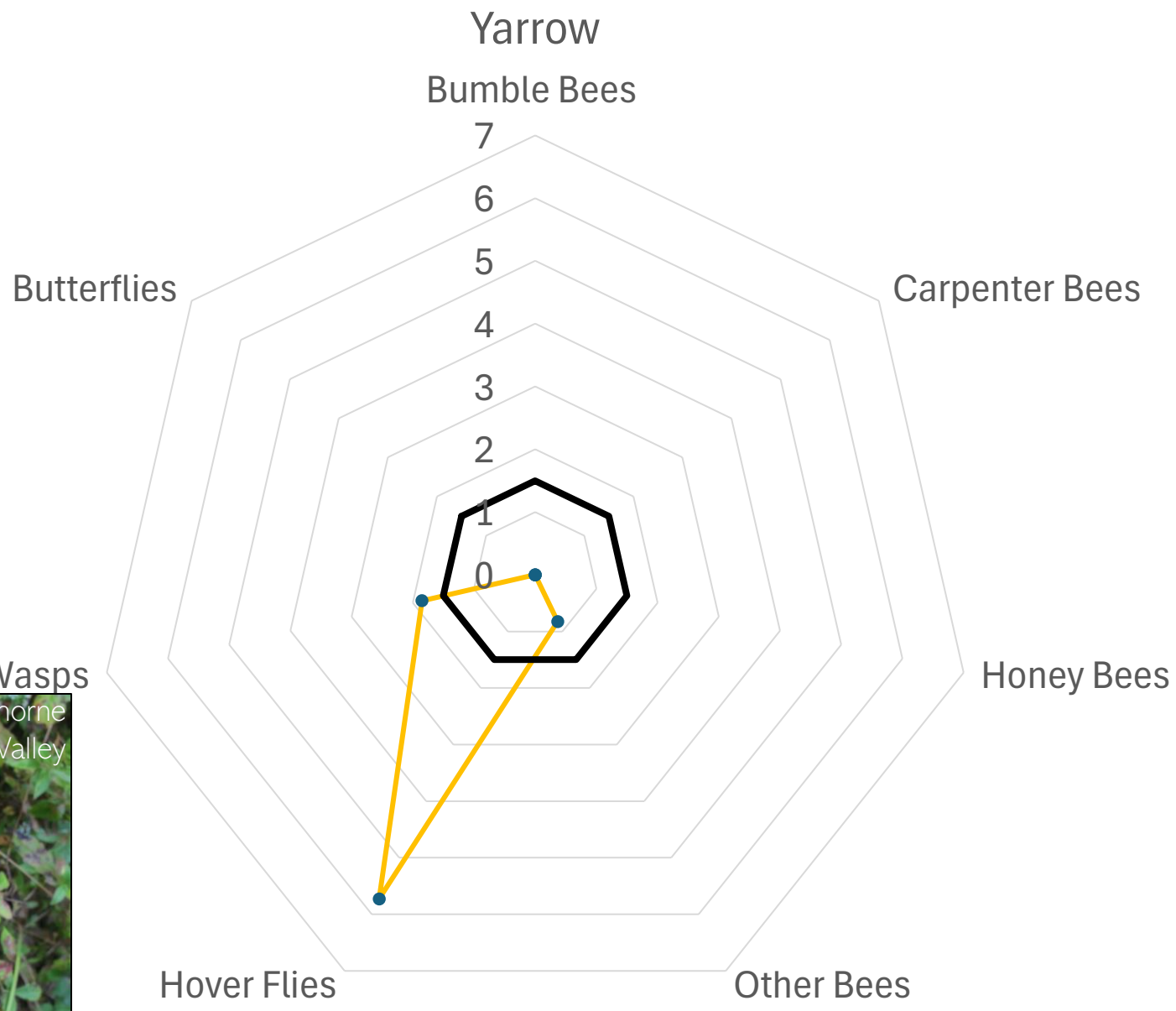

Asian Greens
Bumble Bees
Carpenter Bees
Honey Bees
Other Bees
Hover Flies
Wasps
Butterflies
7
6
5
4
3
2
1
0


Treadlight

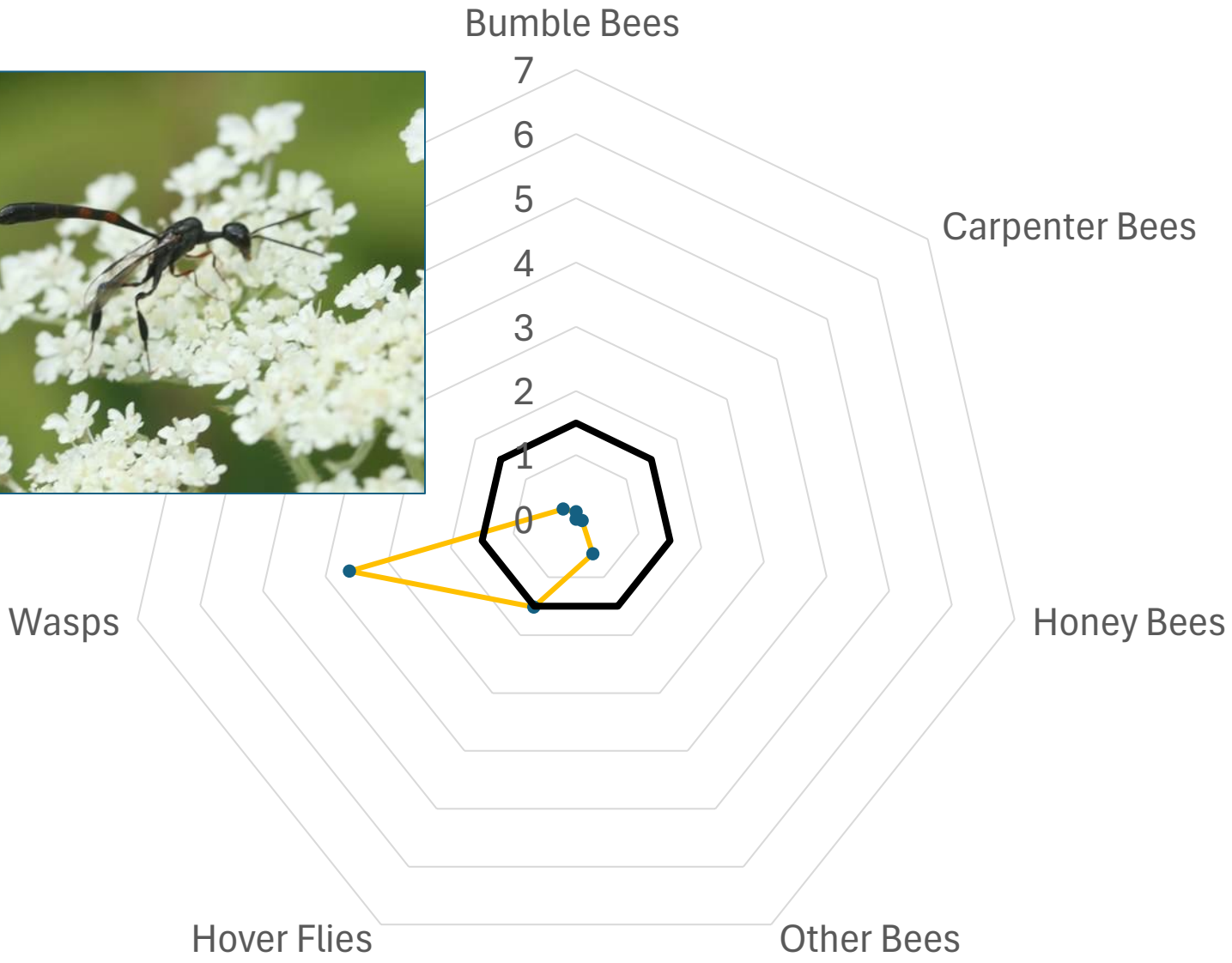

Joe-Pye Weed
Bumble Bees
Carpenter Bees
Honey Bees
Other Bees
Hover Flies
Wasps
Butterflies
7
6
5
4
3
2
1
0

