

# MISSOURI

## BUMBLE BEE ATLAS



### Participant Handbook



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## Resources Available Online at:

[www.MOBumbleBeeAtlas.org](http://www.MOBumbleBeeAtlas.org)



@bumblebeeatlas

facebook.com/groups/mobumblebees (group for Missouri volunteers)

facebook.com/groups/bbatlas (region-wide group for volunteers in the Midwest)



Cover photo: Southern Plains Bumble Bees (*Bombus fraternus*) on Coneflower (*Echinacea* sp).  
Photo by Jennifer Hopwood / Xerces Society.

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# Introduction

Bumble bees are charismatic and easily recognizable pollinators thanks to their large size, loud buzz, and distinctive color patterns. They play an incredibly important role in sustaining the health of our environment by pollinating flowers in natural and urban areas, and by contributing to successful harvests on farms.

To help understand and conserve our state's bumble bees, the Missouri Department of Conservation, Pheasants Forever and Quail Forever, and the University of Missouri partnered with the Xerces Society to launch the Missouri Bumble Bee Atlas in 2020. The Atlas is a community science project covering the entire state that creates an opportunity for people to participate in pollinator conservation. Community scientists, like you, will work alongside researchers to better understand the status, distribution, and habitat needs of bumble bees throughout Missouri.

The variety of Missouri's ecosystems supports about 13 different species of bumble bees. A few of these species, such as the Southern Plains Bumble Bee (*Bombus fraterus*), are in trouble and face an uncertain future. A recent study led by the International Union on Conservation of Nature's Bumble Bee Specialist Group—supported by studies led by Dr. Sydney Cameron—and a status review by the late Dr. Robbin Thorp and the Xerces Society, demonstrate that one quarter of North America's nearly fifty species of bumble bees are undergoing dramatic population declines.

The causes of decline are not fully understood, but the following are likely contributing: habitat loss, degradation or fragmentation, pesticide use, climate change, low genetic diversity, and the introduction and distribution of pathogens through commercial pollinators. Regardless of the ultimate cause, protecting and managing existing habitat or creating new habitat are some of the most immediate and productive steps that can be taken.

With your help, we can quickly collect scientific-quality data throughout Missouri and contribute to bumble bee conservation. Training is provided to equip you with the necessary resources, skills, and confidence to conduct your own bumble bee surveys as a community scientist. Our effort will help conservation biologists, restoration practitioners, and policy makers do a better job protecting, restoring, and managing effective habitat that support healthy bumble bee populations.

The Missouri Bumble Bee Atlas is part of a coalition of existing Xerces Society-affiliated Bumble Bee Atlas projects — the Pacific Northwest BBA, the Nebraska BBA, the California BBA, the Great Plains BBA, the Southeastern BBA, the Minnesota BBA, and the Iowa BBA — which together cover 15 states. These projects are vastly improving our understanding of North America's bumble bees and creating a passionate network of pollinator conservationists.

Thank you for being here and wanting to take on an active role in supporting bumble bees. This document will hopefully answer any questions you may have. When you're ready to get started, visit [www.MissouriBumbleBeeAtlas.org](http://www.MissouriBumbleBeeAtlas.org) for upcoming events and to adopt your grid cell.



Facebook.com/groups/bbatlas  
Facebook.com/groups/mobumblebees



@bumblebeeatlas

**We invite you to join the project; participation is easy:**

1. Attend a training event
  - Live webinar (<https://www.mobumblebeeatlas.org/events.html>)
  - On your own time using the [Online Training Portal](http://www.mobumblebeeatlas.org/train-online) ([www.mobumblebeeatlas.org/train-online](http://www.mobumblebeeatlas.org/train-online))
2. Adopt a grid cell
  - Alone or with a small group of people
3. Conduct 2 formal surveys within your grid cell between June-Sept
  - One formal survey includes a bumble bee survey and a habitat survey, each following standardized protocol we have laid out. The minimum requirement is 2 formal surveys, but more surveys are welcomed!
4. Submit your data online using our website and Bumble Bee Watch

**What you will *need* to participate:**

1. A curiosity for insects and flowers
2. Transportation to your grid cell (or choose an area in which you live or work)
3. A camera or smartphone to take high quality pictures
4. Access to a computer or smart phone where you can upload photos to [Bumble Bee Watch](#) and track your progress

**Items that are *helpful* to participate:**

1. An insect net and vials (glass jars from home work well)
2. Basic knowledge of wildflower identification and where to find them
3. Local plant identification field guides
4. Bumble bee field guides ([Bumble Bees of North America](#))

For a list of workshop events, online training material, purchasing links and more, visit:  
[www.MOBumbleBeeAtlas.org](http://www.MOBumbleBeeAtlas.org)

# Bumble Bee Biology

## Life Cycle

Bumble bees are social insects that live in colonies like honey bees, although the colonies are much smaller (50-500 members, compared with over 10,000) and their life cycle is different. Honey bee colonies are perennial, with the colony surviving the winter by consuming stored honey reserves and the queen living several years. In contrast, bumble bee colonies are annual, with only the newly produced queens living through the winter.

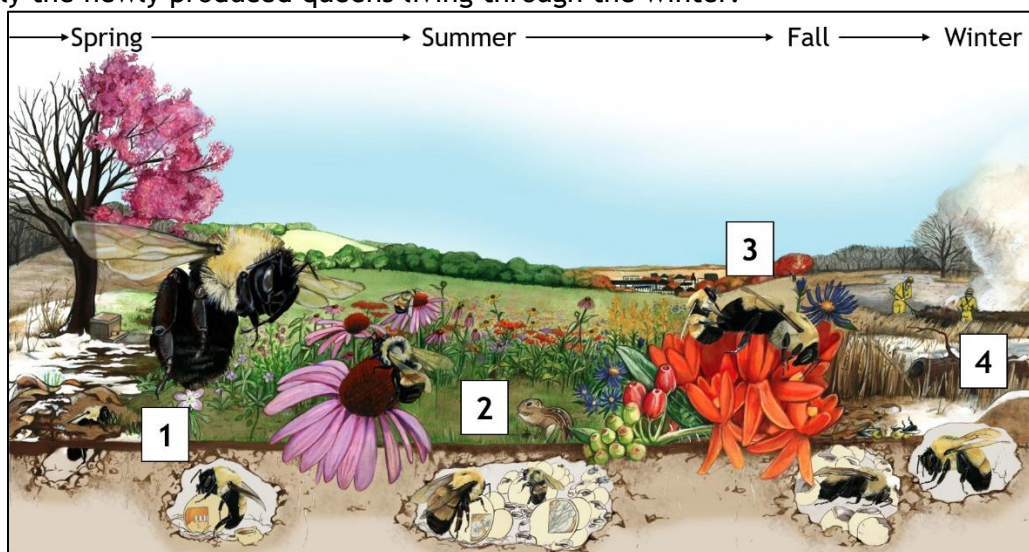


Illustration: Alice Lukas

1. The queens emerge from hibernation in the early spring and immediately start foraging for pollen and nectar and begin the search for a nest site. Nests are often located underground in abandoned rodent nests, or above the ground in tufts of grass, old bird nests, or cavities in dead trees or under rock piles. After the queen finds a nest site, she constructs waxen pots and begins the process of provisioning these with pollen mixed with nectar on which she lays her eggs. Once hatched, the larvae develop into adults in 4-5 weeks, during which time the queen is busy gathering pollen and incubating the developing larvae.
2. The newly emerged adults become the colony's worker force to gather pollen and nectar. The queen now stays in the nest, where her sole responsibility is to lay eggs and rear offspring. At some point, depending on the species and habitat conditions, the colony switches from producing workers to rearing reproductive members of the colony, the new queens and the males. As soon as males reach adulthood, they leave the colony in search of a mate, and usually do not return. New queens remain with the nest until the season is over.
3. Mating occurs when the new queens emerge from the nest, after which the males die off. While the new queen forages to build up energy reserves in preparation for winter, the rest of the colony also dies off, including workers and the foundress queen. At that time, the new queens leave the nest in search of an overwintering site.
4. When the new queen finds her overwintering site, she will dig down a few centimeters, form an oval cavity, and settle in until the following spring. Bumble bees have been observed burrowing in northern-sloped areas under trees and leaf litter, as well as in areas of bare earth or rotten wood.

