

Ohio Bumble Bee Queen Survey, April – June 2018

Thank you for volunteering to be part of the 2018 Ohio Bumble Bee queen survey! By submitting data on when and where bumble bee queens are nest-hunting and on what plants they are feeding, you are giving us important information on the status of bumble bees in Ohio and how to protect them. Healthy bumble bee populations start with queens. Bumble bee nests are annual, starting again each year from a new queen. In late March or April, queens emerge from their winter burrows underground and begin searching for nest sites, and then later collect pollen and nectar to feed their new brood. About a month after a queen finds a new nest, her first group of workers will emerge (in mid- to late May). In June – July, if the colony is doing well, the queen will produce males and new queens in mid and late summer to carry on her genetic line. Those new queens will mate, then overwinter in abandoned rodent burrows, under logs, or in leaf litter to start a nest the following spring.

Spring queens that are actively searching for a nest site will fly low and slowly over the ground in a back and forth sweeping pattern, stopping occasionally to disappear down a hole/ crevice to invest a potential site. Here's an example of what that looks like:

<https://www.youtube.com/watch?v=pKv1IOVVlu4>

This queen survey is being done in conjunction with a larger statewide Ohio bumble bee survey. The goals are to:

- (1) Determine if an endangered bumble bee species (*Bombus affinis*, the rusty-patched bumble bee) and another of conservation concern (*B. terricola*, the yellow banded bumble bee) still occurs in Ohio, and if so, where.
- (2) Document the status of other common bumble bee species in the state
- (3) Add to our understanding of the factors that can cause bumble bee declines, like lack of flower resources and land use change.

Researchers & Contact Information

- **Jessie Lanterman**, PhD, post-doctoral researcher at OSU, Goodell Lab, (Lanterman.2@osu.edu). **Submit data + photos to me at: osubeereseach@gmail.com**
- **Dr. Karen Goodell**, Associate Professor, OSU, Department of Evolution, Ecology, & Organismal Biology (Goodell.18@osu.edu)
- **Dr. Randy Mitchell**, Professor of Biology, U of Akron (RJM2@uakron.edu)

In this document:

- Protocol for doing a timed 15-minute observation of *foraging* queen bumble bee queens that are feeding on flowers, data sheets, and instructions for reporting the data (p. 2-5)
- Protocol for reporting your observations of *nest-hunting* queen bumble bees (p. 6-7) and data sheet
- Resources on bee identification, and how to tell a queen from a worker (p. 8)
- List of plants commonly visited by bumble bees (p. 9-10)

Protocol for doing a timed 15-min foraging bee survey and reporting the data to us:

When:

- On warm sunny days (>65°F) with little wind (< 10 mph)
- Between the hours of 8:00 am and 6:00pm. Since bees are not warm-blooded like mammals, you have the best chance of spotting queens in spring after it has already warmed up for the day, and before it starts to cool down again in the evening.
- For **15 minutes** at a time, when you are not doing other tasks simultaneously. For example, do grab your lawn chair and watch those flowers, but don't say you are doing a timed observation and half-heartedly watch for bees while you hang laundry or weed the flower beds.
- You can submit as many 15-min observations to us as you'd like between April – June

Where & Which Flowers:

- Wherever there are abundant flowers blooming at or below eye-level (may be shrubs or herbaceous plants) – where you can easily observe bees on them
- On a patch of flowers (between 2m² – 10m² area) or a shrub / *small* tree that is in *full bloom*
- In your yard, or a local park, nature center, or other public place with abundant flowers that are attractive to bees
- Once you find a good spot, stay at that patch for the entire 15 min observation period
- Flowers can be wild or planted, but if planted be sure they are not ornamental cultivars that do not produce nectar or pollen. Some ornamentals, like azaleas, rhododendrons, lilies, and hostas are very attractive to bees. However, some garden flowers have been bred just for showiness and lost their ability to make pollen/nectar for bees.
- See our list below of flower species that are frequently-visited by bumble bees. Use your best judgement on flowers, and contact the researchers if you have questions about where and on which flowers to observe.

How to report data:

- Each time you complete a timed 15-minute observation (whether you see bumble bees or not), fill out the data sheet using **Google Forms** at (click, or copy paste this link into the address bar of your browser): <https://goo.gl/forms/wB9N0CS7VDtmwwiM2>
 - OR...if you have having trouble with google forms, you can fill out the data sheet on the next page in Word and send it back by email to Jessie at: OSUBeeResearch@gmail.com
- If you have any photos of bumble bees on flowers that you observed that day *during your timed observation*, we would appreciate it if you send use those at OSUBeeResearch@gmail.com.