Common Sunflower


Hawthorne
Valley


Yarrow
Bumble Bees
7
6
5
4
3
2
1
0
Carpenter Bees
Honey Bees
Other Bees
Hover Flies
Wasps
Butterflies

Queen Anne's Lace



White Clover

Bumble Bees

7

6

5

4

3

2

1

0

Carpenter Bees

Honey Bees

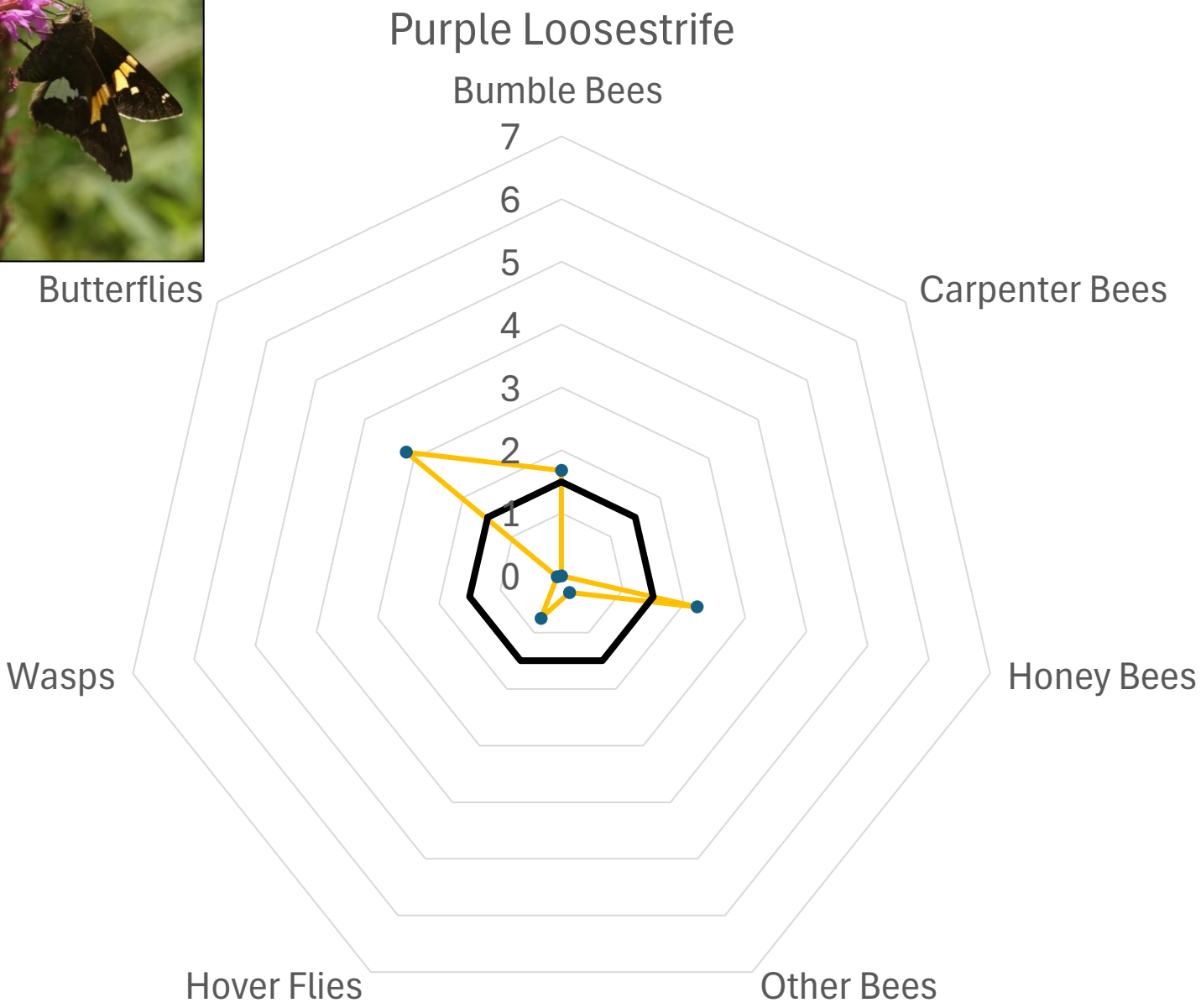
Other Bees

Hover Flies

Wasps

Butterflies


Whistledown


Purple Loosestrife
Bumble Bees
7
6
5
4
3
2
1
0
Carpenter Bees
Honey Bees
Other Bees
Hover Flies
Wasps
Butterflies

Summarizing this information by native/non-native and seeded/wild…

Values are mean preference ratings; higher values = higher average preference; large differences are highlighted in green.

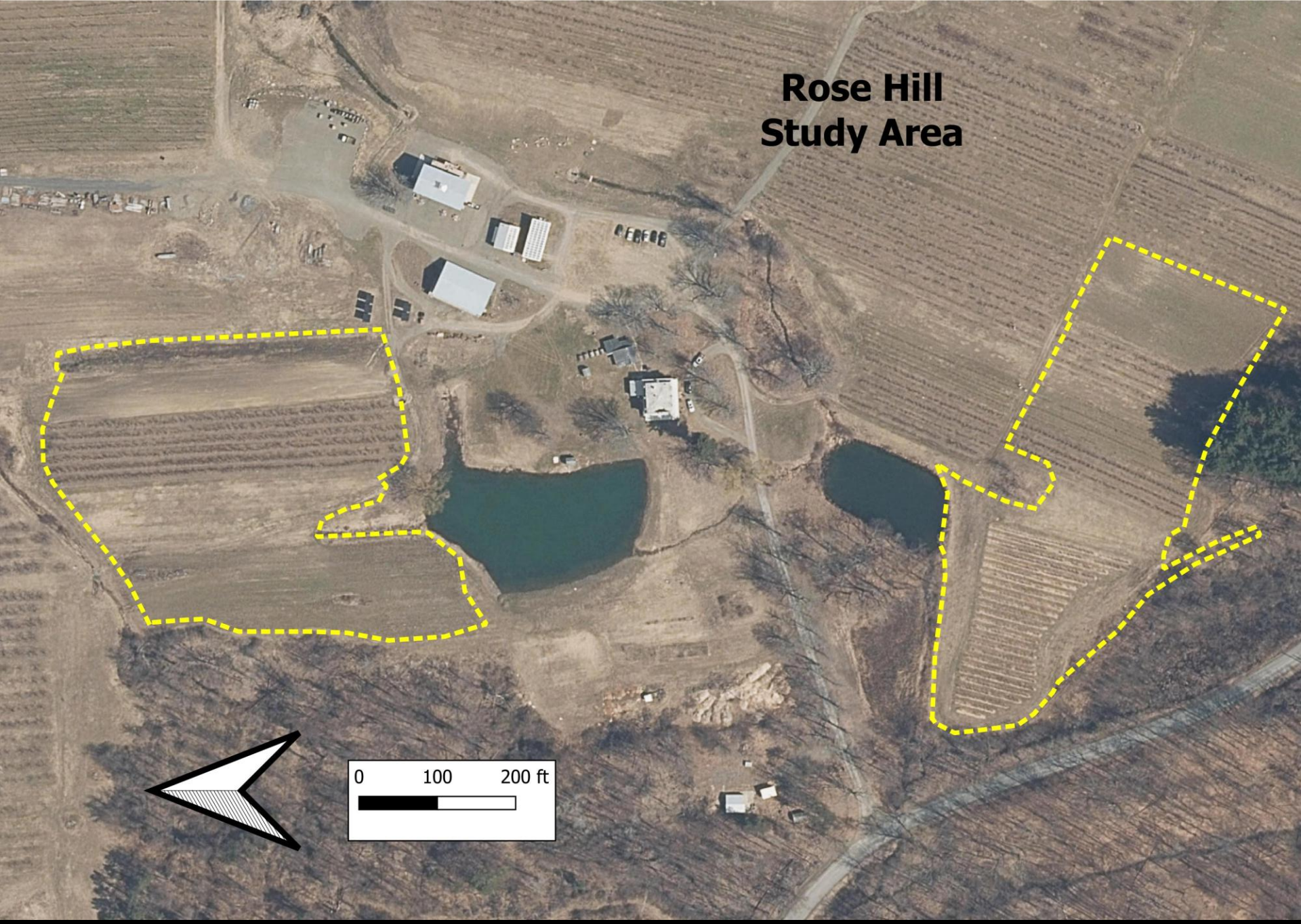
	Butterfly (not inc. skippers)	Bumble Bees	Carpenter Bee	Honey Bees	Hover Fly	Other Bees	Wasp	Skipper
Seeded	0.98	1.17	1.30	1.10	0.78	1.11	0.83	0.95
Wild	1.06	1.12	0.37	0.94	1.06	0.82	1.04	0.87
Native	0.88	1.42	1.57	1.07	0.95	0.75	1.79	0.80
Non-native	1.03	1.09	0.76	1.04	0.96	1.12	0.70	1.13