## Foraging

In general, bumble bees forage on a diverse group of plants, though individual species preferences in plants vary due to differences in tongue length. Some bumble bees have long tongues and preferentially forage on plants with longer corolla tubes, such as penstemon, where the nectar is located deep in the flower. Species with short tongues forage on flowers with an open structure, such as sunflower and coneflower, because the bumble bees are able to obtain nectar and pollen more easily.

Additionally, short-tongued bumble bees will engage in “nectar-robbing” from flowers with a long corolla tube. Sitting on the outside of the flower, the bee will bite holes at the base of the corolla tube and drink nectar by inserting her tongue. This practice is called nectar-robbing because the bee does not touch the reproductive parts of the plant (male anthers or female stigma) when accessing the nectar, thus taking the reward without contributing to the plant’s pollination needs.

## Flight Distance

Studies of flight distance show that different species of bumble bees vary in how far they forage from the nest, with estimates ranging from 275 m (900 ft) to 750 m (2,460 ft—nearly 1/2 mi.), considerably further than most other native bees. Body size and colony size are good predictors of flight distance of different species. There is also recent evidence that bumble bee foraging distances decrease with nearby high-quality foraging habitat. This agrees with optimal foraging theory, which suggests that bumble bees should seek to reduce their flight distances; longer flights require more energy expenditure, and thus increased time foraging for nectar, meaning fewer resources for offspring.

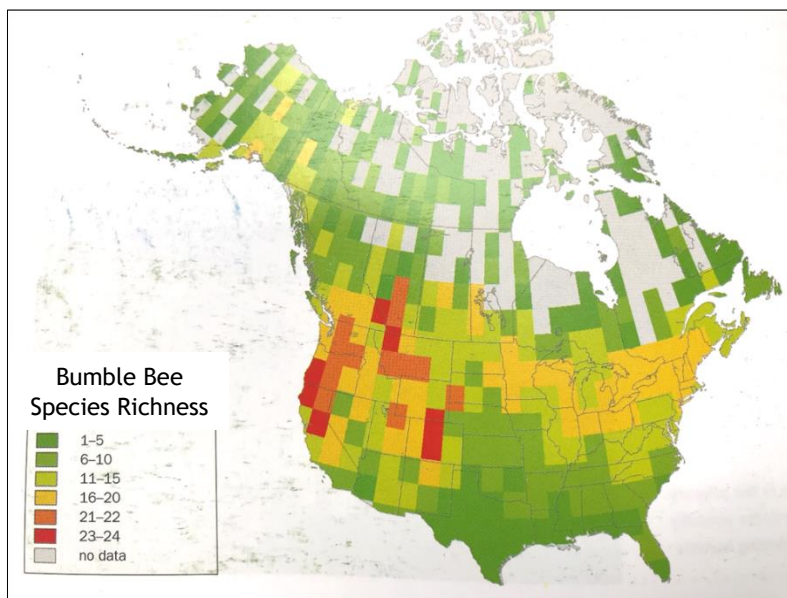
## Temperature Regulation

Compared to many wild bees, bumble bees are large in size and covered in dense fur. They also are able to thermoregulate, meaning they can control their body temperature by generating or releasing heat. This ability to thermoregulate is uncommon among insects and allows bumble bees to fly at colder temperatures than most other bees. As such, bumble bees are able to thrive in northern temperate climates and high-elevation areas.

## Species Diversity

Approximately 265 species of bumble bees exist in the world, and they are most diverse in temperate regions. In North America, species diversity is highest in the western mountainous and coastal regions, with about 24 species. In Missouri, it is understood there are about 13 different species.

Illustration: *An Identification Guide to Bumble Bees of North America*, Williams et al. 2014



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# Project Design

To design the Atlas, we first divided Missouri into 75 grid cells; the majority of which are 67 km by 67 km (42 mi by 42 mi). Next, we prioritized sampling locations throughout the region based upon the region's historic bumble bee data, areas with at-risk species, areas that are relatively under-surveyed, and areas with ecologically rich habitats. Priority grids may change from year to year based on the effort of Atlas participants. A map of current priority grids is available on the Atlas website ([www.MOBumbleBeeAtlas.org/adopt](http://www.MOBumbleBeeAtlas.org/adopt)).

Standardized protocol were put in place to keep sampling efforts and data collection consistent, and then community scientists were invited to join this bumble bee conservation project. Community scientists sign up to participate by "Adopting a Grid Cell," meaning they will take on responsibility to survey one or more grid cells of their choice at least twice each year. Grid cells can be adopted and surveyed by an individual or a group of individuals. Community scientists are encouraged to adopt priority grid cells, as these are the project's focal areas.

A goal of the Atlas is to better understand bumble bee distributions and needs outside of urban and suburban areas. Community science projects are typically very good at collecting data within larger cities because there are more people contributing. To ensure the Atlas collects data outside of the state's major cities, we limit the number of people who can adopt the same grid cell to 5 individuals.

Surveys are carried out during the region's peak bumble bee season, June-September. Participants can conduct surveys anywhere within their grid cell, on any date, and at any time during the survey window. Ideal survey conditions are provided in this document and in training workshops to assist participants with choosing the best survey date and location. Surveys must be conducted in public-access areas or in areas where participants are permitted to enter.

After surveys are conducted, community scientists will upload data and photographs to BumbleBeeWatch.org. All submitted observations will be verified by experts at the end of each survey season and a summary of findings will be posted on the Atlas website.

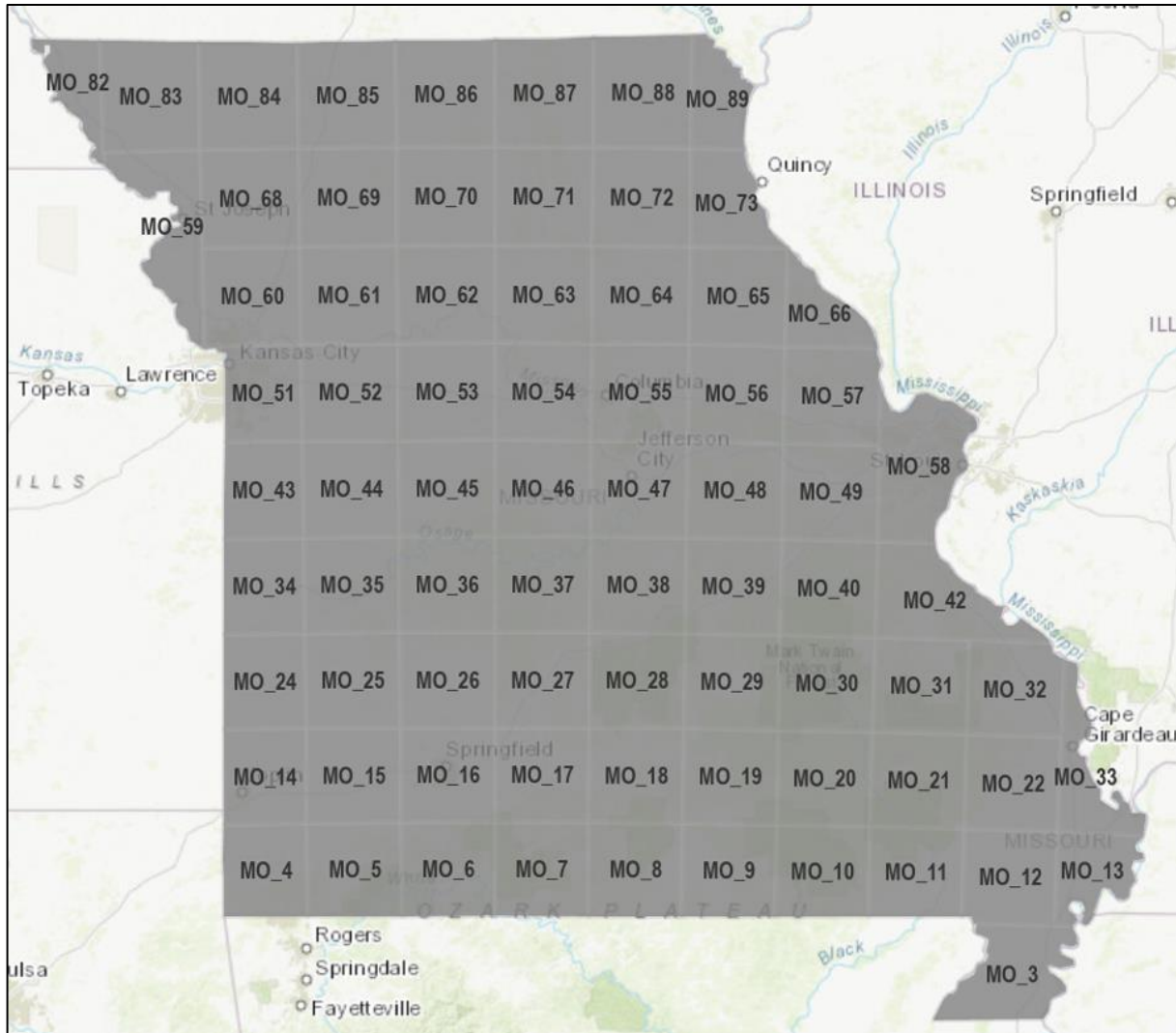
The data collected during the Missouri Bumble Bee Atlas will assist natural resource professionals, land and area managers, and policy-makers alike refine current bumble bee conservation practices using evidence-based recommendations.