Grab a pen and a notebook. Here is the specific information you need to record during each 15-min observation:

- Date, Start/End Time, Temperature (can estimate from watching the morning news, newspaper, online...), Weather (sunny or cloudiness)
- Location (street address and/or GPS coordinates)
- Habitat type (forest, woodland, edge or transitional zone, wetland, grassland/meadow, maintained yard or flower bed)
- Total area / size of the patch of flowers you observed __ ft by __ ft
- Total number of queen bumble bees you saw
- The names of the types of flowers you watched for bees, and approximately how many flowers were in that patch
- The number and type (species) of bumble bees you observed on each type of flower (see data sheets below)

Tips for seeing the most bees

- You will catch more bees on patches of flowers in the sun than in the shade
- Stand at least three feet away from the flower patch you are observing, and position yourself so that you don't cast a shadow over the flowers

Foraging Queen Bumble Bee Survey Data Sheet

Name:

Date: (day-month-year, ex: 27-Mar-2018):

Time & Weather (ex: 10:30-10:45am, sunny):

Location: (street address or GPS coordinates):

Photos? (yes/no)

Size of the flower patch you observed: ____ ft by ____ ft

Habitat Type (circle): Forest, Woodland, Forest Edge, Wetland, Grassland/Meadow, Maintained Yard or Flower Bed, Other
If *other* describe:

Plant names →						
# of flowers of that plant type →						
<i>B. impatiens</i>						
<i>B. griseocollis</i>						
<i>B. bimaculatus</i>						
Total						

Notes on how to complete the table above: Fill in plant names as best you can, whether you know the scientific name or just the common name. Write in additional rows of bumble bee species as needed. We just filled in a few of the most common species. For the # of flowers you observed of each species, if there is a large number estimate by counting say all the flowers on one branch, then multiplying up by the number of flowering branches. If there are more than a thousand flowers, write ">1000."

Example of completed Foraging Queen Bumble Bee Data Sheet

Name: Betty Buckeye

Date: (day-month-year, ex: 27-Mar-2018): 1-April-2018
14:15), sunny

Time & Weather: 2:00 - 2:15pm (or 14:00 -

Location: 318 W 12th Ave Columbus, OH 43210, 40.848894N, -80.723522W **Photos?** Yes, 1 B. impatiens on honeysuckle

Size of the flower patch you observed: 10 ft long by 3 ft wide

Habitat Type (circle): Forest, Woodland, **Forest Edge**, Wetland, Grassland/Meadow, Maintained Yard or Flower Bed, Other

Brief description of habitat: sunny patch of flowers along forest edge with flowering shrubs and herbs

Plant names →	Bush honeysuckle (<i>Lonicera morrowii</i>)	Autumn olive (<i>Elaeagnus umbellata</i>)	Daffodil (<i>Narcissus</i> sp)	Large flowered white trillium (<i>Trillium grandiflorum</i>)		
Approximate # of flowers you watched of that plant type →	>1000	>1000	50	15		
<i>B. impatiens</i>	2	1		1		
<i>B. griseocollis</i>						
<i>B. bimaculatus</i>		1				
<i>B. vagans</i>	1					

Total	3	2	0	1		
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Protocol for reporting an observation of a nest-hunting queen bumble bee

When:

- On warm sunny days (>65°F) with little wind (< 10 mph)
- Between the hours of 8:00 am and 6:00pm. Since bees are not warm-blooded like mammals, you have the best chance of spotting queens in spring after it has already warmed up for the day, and before it starts to cool down again in the evening.
- As you are going about your daily business, walking the dog, keeping up the yard or garden...wherever you see a queen bumble bee nest hunting
- You can submit as many observations as you'd like during spring when queens are emerging and establishing new nests (April – May)

Where:

- Around your home, or at a local park / nature center, along city sidewalks or roadside ditches, or other public places
- Bumble bee queens typically search for nest sites in places where there is woody debris and/or leaf litter and small crevices or holes in the ground
- Some species build their nests underground in abandoned rodent burrows, while others nest near the surface under vegetation or woody debris (grass tussocks, fallen logs, compost piles, the edge of the asphalt in your driveway...)
- They may be searching for nest sites on a forested hillside by a stream, or in the field, depending on the species

How to report data:

- Each time you spot a nest-hunting queen, send us information on the observation by filling out this data sheet using **Google Forms** at (click, or copy paste this link into the address bar of your browser): <https://goo.gl/forms/1ebM6AcEf2FxcQQT2>
 - OR...if you have having trouble with google forms, you can fill out the data sheet on the next page in Word and send it back by email to Jessie at: OSUBeeResearch@gmail.com
- If have any photos of this nest hunting bumble bee that you want to share, please send it to us at OSUBeeResearch@gmail.com.