Wild plants seem to be particularly important for wasps and hover flies, two groups of agriculturally beneficial insects less commonly considered than bees and for whom small, relatively 'bland' flowers, can form important resources.

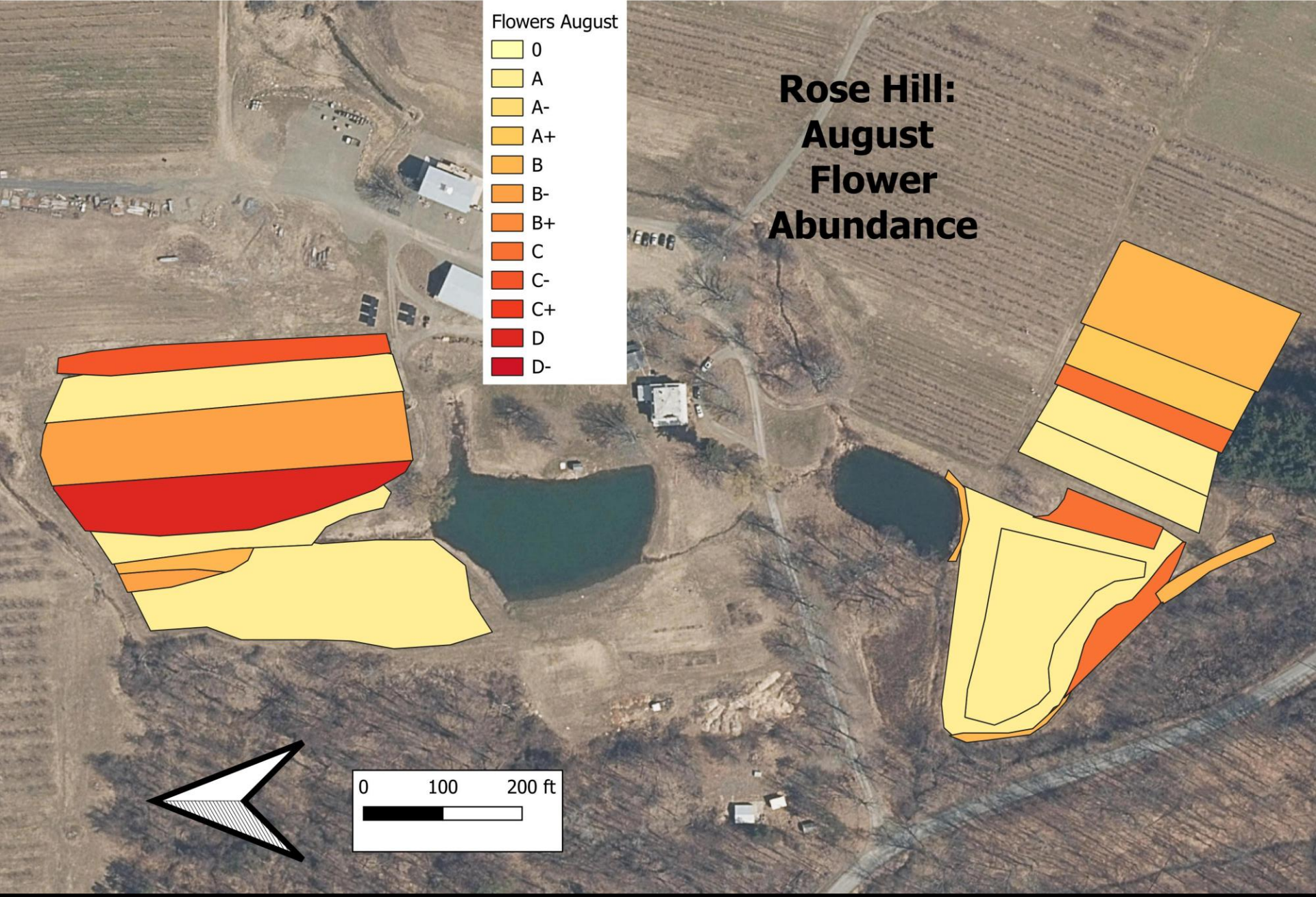
Native flowers seem most important for Bumble Bees, Carpenter Bees and Wasps.

Interestingly, "Other" (largely native) Bees seem, if anything, to be attracted to non-native seeded flowers. However, this group includes a wide variety of large and small bees, and I need to explore which flowers and bees are driving this pattern.