**New Volunteers:** We encourage you to adopt a priority grid cell to help meet the project's objective.

**Returning Volunteers:** You do not need to re-adopt your grid cell.

**If you cannot adopt a grid cell but still want to participate,** we encourage you to download the Bumble Bee Watch app ([Apple](#) or [Android](#) or [website](#)) and submit your observations.

Visit [MOBumbleBeeAtlas.org/adopt](http://MOBumbleBeeAtlas.org/adopt) for a map of current grid adoption.



As individuals sign up for the project, their chosen grid cell will be shaded on the interactive map. Only 5 individuals may adopt the same grid cell.

To adopt a grid cell and view a current map of grid cells, visit the Atlas website: [mobumblebeeatlas.org/adopt](http://mobumblebeeatlas.org/adopt).

## NEW! Survey Focus for 2023 and Beyond

When we began the Atlas in 2020, our goal was to conduct surveys across the entire state to learn more about species distribution, floral and habitat associations, and fill in existing data gaps. Thanks to help from so many of you, we have accomplished that statewide goal, documented nearly 4,000 bumble bees and conducted over 450 surveys—Thank You!

We are now ready to shift into the next phase of the Atlas and really focus our efforts on understanding Missouri's species of conservation concern. These include the yellow bumble bee (*B. fervidus*), the Southern Plains bumble bee (*B. fraternus*), the American bumble bee (*B. pensylvanicus*), and the half-black bumble bee (*B. vagans*). To help track these populations, the Xerces Society has developed target zones for each of these species (see map on page 11). Target zones represent areas where each of these at-risk species are most likely to occur, calculated using data collected from 2020-2022 by MO Bumble Bee Atlas volunteers.

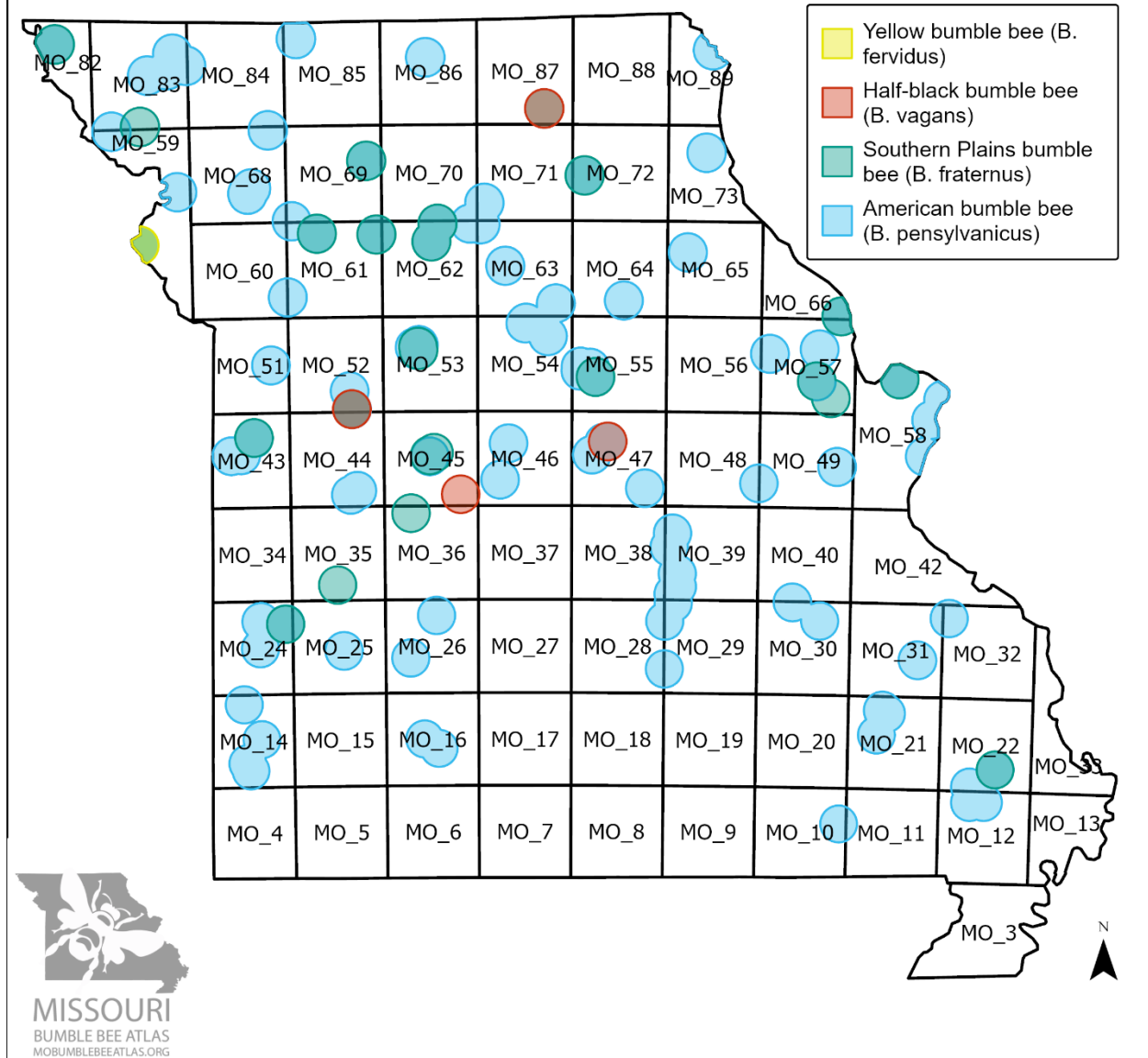
**What is changing?** During the months of June and September the Atlas will run as usual, but during July and August we will focus our survey effort to be within target zones. Target zones exist in nearly all grid cells, and you're welcome to survey any of them.

**Do I need to adopt a target zone?** No! As long as you have adopted a grid cell, you are welcome to survey within any target zone.

**Can I conduct surveys outside of a target zone?** Yes! We encourage you to conduct surveys anywhere within your grid cell in both June and September, but survey within target zones in July and August. Splitting the months allows us to increase our chances of detecting at-risk species during peak bumble bee activity (July-August), while still allowing for discoveries and new species locations to be recorded during the tail ends of the season (June, September). You do not need to conduct surveys within target zones if it presents as a barrier, this is just our new goal for the Atlas, traditional surveys within your grid cell are still valuable.

**What is the survey requirement?** To participate in this initiative, our ask is still that you complete at least two bumble bee surveys anytime between June-September. To help you identify survey areas within the target zones in your grid cell, a [google map of target zones for Missouri](#) has been made available on the Atlas website. As with standard Bumble Bee Atlas surveys, surveys in target zones may be completed (1) at two different survey areas on the same day, (2) at the same survey area on different days, or (3) at two different survey areas on different days. You may notice that some grid cells feature target zones for more than one species — if you choose to survey in two different areas, your survey areas can be in the same target zone, in different target zones for the same species, or in different target zones for different species.

## Target Zones for At-risk Species



Target Zones for the yellow bumble bee (*B. fervidus*), the half-black bumble bee (*B. vagans*), the Southern Plains bumble bee (*B. fraterus*) and the American bumble bee (*B. pensylvanicus*). Most grid cells feature at least one target zone.