Grab a pen and a notebook. Here is the specific info you need to record for each observation:

- Date, Time, Temperature (can estimate from watching the morning news, newspaper, online...), Weather (sunny or cloudiness)
- Location (street address and/or GPS coordinates, or name of park + trail)
- Habitat type (forest, woodland, edge or transitional zone, wetland, grassland/meadow, maintained yard or flower bed)
- Total number of queen bumble bees you saw, total amount of time you spent there
- Species of bee you observed
- Specific features of the habitat (see data sheet on next page)

Nest-Hunting Queen Bumble Bee Survey Data Sheet

Name:

Date:

Temp (F):

Weather (sunny, partly sunny, cloudy):

Location: (street address or GPS coordinates):

Photos? (yes/no)

Habitat Type (circle): Forest, Woodland, Forest Edge, Wetland, Grassland/Meadow, Maintained Yard or Flower Bed, Other
If *other* describe:

Total amount of time you spent there that day (minutes):

Total # queen bumble bees you saw there:

Were you stationary or walking?

	Species of bee	Amount of time (min) you spent watching her	Behavior	Carrying pollen on hind legs? Yes/no	Habitat features in the immediate area where you saw her nest hunting
<i>Queen bee #1</i>					
<i>Queen bee #2</i>					
<i>Queen bee #3</i>					
<i>Queen bee #4</i>					
<i>Queen bee #5</i>					

In the habitat features column, please note if any of the following are present: leaf litter, other mat-forming herbaceous plant litter, large grass clumps/ tussocks, fallen logs or woody debris >6in in diameter, clumps of moss, stream or river, lake or pond, trees in full bloom, shrubs in full bloom, herbaceous plants in full bloom.

Example of completed Nest-Hunting Queen Bumble Bee Survey Data Sheet

Name: Betty Buckeye

Date: 21 April 2018

Temp (F): 72

Weather (sunny, partly sunny, cloudy): partly sunny

Location: (street address or GPS coordinates): Maple Highlands Bike Trail, 0.5 mi E of Mountain run trailhead on S Hambden St

Photos? (yes/no) No

Habitat Type (circle): Forest, Woodland, **Forest Edge**, Wetland, Grassland/Meadow, Maintained Yard or Flower Bed, Other
If *other* describe:

Total amount of time you spent there that day (minutes): 60 min

Total # queen bumble bees you saw there: 2

Were you stationary or walking? walking

	Species of bee	Amount of time (min) you spent watching her	Behavior	Carrying pollen on hind legs? Yes/no	Habitat features in the immediate area where you saw her nest hunting
<i>Queen bee #1</i>	B. impatiens	5 min	Exploring under logs and in holes	No	Leaf litter, clumps of moss, fallen logs, creek, flowering shrubs
<i>Queen bee #2</i>	B. bimaculatus	1 min	Flying low over grass tussocks edge of swamp	Yes	Leaf litter, herbaceous litter, grass clumps, fallen logs, creek, spring ephemeral wildflowers
<i>Queen bee #3</i>					

How to tell a queen from a worker: Size & Timing

Queens are much larger than their daughters (the workers). Although size can vary a little by species, go by the rule of thumb – a queen will be about 1/2 - 2/3 the size of your thumb (or 17-21mm), and workers are on average half that size (9-16mm). In March – April in Ohio, the only bumble bees flying are queens (unless it's an exceptionally warm early spring). The workers begin to appear around mid-May, and males as early as mid-June. Different bumble bee species have staggered periods of seasonal activity, with the queens of some species emerging earlier (e.g. *B. impatiens*, *B. bimaculatus*, *B. affinis*) and some emerging later (e.g. *B. griseocollis*, *B. fervidus*, *B. auricomus*, *B. pensylvanicus*). On the other end of the season, you can see new queens-of-the-year in July and August that are looking for mates and hibernacula.