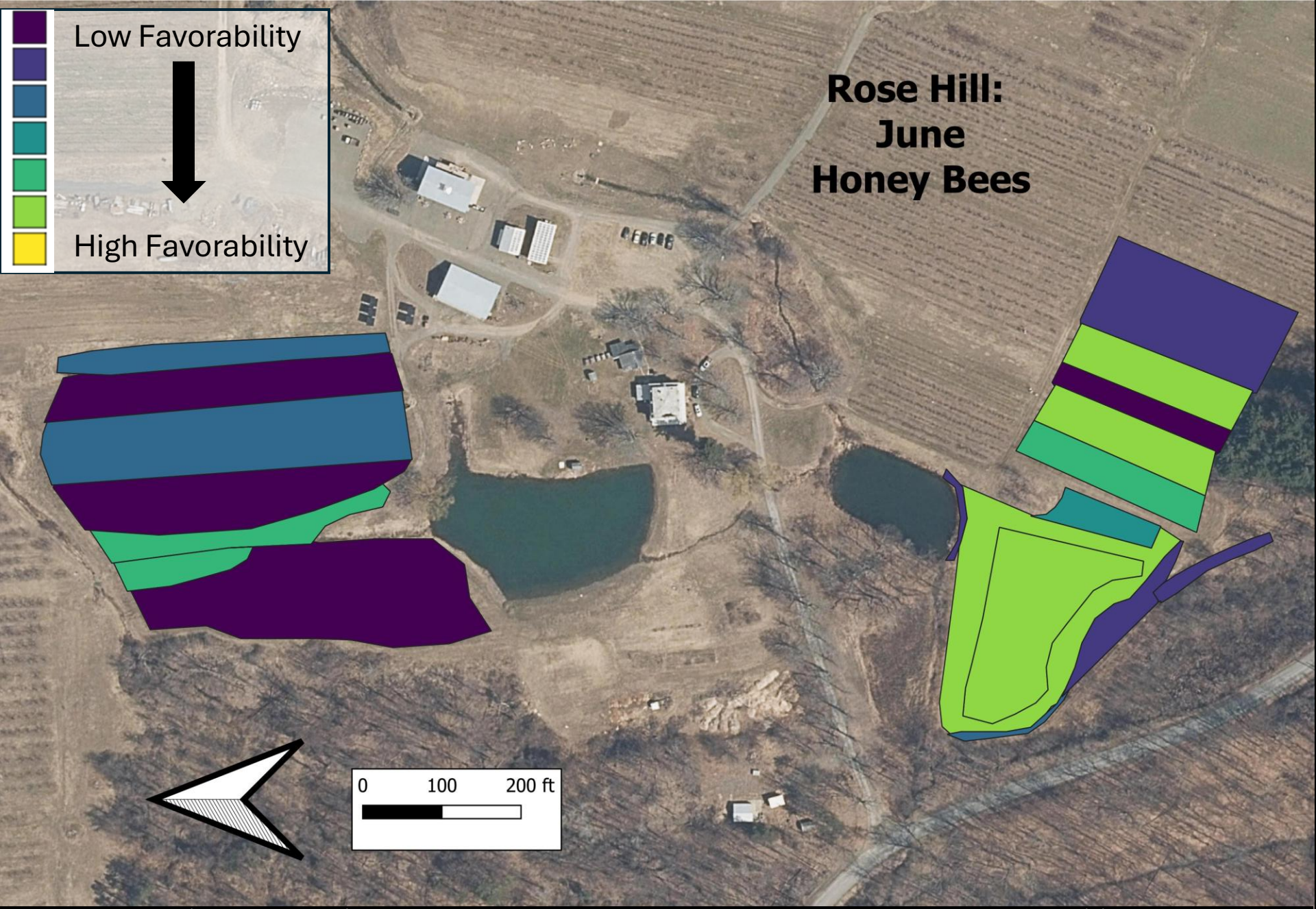
Wild & seeded and native & non-native flowers appear to have a role to play in supporting on-farm flower visitors. All are important. Some particular flower species seem to be more preferred, but gross categories might not particularly useful.



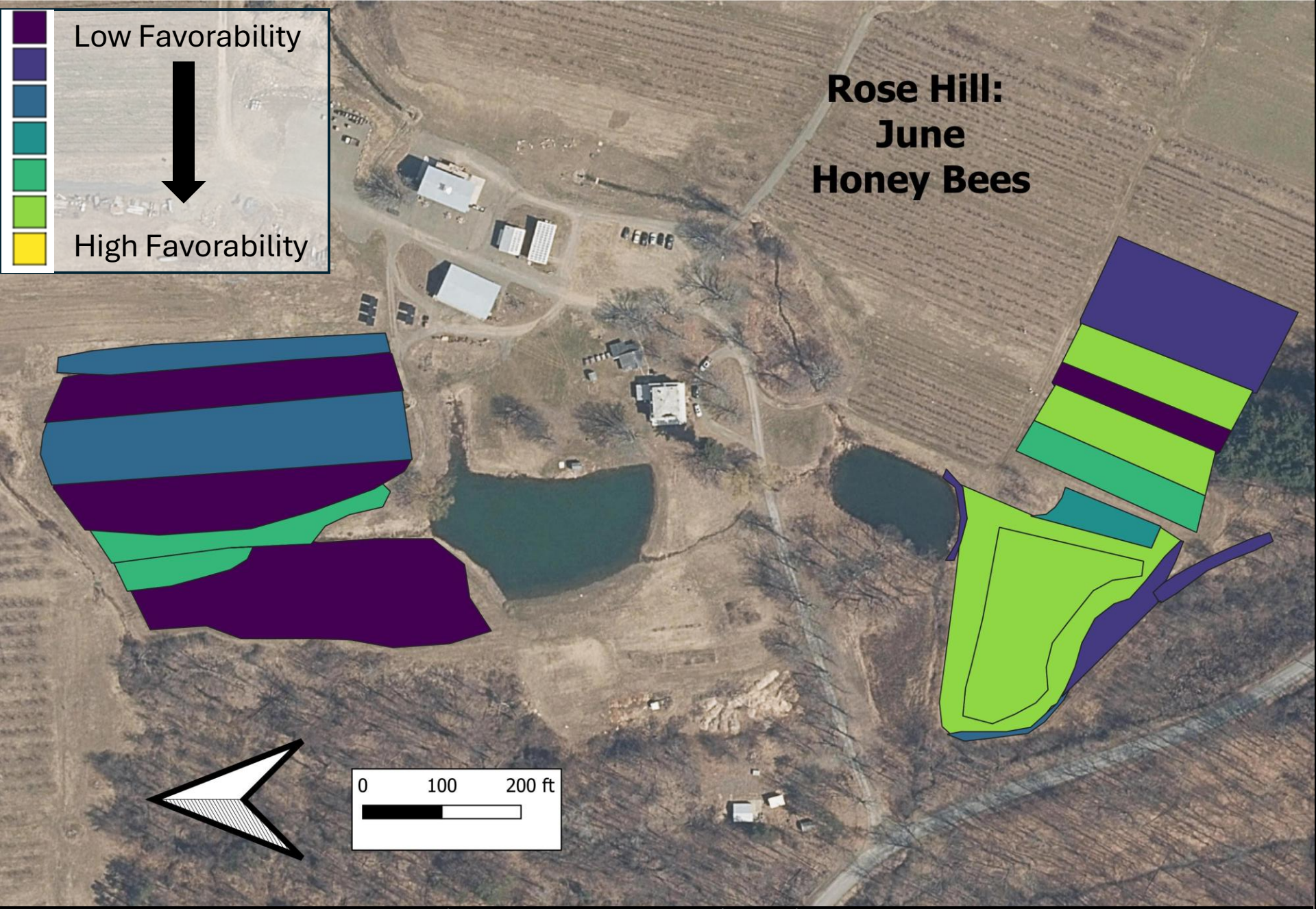
Here's an example of how we used these data to map insect flower resources.