## Tracking Your Efforts

Community scientists are the backbone of the Missouri Bumble Bee Atlas, so thank you for participating! We are thrilled to have you on board, and would not be able to carry out this important conservation work without your help. We are working hard behind the scenes to make this project successful by providing you with the necessary resources, but we also want to know

all about your efforts: What does it really take to gather this information? What amazing experiences do you encounter traveling throughout the state capturing and identifying bumble bees?

To do this, we ask that you track your survey efforts and share them with us when you submit your data. It's pretty simple, we just ask for an estimate of the time it took to conduct a survey (including travel), and how many miles you traveled to get there. More detail on this is explained under *Step 5: Submit Your Data*.

You are going to come across some amazing sights and experiences as you travel throughout the state conducting bumble bee surveys and we would love to hear your stories and see your photos!



Join the other Atlas volunteers in our [Facebook group](https://www.facebook.com/groups/mobumblebees) that is set up for people to interact, share photos or experiences, and ask questions.

<https://www.facebook.com/groups/mobumblebees> (Missouri volunteers)

<https://www.facebook.com/groups/bbatlas> (region-wide group of volunteers)



Follow us on Instagram [@bumblebeeatlas](https://www.instagram.com/bumblebeeatlas/) to stay up to date with the project and use [#BBAtlas](https://www.instagram.com/bumblebeeatlas/) to share your photos with us!

<https://www.instagram.com/bumblebeeatlas/>



Follow us on Twitter [@bumblebeeatlas](https://www.twitter.com/bumblebeeatlas/) to stay up to date with the project and use [#BBAtlas](https://www.twitter.com/bumblebeeatlas/) to share your photos with us!

<https://www.twitter.com/bumblebeeatlas/>

## Atlas Survey Blitz

A survey blitz are targeted survey efforts that take place once per month throughout the season. Blitz events are a joint effort between all Atlas projects, so there will be bumble bee watchers surveying in Missouri, Kansas, Nebraska, South Dakota, North Dakota, Minnesota, California, Oregon, Idaho and Washington! A fantastic snapshot of bumble bees will be gathered as a result of participants surveying simultaneously in all states. We encourage you to participate in one (or all!) of the blitz events, if possible.

To find Blitz dates, visit [www.MOBumbleBeeAtlas.org/events](http://www.MOBumbleBeeAtlas.org/events)

# Endangered Species

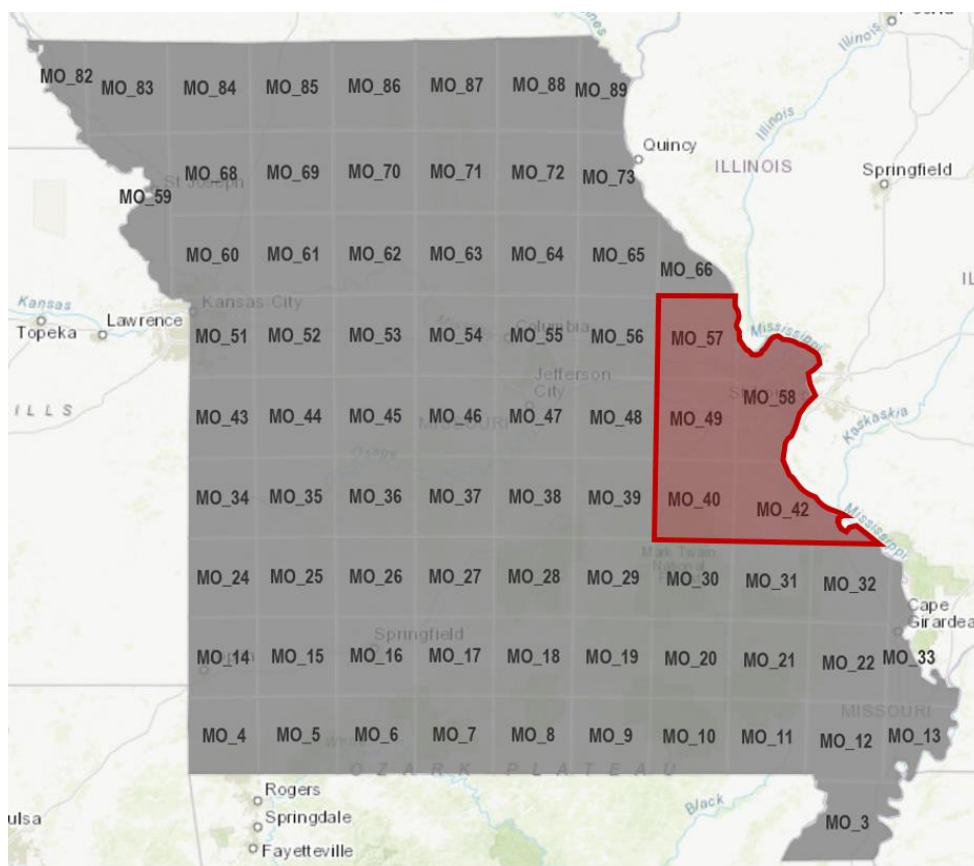
The Rusty Patch Bumble Bee (*Bombus affinis*) is a federally protected bee under the U.S. Endangered Species Act.

The U.S. Fish and Wildlife Service (USFWS) maintains an [online map](#) that identifies areas where the Rusty Patch Bumble Bee is likely to be present. Part of the Missouri falls within the historic range, see the red area below, which is currently considered unoccupied by the species. It is very unlikely you will observe the Rusty patch bumble bee though we urge you to exercise caution when surveying these particular grid cells and know how to recognize the Rusty Patch Bumble Bee should you observe one. The USFWS does not recommend that folks obtain scientific recovery [section 10(a)1(A)] permits to survey bumble bees in unoccupied areas.

In the unlikely event that you observe a Rusty Patch Bumble Bee, stop activity and notify the USFWS MO Ecological Services Office: <https://www.fws.gov/midwest/ColumbiaES/>

Identification Guide: <https://www.fws.gov/midwest/endangered/insects/rpbb/rpbbid.html>

For additional information and recommendations visit the [USFWS \*B. affinis\* map webpage](#).



The grid cells highlighted in red (MO\_40, MO\_42, MO\_49, MO\_57 and MO\_58) are within the historical range of the Rusty Patch Bumble Bee. While these areas are currently considered unoccupied, we urge you to exercise caution when surveying these particular grid cells and know how to recognize the Rusty Patch Bumble Bee should you observe one.

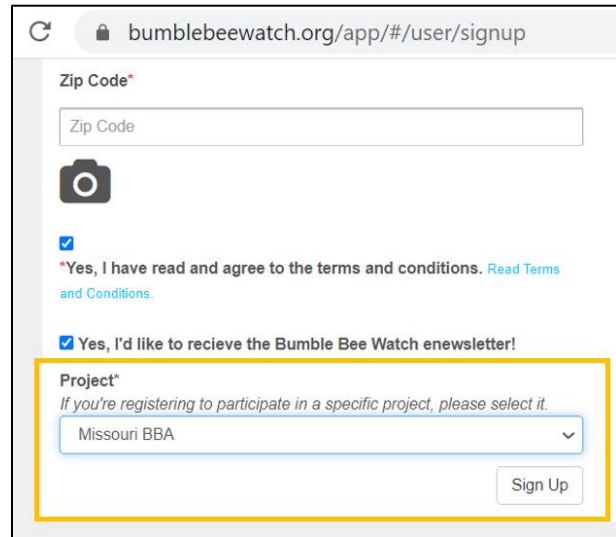
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# How to Participate

## Step 1: Register

The first thing you will need is a Bumble Bee Watch account. You can easily set up an account online in about 5 minutes.

1. If you do not have a Bumble Bee Watch account, please [create an account](#), and be sure to select **Missouri BBA** as your project. This will help us keep track of user participation and data for the project.
2. If you already have a Bumble Bee Watch account, all you need to do is register your account with the Missouri Bumble Bee Atlas project. To do this simple step, start by logging in ([www.BumbleBeeWatch.org](http://www.BumbleBeeWatch.org)), click on your username at the top right of the page, and this will bring you to your profile. In the left corner above your photo, click “edit”. Scroll towards the bottom to the last drop-down box labeled as “Project” and select **Missouri BBA**, and then click save. You are all set!