Resources for bumble bee identification to species

Web resources

- From **Beespotter**, a pollinator conservation organization that collects bee observation data from the public:
 - **Dichotomous Key.**
<https://beespotter.org/topics/key/images/BumbleBeeKey2016.pdf>
 - **Field Guide style.**
<https://beespotter.org/topics/key/images/BumbleBeeFieldguideAlt4.pdf>
- **Bumble Bees of the Eastern US**, a field guide by Colla, Richardson, and Williams that was produced in partnership with the US Forest Service, the USDA, and Pollinator Partnership:
<https://www.fs.fed.us/wildflowers/pollinators/documents/BumbleBeeGuideEast2011.pdf>

Books

Bumble Bees of North America: an Identification Guide, 2014, by Paul Williams, Robbin Thorpe, Leif Richardson, and Sheila Colla. https://www.amazon.com/Bumble-Bees-North-America-Identification/dp/0691152225/ref=sr_1_2?ie=UTF8&qid=1521671217&sr=8-2&keywords=bumble+bee+book

List of Bumble Bee Food Plants by Growth Form & Season

Below is a list of plant species that we have frequently observed bumble bees visiting for pollen and nectar. These plants are mostly wild-growing, not cultivated garden flowers. Because they are diet generalists, bumble bees also visit many additional plant species besides the ones listed here, these are just the ones that attracted the most bees in our research surveys in meadows around Ohio.

Shrubs - spring

- rhododendron (*Rhododendron* spp.)
- azalea (*Rhododendron* spp.)
- willow (*Salix* spp.)
- redbud (*Cercis canadensis*)
- bush honeysuckle (*Lonicera* spp.)
- autumn olive (*Elaeagnus umbellata*)
- blueberry (*Vaccinium* spp.)
- serviceberry (*Amelanchier* spp.)
- raspberry (*Rubus pensylvanicus*, *R. occidentalis*)
- wild roses (*Rosa multiflora*, *Rosa* spp., native with pink flowers, not ornamentals)

Trees

**** only use trees that are short enough or with low enough flowering branches to easily observe the bees and determine species ****

- apple, pear (*Pyrus* spp.)
- cherry (*Prunus* spp.)
- hawthorn (*Crataegus* spp.)
- black locust (*Robinia pseudoacacia*)
- catalpa (*Catalpa* spp.)
- linden/ basswood (*Tilia americana*)
- buckeye (*Aesculus glabra*)
- sourwood (*Oxydendrum arboreum*)

tulip poplar (*Liriodendron tulipifera*)

Herbs - spring

Virginia blue bells (*Mertensia virginica*)

squirrel corn (*Dicentra canadensis*), dutchman's breeches (*Dicentra cucullaria*)

waterleaf (*Hydrophyllum virginiana*)

trillium (*Trillium* spp.)

trout lilies (*Erythronium americanum*, *E. albidum*)

Herbs - early summer

beard tongue (*Penstemon digitalis*)

lupine (*Lupinus perennis*)

blue and white indigos (*Baptisia australis*, *B. alba*)

Herbs - mid summer

red clover (*Trifolium pratense*)

milkweed (*Asclepias syriaca*, *A. incarnata*, *A. tuberosa*)

bee balm/ wild bergamot (*Monarda fistulosa*)

mints (spearmint, hyssop, oregano, thyme, basil, catnip, wild basil, heal-all...)

blazing star (*Liatris* spp.)

mountain mint (*Pycnanthemum virginianum*)

purple cone flower (*Echinacea purpurea*, as long as it's not a strange nursery cultivar)

rattlesnake master (*Eryngium yuccifolium*)

flowerbed Hostas (*Hosta* spp.)

orange day lily (*Hemerocallis fulva*)

wingstem (*Verbesina alternifolia*)

blue lobelia (*Lobelia siphilitica*)

Herbs - late summer

Joe Pye weed (*Eutrochium fistulosum*)

sunflowers (*Helianthus* spp.)

goldenrods (*Solidago* spp.)

"Weeds" - all summer

red clover (*Trifolium pratense*)
dandelion (*Taraxacum officinale*)
knapweeds (*Centaurea* spp.)
chickory (*Cichorium intybus*)
small thistle (*Cirsium arvense*)
large thistles (*Cirsium vulgare*, *Cirsium discolor*)
teasel (*Dipsacus fullonum*, *D. laciniatus*)
crown vetch (*Securigera varia*)
birds foot trefoil (*Lotus corniculatus*)
sweetclover (*Melilotus officinalis*, *M. albus*)
queen anne's lace / wild carrot (*Daucus carota*)

Online resources on what flowers to plant to attract [bumble] bees:

University of Minnesota pollinator extension program:

<https://www.extension.umn.edu/garden/insects/find/bumblebees/>

Denise Ellsworth, OSU Extension program:

Ohio Trees for Bees https://cpb-us-west-2-juc1ugur1qwqqqo4.stackpathdns.com/u.osu.edu/dist/a/836/files/2016/03/ENT_71_15-13m1u0u.pdf

The Xerces Society for invertebrate conservation:

Planting for pollinators in the Great Lakes Region <https://xerces.org/pollinators-great-lakes-region/>