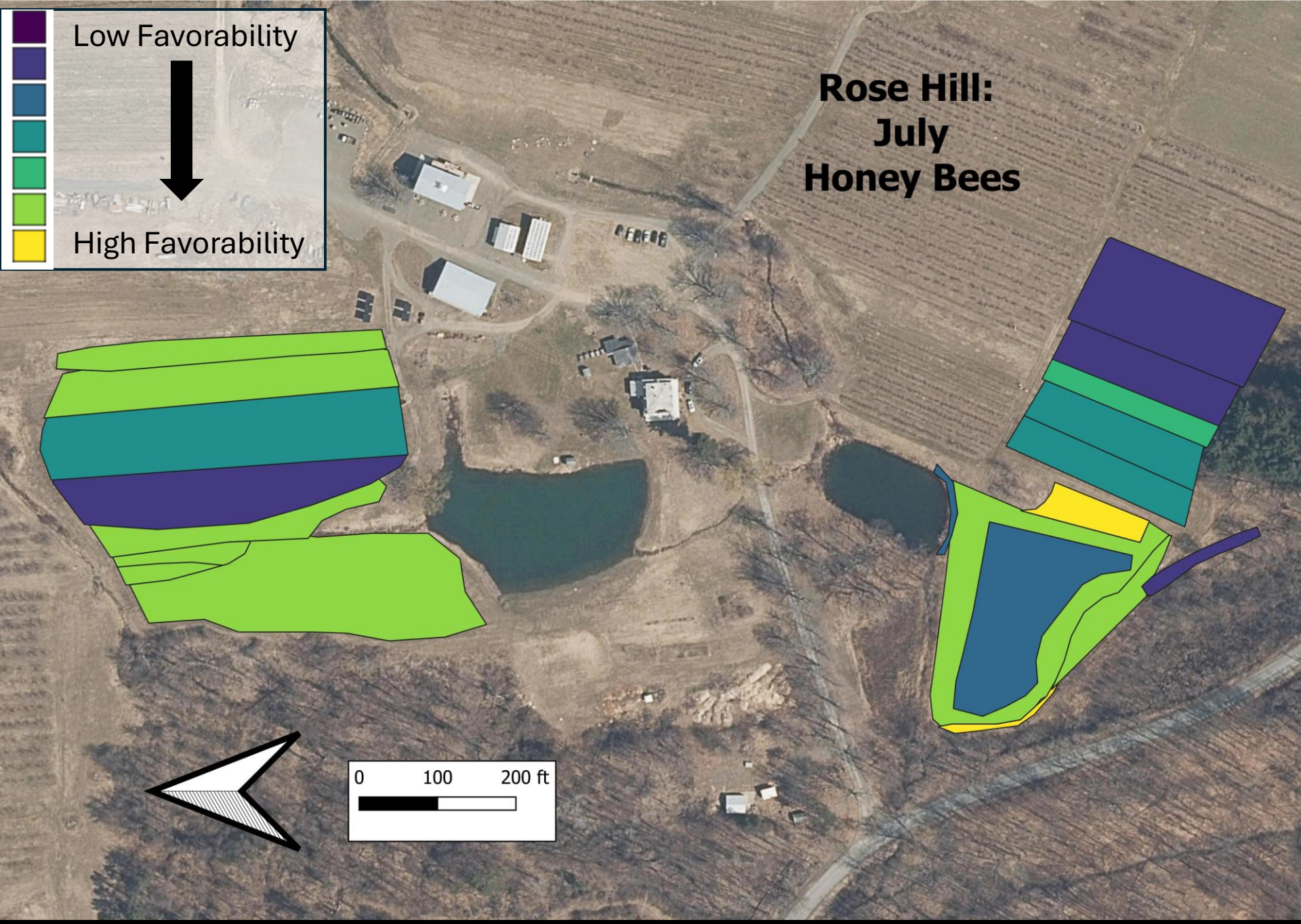
We took Claudia's flower abundance maps and her details on the types of flower found within each management unit...