The screenshot shows the Bumble Bee Watch signup page at [bumblebeewatch.org/app/#/user/signup](http://bumblebeewatch.org/app/#/user/signup). The form includes a 'Zip Code\*' field, a camera icon for a profile picture, and two checked checkboxes: 'Yes, I have read and agree to the terms and conditions. Read Terms and Conditions.' and 'Yes, I'd like to receive the Bumble Bee Watch newsletter!'. Below these is a 'Project\*' dropdown menu with 'Missouri BBA' selected. A yellow box highlights the 'Project\*' section and the 'Sign Up' button.

## Step 2: Adopt a Grid Cell

After you have established a Bumble Bee Watch account, use the same email address to “adopt a grid cell.” Adopting a grid cell (survey area) means that you have agreed to be an integral part of this project, and plan to survey your grid cell for bumble bees using our standardized protocols. At a minimum, you will need to complete two surveys during peak bumble bee season, June-September, to observe bumble bees and the surrounding habitat. To meet this minimum requirement, you may visit two different locations within your grid cell on the same day, or revisit the same location on two different days.

When choosing a grid cell to adopt, consider the travel involved, and keep local and federal community health guidelines in mind. While our goal is to spread out and survey the entire state, your health and safety is of top priority.

**New Volunteers:** We encourage you to adopt a priority grid cell to help meet the project’s objective.

**Returning Volunteers:** You do not need to re-adopt your grid cell. If your grid cell is now gray, we encourage you to survey in a blue cell instead.

To adopt a grid cell, visit the Atlas website to use the interactive project map. This allows you to see which grid cells are still available for adoption. Find the map and adoption instructions at: <https://www.mobumblebeeatlas.org/adopt.html>.

If you cannot adopt a grid cell but still want to participate, we encourage you to use the Bumble Bee Watch app ([Apple](#) or [Android](#)) or [website](#) and submit your observations.

## Step 3: Get Familiar With Project Protocols

The best way to become acquainted with project protocols is by attending a workshop or using our [online materials](#). Much of the information given in a workshop is included in this document, but attending a live or in-person event will allow you to connect with other participants, ask questions of project coordinators, learn survey techniques, and receive materials to further your success in the project.

**Workshops:** These events provide knowledge on bumble bee biology, behavior, ecology, threats, conservation, as well as instructions for how to identify various bumble bee species, how to conduct a survey, photograph and handle bees, and how to submit your data. Workshops are held virtually or in-person, depending on health measures, and typically last 4-6 hours, but may be split between two days if online.

**Field Days:** Field days provide hands-on experience alongside one of our experts, space to ask questions and interact with other participants. Typically, field days include instruction on swinging nets, transferring bees from a net to a vial, photographing bees, and identifying bees. These two hour events are held in-person, if safe to do so, and participants must register in advance as space is limited to maintain an effective ratio of teacher to student.

If you are unable to attend a live event in-person or virtually, the workshops will be recorded and available on in the [Online Training Portal](#). We have worked hard to ensure that our online materials provide you with the knowledge, skills, and confidence to conduct your own bumble bee surveys.

**For Workshops and Field Day dates, please visit:**

<https://www.mobumblebeeatlas.org/events>

## Step 4: Conduct a Survey

### *Plan your visit*

Take some time to investigate your adopted grid cell. The grid cells are large with varied habitat, terrain and land ownership, having a plan will increase your efficiency when traveling and surveying. You can survey anywhere in the grid cell as long as the area is public or you have permission. We suggest you start with the project map, or [Google Maps](#) (or similar) with aerial photography to flag potential sites and plan travel routes. Getting familiar with your sites using maps will also help you when it comes time to submit your data; accurate locations are

important. Many areas in the state are rural, with limited travel routes and cellular service. As such, bring resources with you to navigate like printed maps.

When surveying, please follow all rules, regulations and posted signs; respect private property and take all necessary safety precautions. Inform a friend or family member of your survey plan, wear bright colors for roadside surveys, and use the car placard in the back of this handbook.

It is possible that when you arrive at a pre-selected site, you will find that conditions may not be optimal for a survey. For example, the wind may be too strong, rain may have started, or the open field has been developed. We encourage folks to be flexible, and opportunistic, but to stay within their assigned grid cell.

For the purpose of planning your trip, we've provided a few resources to help. (Note: we do not guarantee the veracity of any of these resources, we simply provide them as tools to help plan your trip. To our knowledge, these are some of the best and most reliable mapping resources available, though alternatives certainly exist.)

### Where to Survey:

- Public land or public right-of-ways (roadsides)
- Your own acreage, a friend or relative's that you have explicit permission to survey
- Missouri Dept. of Conservation Areas
  - Complete Volunteer Agreement (end of handbook or access internet-version pdf on the Atlas website) and return to the appropriate Area Manager before surveying. Find Area Manager by visiting: <https://mdc.mo.gov/contact-engage/regional-offices>
- Missouri Prairie Foundation Properties
  - Please note: To survey on MPC lands, you must contact the foundation prior to ask permission (<https://moprairie.org/contact-us/>)
- US Forest Service lands (like Mark Twain National Forest)- download Avenza Maps app to access the Motor Vehicle Use Map (MVUM) to stay on legal roads, you are free to walk anywhere. **4WD is needed for most USFS roads.**
- MRAP All Access Sites, [mdc.mo.gov/mrap](https://mdc.mo.gov/mrap)

### Where NOT to Survey:

*\*You may not capture bumble bees in the following locations without a permit, please only take photographs to submit as incidental observations if you visit one of these areas.*

- **National Monuments**
- **National Wildlife Refuges**
- **Waterfowl Production Areas (WPAs)**

When selecting a specific survey area, these tools may be of use:

*\*Note: We do not guarantee the veracity of any of these resources, we simply provide them as tools to help plan your trip. To our knowledge, these are some of the best and most reliable mapping resources available, though alternatives certainly exist.*

- [Google Maps with Overlaid Grid](#) (you will be able to find the grid number of your adopted cell to help you plan a trip).
- Missouri Conservation Areas: <https://nature.mdc.mo.gov/discover-nature/places>
- Missouri Hiking Trails: <https://www.hikingproject.com/directory/8008930/missouri>
- USGS Topo Maps; available from many outdoor retailers and as downloads.

#### What to Bring:

- Paper Maps
- Camera (ideally with macro capacity) and/or smart phone
- Extra batteries and/or charger
- Insect net
- Data sheets and pencil/pen
- Small cooler with crushed ice
- Vials or insect viewing jar
- Field guides (plant and bumble bee)
- Timer
- GPS Unit or similar Smartphone App
- Hat/Sunscreen
- Drinking water
- Field notebook

Check Road Conditions: <http://traveler.modot.org/map/index.html>

### Conduct Your Survey

The minimum participation requirement is for each grid adoptee to complete two formal surveys anytime between June and September. A complete formal survey is made of two components, which include (1) a bumble bee survey and (2) a habitat assessment. There are two types of bumble bee surveys you may conduct within your grid cell to fulfill the minimum participation requirement: point surveys and roadside surveys.

**Point Surveys:** Select an area that is 1 hectare in size, conduct one 45 person-minute bumble bee survey and one habitat assessment.

**Roadside Surveys:** Drive or bike along a 10-mile stretch of road, stop at five points along that stretch at least ½ mile apart. Conduct one 15 person-minute bumble bee survey and one habitat assessment at each stop. You will have conducted 5 total surveys at the end which will be submitted separately to Bumble Bee Watch.

You may complete the minimum requirement by conducting two point or two roadside surveys, or a combination of the two. These surveys may be completed on the same day in different areas or in the same area on different days. There is no maximum number of surveys, welcome community scientists to complete as many formal surveys as they wish.

See [Survey Methods](#) for further details.

## Step 5: Submit Your Data

All data will be submitted to the community science website: [Bumble Bee Watch](#).

1. Keep track of the time you spend on this part, you will enter this as volunteer hours into Bumble Bee Watch.

2. Curate your photos. Decide which photos you are going to upload for each bee entered on your data sheet. Make sure they are clear and the lighting is good. You can submit up to 5 photos per bee, so choose the clearest, best lit photos if you took more than that. If you are unsure of the plant you caught the bee on and have a photo of that plant, upload that plant as one of your 5 photos.
3. Login to [Bumble Bee Watch](#).
4. Choose *Record a Sighting* → *Bumble Bee Sighting* (from the gray options bar)
5. Under *Project* select Missouri BBA. This must be selected in order to enter your habitat data.

**Bumble Bee Sighting**  
This form is for submitting a bumble bee sighting  
\*Required fields.

**Project\***  
Please indicate if this sighting is part of a project. Choose Bumble Bee Watch if you aren't sure.

Missouri BBA

6. Enter your location information.
  - a. Above the map, search for the city nearest your survey area and then navigate directly on the map to find the precise area. Once you click on your survey area on the map, the *latitude* and *longitude* fields will automatically populate.
  - b. Give your survey area a *Site Name* of your choosing.
  - c. Enter the accuracy; meaning how close to your actual survey location is the selected map point?

**Location**  
To pinpoint your sighting location, use the map, or search for an address below. You can place a pin, or change its location by clicking on the map. Coordinates will appear automatically.

Enter a location

**Select a Previous Location**  
Your Locations  
Search for Previous Location  
Type in a previously used Site Name to generate coordinates from recently submitted location.

**Site name:\***  
Enter a location

Enter a site name and this location information will be saved as a Previous Location.

**Latitude:\***  
Latitude

**Longitude:\***  
Longitude

**Province /State:\***

**How accurate is this location (in meters):\***

**Date of Sighting:\***

- Use your data sheet to enter details about the survey you conducted including the survey type, collection method, number of observers, time, weather, and weather notes.

<b>Survey Type*</b> <input type="text"/>		<b>Approximately how many hectares was your survey area?*</b> <i>1 ha is approximately the length of a football field squared or the area inside a standard (400m) track.</i> <input type="text"/>	
<b>Collection Method*</b> <input type="text"/>			
<b>Number of Surveyors*</b> <input type="text"/>	<b>Survey Start Time*</b> <input type="text"/>	<b>Survey End Time*</b> <input type="text"/>	<b>Survey Minutes*</b> <i>Including all surveyors, what is the total number of person-minutes for your survey?</i> <input type="text"/>
<b>Temperature*</b> <input type="text"/>	<b>Cloud Cover*</b> <input type="text"/>	<b>Wind Speed*:</b> <input type="text"/>	<b>Weather Notes</b> <input type="text"/>

- Use your habitat data sheet to select the dominant habitat type of your survey area, and the top three habitat types that *surrounded* your survey area. If a single habitat type surrounded your survey area, you only need to complete the first dropdown menu for surrounding area. Then select the percentage of flowering resources in your survey area, and check the boxes of any habitat features that were in or near your survey area.

<b>Habitat type of SURVEY AREA*</b> Please choose one. You can add more details in the Notes if needed. <input type="text"/>		<b>Habitat type of SURROUNDING AREA*</b> Please choose the most abundant habitat type of the surrounding area. <input type="text"/> If there is more than one surrounding habitat type, please select the second most abundant habitat type of the surrounding area. <input type="text"/>	
<b>How much of the survey area has flowering resources available?*</b> <input type="text"/>	<b>Which of the following features do you see in or near the survey area?</b> <input type="checkbox"/> Bunch grasses <input type="checkbox"/> Rodent holes/Tunnels <input type="checkbox"/> Brush piles <input type="checkbox"/> Loose bare soil <input type="checkbox"/> Leaf litter <input type="checkbox"/> Pine needle duff <input type="checkbox"/> Rock piles <input type="checkbox"/> Mulch <input type="checkbox"/> None of the above		

- Use the drop down menu to select *Yes*, *No*, or *Suspect* for each of the eight practices.

**I see evidence of, or know that the following have occurred in or near the survey site(s):**  
*If you said yes or suspect to Fire or Honey Bees, please include more details in the notes below (type of fire, number of honey bee hives observed and how close to the survey site).*

<b>Mowing</b> <input type="text"/>	<b>Livestock Grazing</b> <input type="text"/>	<b>Native Grazing</b> <input type="text"/>	<b>Agriculture</b> <input type="text"/>
<b>Herbicide Use</b> <input type="text"/>	<b>Fire</b> <input type="text"/>	<b>Honey Bees</b> <input type="text"/>	

10. Enter your blooming plants. Start by using the dropdown menu to select how many different species were in bloom that were *not* visited by a bumble bee. The website will automatically provide you with the appropriate amount of spaces to enter your plant information (up to 15 plants).

How many different species of flower (including trees and shrubs) were in bloom in the survey area (that were not visited by bumble bees)?

3-5

Plant 1 - Common Name	Plant 2 - Common Name	Plant 3 - Common Name	Plant 4 - Common Name
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Plant 1 - Scientific Name <i>If you know the specific name, and/or the genus, please include it here.</i>	Plant 2 - Scientific Name <i>If you know the specific name, and/or the genus, please include it here.</i>	Plant 3 - Scientific Name <i>If you know the specific name, and/or the genus, please include it here.</i>	Plant 4 - Scientific Name <i>If you know the specific name, and/or the genus, please include it here.</i>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

11. Enter the total amount of time you spent on this effort. If you conducted multiple surveys on the same day, please only enter this information on one of your submissions.

Was this survey a volunteer effort? Yes	What time did you start volunteering on the day of your survey (include planning and driving time)? --:--	What time did you stop volunteering on the day of your survey (include planning and driving time)? --:--
How many hours did you spend organizing and entering your data (what you're doing now)? Include all time spent organizing and entering data for this survey.	How many miles did you drive to conduct your survey (roundtrip)? <input type="text"/>	By typing your name below, you agree that all information provided above is correct and accurate to the best of your knowledge. <input type="text"/>

12. Hit *Next* in the bottom right and you will be taken to *Step 2* and see a green box appear in the upper right stating your checklist has been saved. If you are not taken to the next screen, scroll back up and look for any red text, chances are you forgot to complete a required question.

**Bumble Bee Watch** Welcome, klamke Batch Verify Sightings

Home About Record a Sighting Bumble Bee Species Map Gallery Explore Data Resources Sign Up

○ step 1: location ● step 2: record(s)

Images: Add up to 3 photos

Drop photos here to upload

Choose Files No file chosen

Species: sp. / Bumble bee Identification Tool

Floral Host: Add floral host...

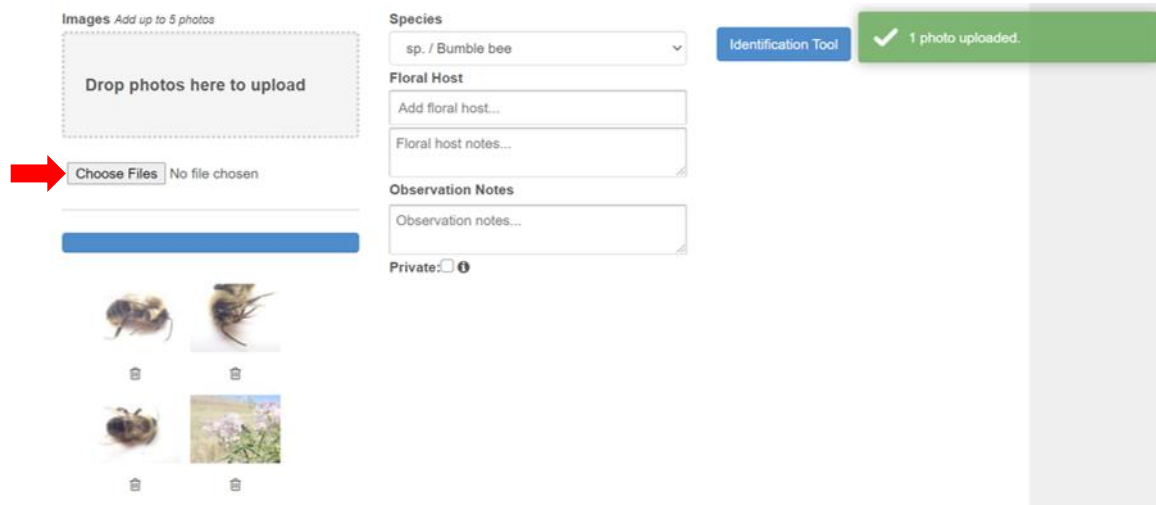
Floral host notes...

Observation Notes: Observation notes...