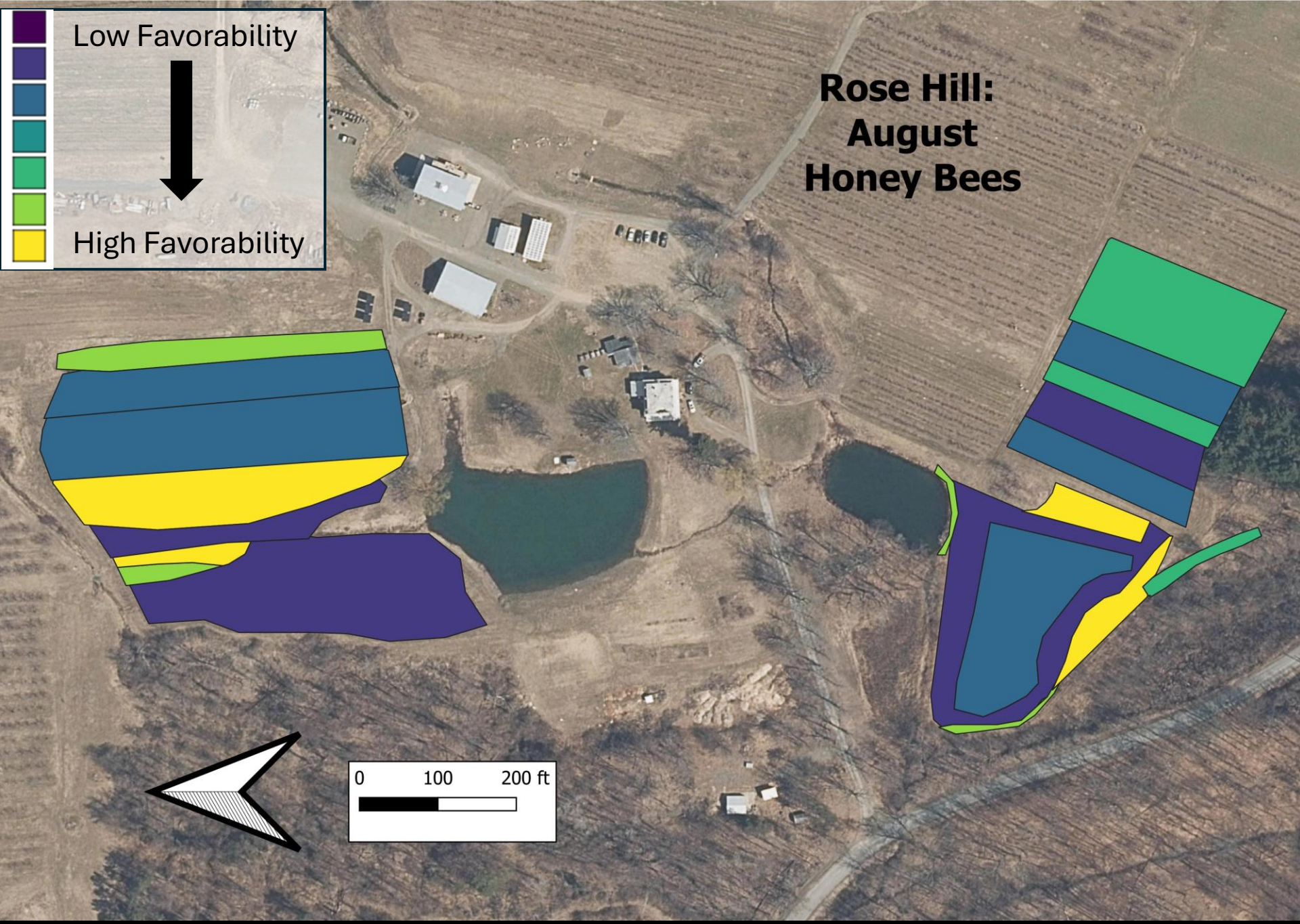


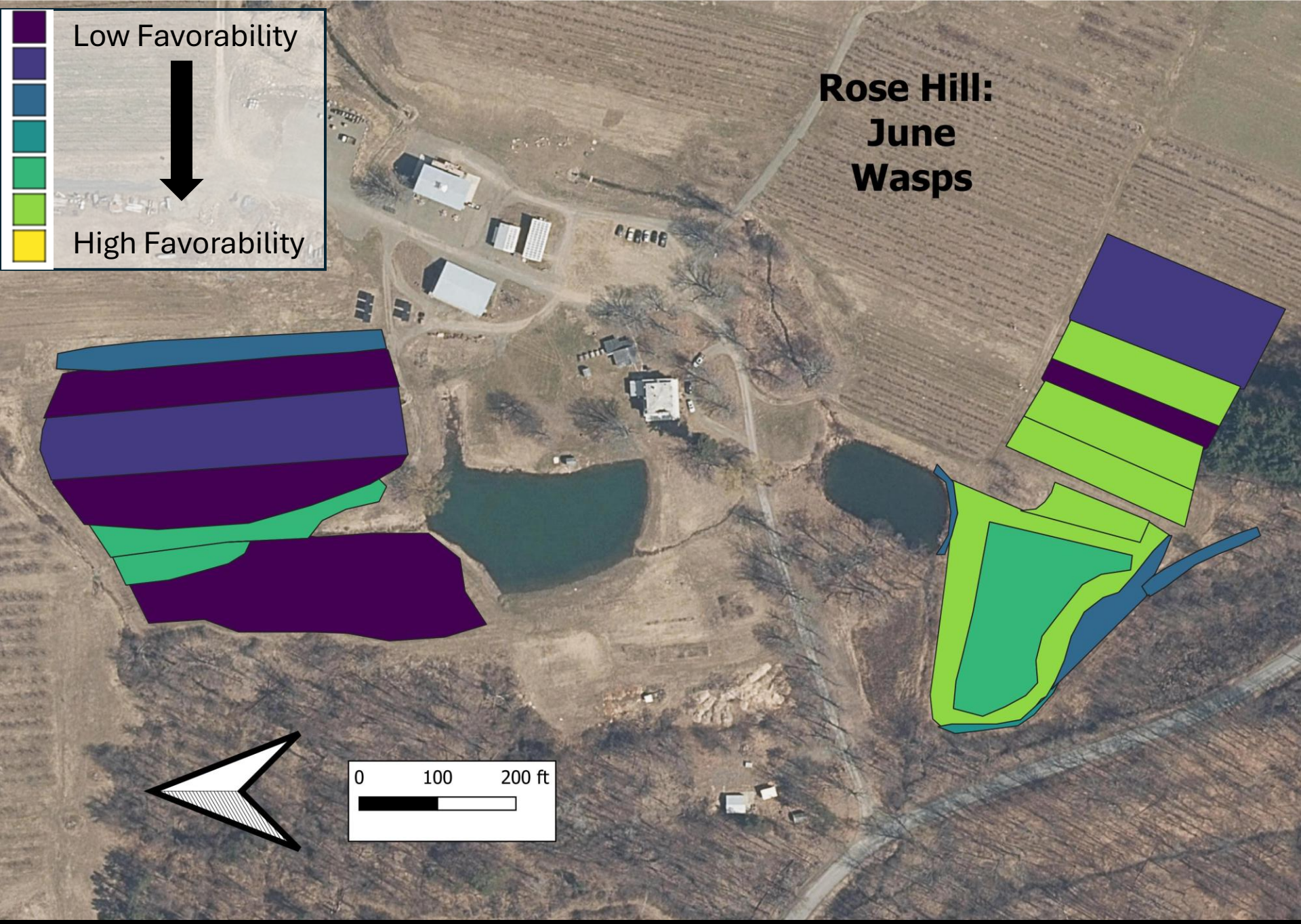
... and combined that with our flower preference scores to get flower favorability maps for each insect group during each month.



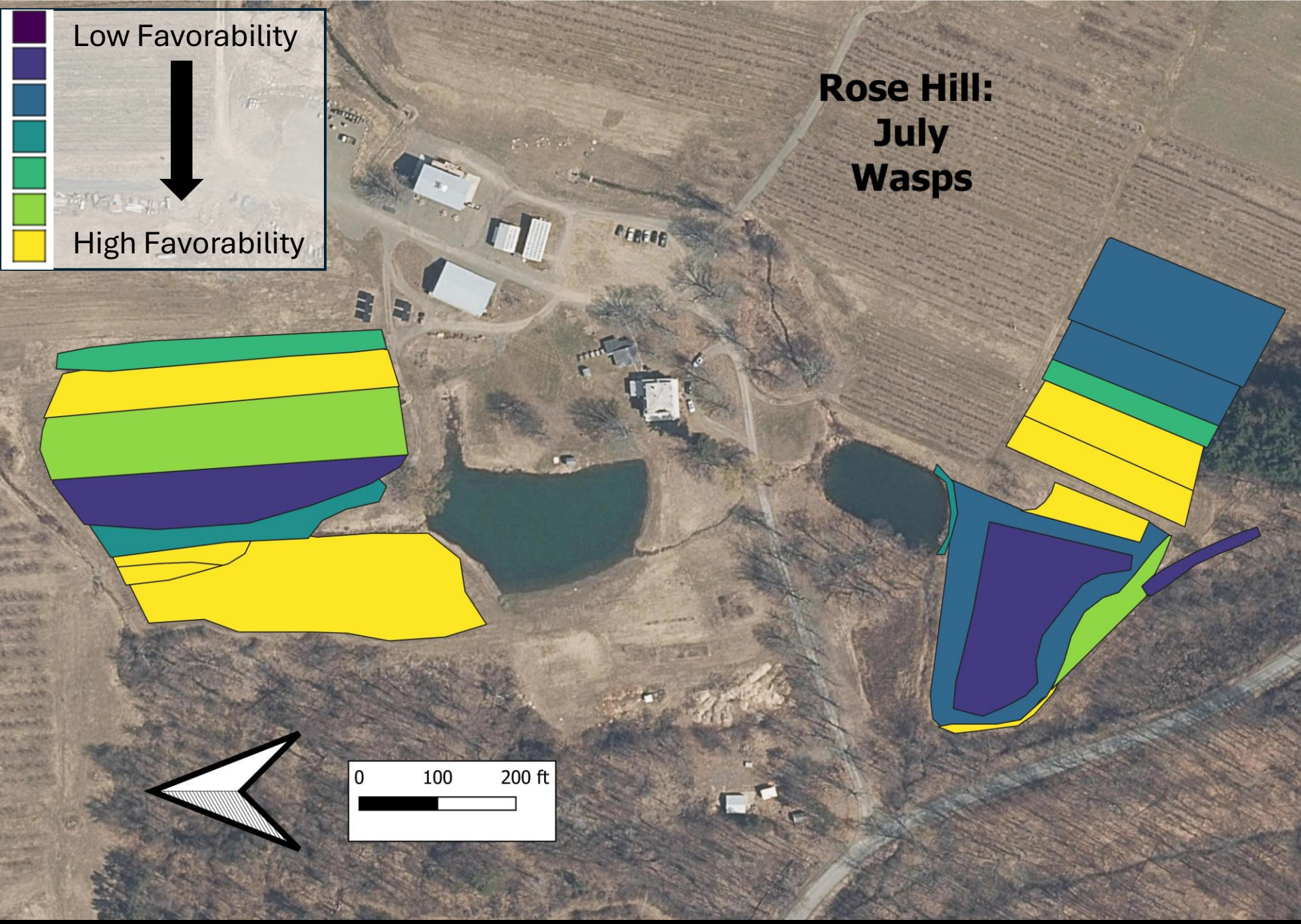
As we scroll through these, notice how even for a single insect group, the apparent value of a management unit can vary radically across the season. First, Honey Bees....