Private: ☐

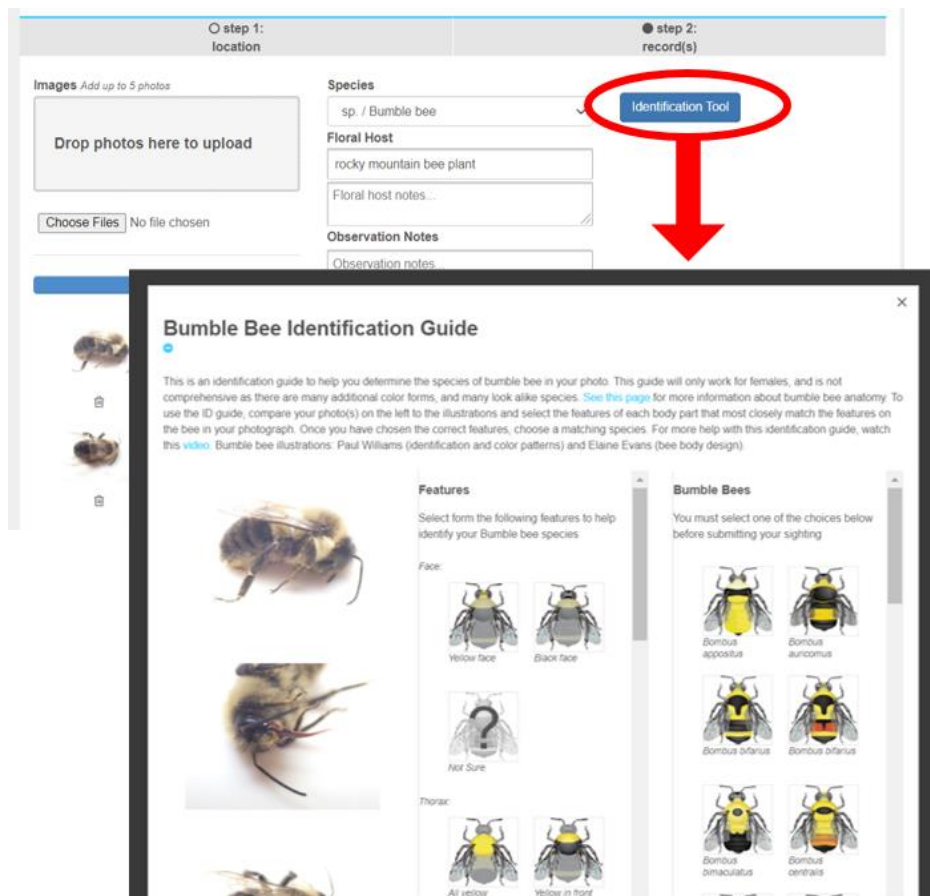
Checklist has been saved.

13. Step 2 is where you will begin entering your bumble bee photos and the flowers you observed them on. You can upload up to 5 photos per bee, one of which can be the flower you observed the bee on. A green box will appear confirming your uploads.



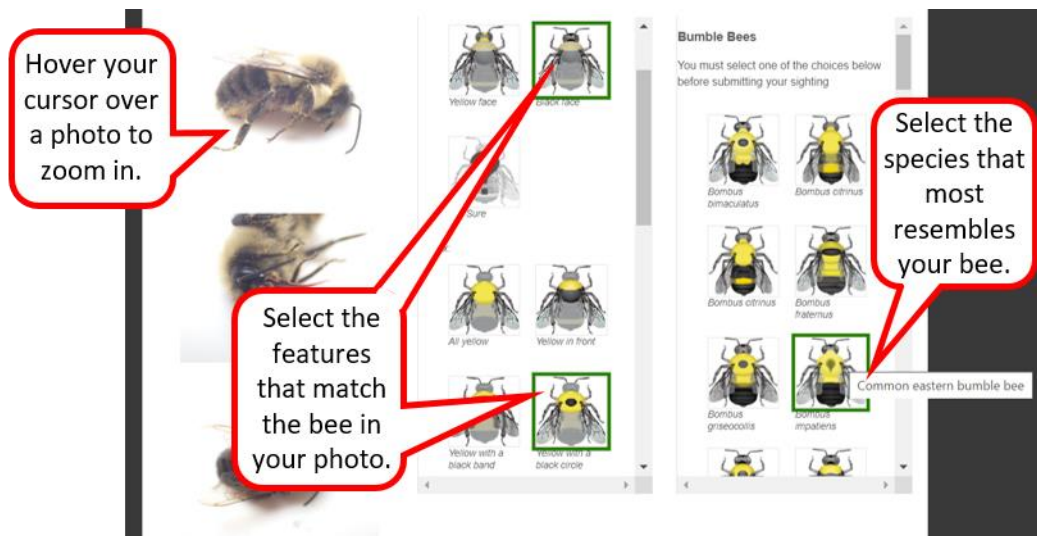
The screenshot shows the 'Step 2' upload interface. On the left, there's a 'Drop photos here to upload' box with a 'Choose Files' button (highlighted by a red arrow) and a 'No file chosen' status. Below this are four photo thumbnails. On the right, there's a form with fields for 'Species' (set to 'sp. / Bumble bee'), 'Floral Host' (with 'Add floral host...' and 'Floral host notes...' sub-fields), and 'Observation Notes' (with 'Observation notes...' sub-field). A green notification box at the top right says '1 photo uploaded.' A blue 'Identification Tool' button is also visible.

14. After uploading your photos and entering the floral host, click *Identification Tool* if you need help figuring out which species you observed.



This block contains two screenshots. The top screenshot shows the 'Step 2' form with the 'Identification Tool' button circled in red and a red arrow pointing down to the bottom screenshot. The bottom screenshot is the 'Bumble Bee Identification Guide' modal. It includes a title, a disclaimer, and two main sections: 'Features' and 'Bumble Bees'. The 'Features' section asks the user to select from illustrations of bee faces (Yellow face, Black face, Not Sure) and thoraxes (All yellow, Yellow in front). The 'Bumble Bees' section shows a list of species with corresponding illustrations: *Bombus appositus*, *Bombus auricomus*, *Bombus bifarius*, *Bombus bifarius*, *Bombus bimaculatus*, and *Bombus centralis*.

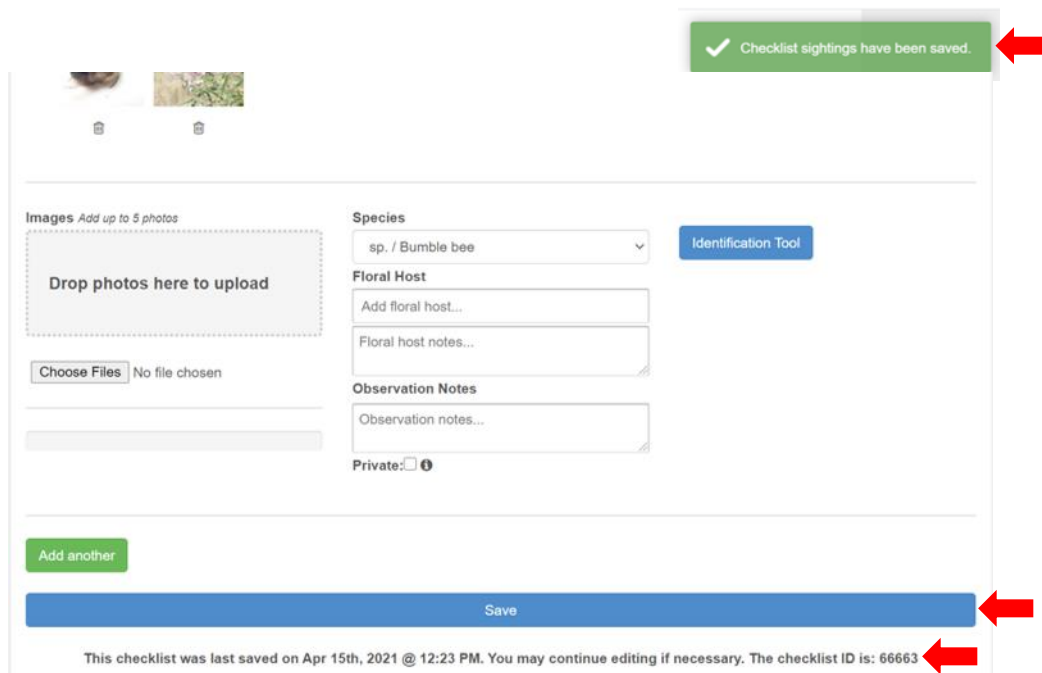
15. As you select features that match your images, the identification tool will narrow down the list of species you may have. When you click on a species, the tool will close and you will be brought back automatically to the submission page. If you are not confident in your identification after using the tool, you can leave the species dropdown box as *Sp. / Bumble Bee*, experts will verify everything.