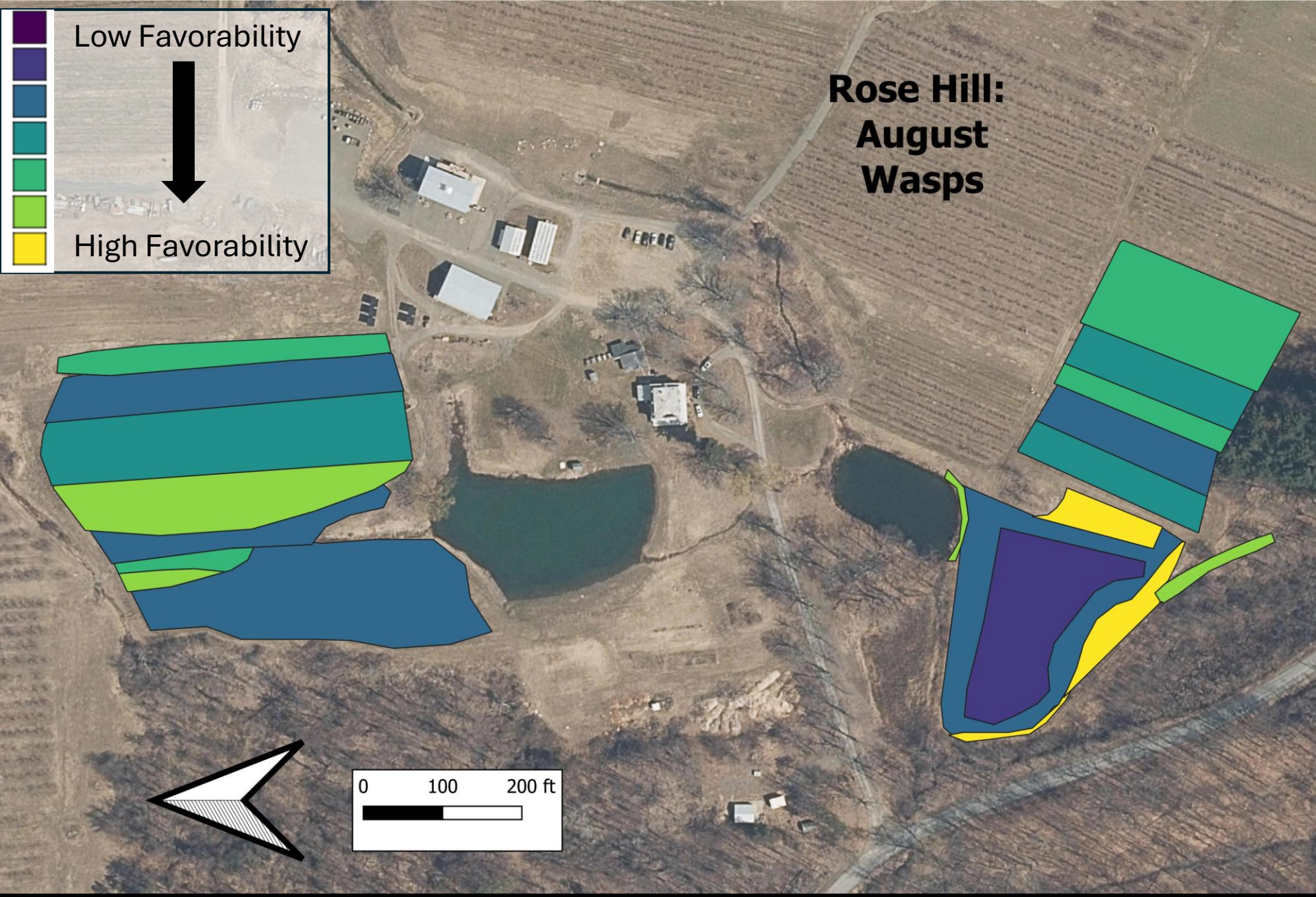

Low Favorability
High Favorability
Rose Hill:
July
Honey Bees
0
100
200 ft


Low Favorability
High Favorability
Rose Hill:
August
Honey Bees
0
100
200 ft

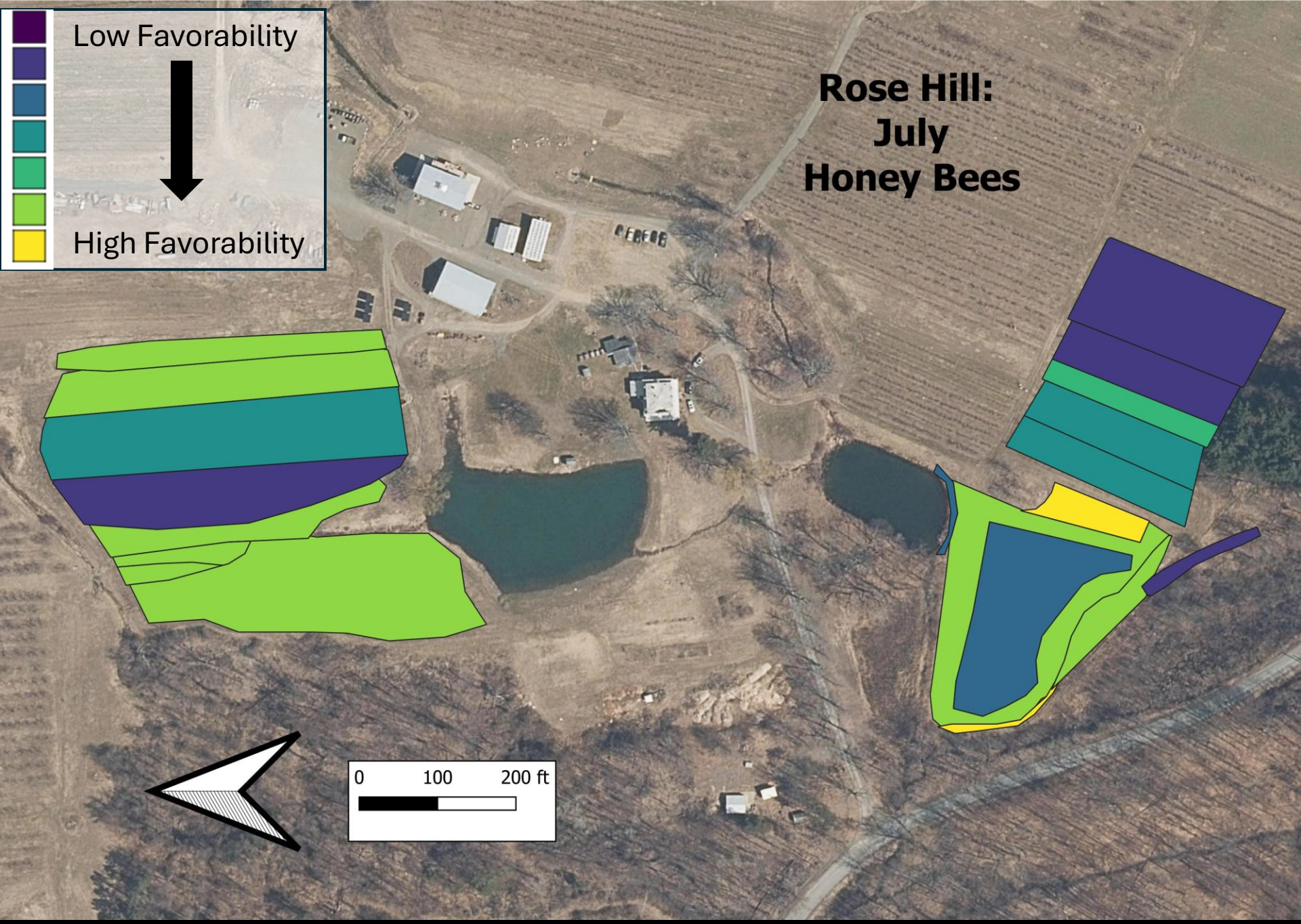

Low Favorability
High Favorability
Rose Hill:
June
Wasps
0
100
200 ft

Now wasps....

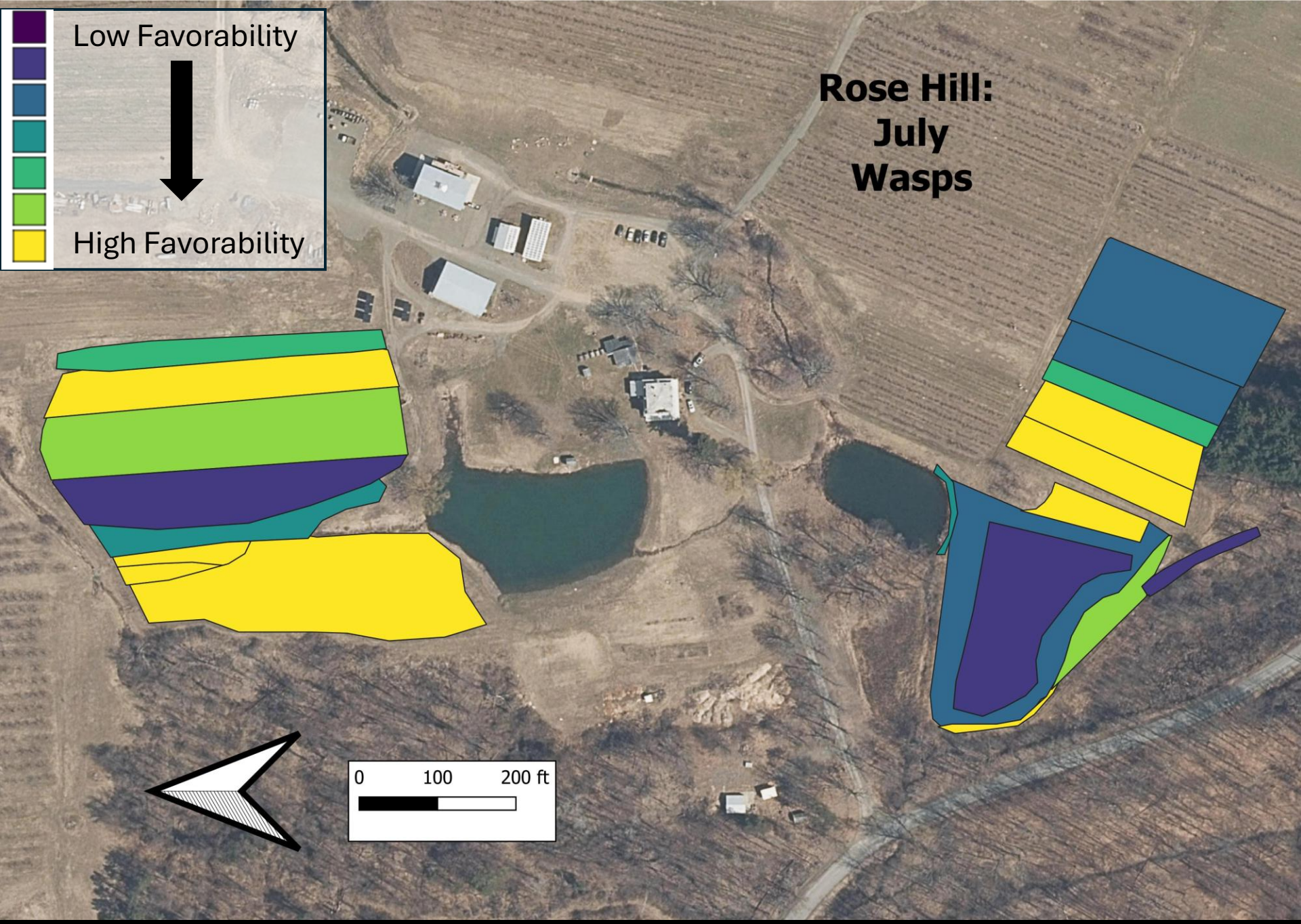

Low Favorability
High Favorability
Rose Hill:
July
Wasps
0
100
200 ft

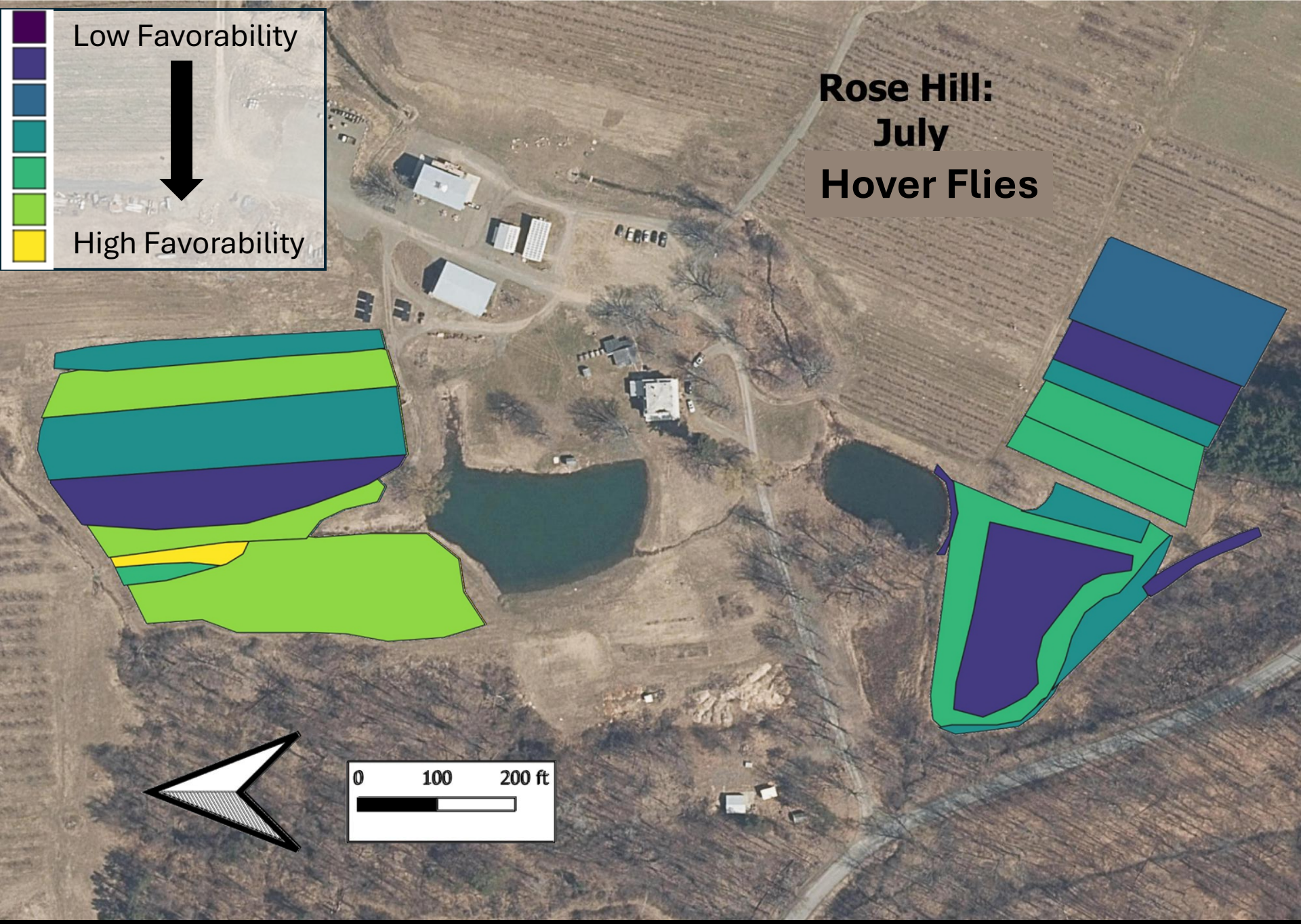


Remember, these insects are not bound to any one management unit, but can integrate across the farm and seasons.



Now look at how, during the same season, suitability differs amongst insect groups.


Low Favorability
High Favorability
Rose Hill:
July
Wasps
0
100
200 ft



In other words, a diversity of habitats supports a diversity of organisms.

Conclusions:

For a given group of insect visitors, different parcels tend to play different roles during different months. Bees are mobile, and it's more important that there is season-long availability of flower resources somewhere on the farm, than that a given unit or bed is valuable for the entire season.

When comparing across insect groups, parcels may have different relative values for the different groups depending on what's growing therein and the attractiveness of those flowers for a particular group of insects.

The above patterns should be taken into account when considering not only intentionally planted areas, but also wilder areas which may be managed more passively (e.g., by mowing schedules).

Can you use maps like these to produce season-long flower offerings for any particular group of insects and to ensure that a diversity of insects are being supported by your land management?

Thank you to the collaborating farms, our colleagues, and the Hudson Valley Farm Hub, which provided funding.