16. After selecting an identification for your bee, double check you have entered the floral host and any notes. Then click **Add Another** in the bottom left if you have more bees to enter from this survey. This will produce a subsequent section to upload another bumble bee observation. Repeat this step until you have entered information and photos for each of the bees you captured.

The screenshot shows the survey submission form. On the left, there is a section for 'Images. Add up to 5 photos' with a 'Drop photos here to upload' area and a 'Choose Files' button. Below this, there are four small images of bees. On the right, there is a 'Species' dropdown menu set to 'impatiens / Common eastern bumble be', a 'Floral Host' text box set to 'rocky mountain bee plant', and 'Floral host notes...' and 'Observation notes...' text boxes. A 'Private' checkbox is also present. At the bottom left, there is a green 'Add another' button with a red arrow pointing to it.

17. After you have entered all of your bumble bee photos, click **Save** at the bottom. A green box will appear in the top corner and a timestamp will be appear beneath the Save button. If you see these two items, you may close the window.



The screenshot shows a web form for recording bumble bee sightings. At the top right, a green notification box states "✓ Checklist sightings have been saved." with a red arrow pointing to it. The form includes sections for "Images" (with a "Drop photos here to upload" area and a "Choose Files" button), "Species" (a dropdown menu set to "sp. / Bumble bee" and an "Identification Tool" button), "Floral Host" (with "Add floral host..." and "Floral host notes..." fields), and "Observation Notes" (with an "Observation notes..." field). A "Private" checkbox is also present. At the bottom, a large blue "Save" button is highlighted with a red arrow. Below the button, a message reads: "This checklist was last saved on Apr 15th, 2021 @ 12:23 PM. You may continue editing if necessary. The checklist ID is: 66663" with a red arrow pointing to it. An "Add another" button is located above the "Save" button.

18. Thank you! You will need to repeat this procedure for each individual survey.

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# Survey Methods

## Survey Timing and Conditions

Throughout Missouri, bumble bees may be active from March through October depending on environmental conditions and location, as well as particular species which vary in emergence times, population sizes, and length of active season. However, since the goal of the Atlas is to gain a better understanding of bumble bee distribution region wide, the survey season runs from June-September to align with the bee's peak active season.

During the survey season, selecting a particular survey day will require you to be opportunistic and flexible. Bumble bees prefer to forage on calm sunny days when the temperature is between 60°F and 90°F with winds under 15mph. Conditions much hotter, cooler, or windier will result in reduced bumble bee activity. Please also be aware of moisture levels; the wetter it is the less likely you are to encounter bumble bees. In the summer, temperatures may reach 60°F by 7am, but many of the flowers may still be wet with morning dew and thus will not be visited by bumble bees until the plants are drier. Thunderstorms are also common throughout the summer, please keep an eye on the radar and know that bees will not be active in the rain, despite temperature.

Ideal survey conditions: Any day between June-September, before 1pm, temp is 60-90°F, winds <15mph, no rain.

Video: [How to Conduct a Survey](#)

## Point Surveys

Point surveys are the standard type of formal survey. Point surveys take place in an area that is approximately 1 hectare (2.5 acres), nearly the size of two football fields. One complete point survey has two components: a bumble bee survey, and a habitat assessment. Bumble bee surveys occur first, and last for 45 person-minutes, meaning the duration of active search/netting time depends on the number of people participating. For example, if you are surveying alone you will actively search for and net bumble bees for 45 minutes (this time does not include transferring bees from the net to a vial), if there are 2 people you will actively search for and net bumble bees for 22.5 minutes, if 3 people you'll search for 15 minutes, and so on. After completing the bumble bee survey, you'll conduct a habitat assessment to gather information about the survey area.

Please make sure to plan your travel timing appropriately; consider the time it takes to travel to and from your survey site, to conduct the bumble bee survey, to handle, photograph, and record bumble bees, and to conduct the habitat assessment. Please respect private property, follow posted signs and regulations, and obtain permits or permission if necessary.

### Phase 1: Plan Your Survey Area

Surveys should cover approximately one hectare or 2.5 acres. The area does not have to be of a particular shape; it could be a round field or a long narrow stretch of land. Mark the center of your location on a map (either paper or smartphone app) to record the latitude and longitude in decimal degrees. **This will be very important later for data submission, please document the location of each survey accurately.** For help with recording your locality in decimal degrees, see the following website: [www.mobumblebeeatlas.org/trainingpacket](http://www.mobumblebeeatlas.org/trainingpacket)

### Phase 2: Fill Out Bumble Bee Data Sheet

Before you begin looking for bumble bees, fill out the top of the data sheet. This will include date, time, surveyors, location, and basic weather information (approximate temperature, cloud cover, wind, etc.). For suggested weather apps and an interactive Google Map of the Atlas grid cells visit: <https://www.mobumblebeeatlas.org/resources.html>

### Phase 3: Begin Your Bumble Bee Survey

Record the start time of your survey, start the timer and begin searching for bumble bees. While looking for bumble bees you should wander through the entire survey area, focusing on plants that are flowering. Focus on *ALL* flowering plants, not just those that are most abundant or showy, because different bumble bees are sometimes attracted to different flowers.

**Pro Tip:** Pay attention to where your shadow falls on the flowers to avoid spooking the bee.

When you find a bumble bee, capture it in a vial (either directly or using an insect net), note the plant species that it was visiting, and place the vial in a chilled cooler. If you're unsure of the plant, take a few photographs of the flower head, stem and leaves for later identification.

The smartphone app *iNaturalist* is a great identification resource for wildflowers and has the capability to save photos and locations of all your observations.

**Pro Tip:** Assign a number to each vial and write the same number on your data sheet to keep each bee connected to its flowering plant. Alternatively, place a petal of the flower into each vial to remind you which plant species that particular bee was visiting.

Continue in this fashion for 45 person-minutes (count only time searching for bumble bees) or until you have run out of vials. If you run out of vials, stop the timer and continue to Phase 4. Once Phase 4 is complete and your vials are free again, return to Phase 3 and finish out the time remaining on your survey. When finished, note the end time of your survey.

#### Phase 4: Photo Document Each Bumble Bee

When your 45-minute timer is up, the chilled bees will be slow enough that you can easily photograph them. If the bee is still moving too much, leave the vial on ice for 5-10 more minutes.

Photograph each bee one at a time using the grids on the data sheet as a background, ideally on a clipboard or cooler lid for a sturdy surface. Make sure your photos are well-lit and in focus. Using a camera with a macro lens setting (look for a flower icon) or a smartphone with a macro attachment lens works best. Clearly record which photos link to each bee on the data sheet, otherwise submitting data online will very hard and likely inaccurate. You can submit up to 5 photos per bee online.

If the bee is sluggish afterward, place it in the shade and allow it some time to return to ambient temperature.



Images: Xerces Society/Katie Lamke

**See the back of the Missouri Bumble Bee Atlas Identification Guide for a checklist of features that need to be photographed.** More info at: [mobumblebeeatlas.org/phototips](http://mobumblebeeatlas.org/phototips)

After photo documenting your bumble bees, or while they chill longer on ice, spend a few minutes filling out the Habitat Assessment Form. This form provides us with a snapshot of the present habitat and an idea of food and nesting resources available to bees in or near your survey area. Detailed instructions for completing this form are in the next section.

#### Phase 6: Check for Completeness

While still at your survey area, double check your data sheets to ensure that they are complete. It may be tempting to fill out some of this information for later, or to finish when you get home, but taking the time to do it while on site will reduce errors and increase the quality of the data you collect.

#### Phase 7: Submit Your Data

After completing your formal survey, please try to submit your data within one month. To submit data, log on to [BumbleBeeAtlas.org](http://BumbleBeeAtlas.org), navigate to the *Data* tab and click *Submit Data*. For help, refer to [Step 5: Submit Your Data](#) or click *Help* under the *Data* tab online.

## Roadside Surveys

Roadside surveys are an alternative method of surveying that are useful in places with little public land available. Roadside surveys take place along a 10-mile stretch of road within your grid cell and are carried out by car or bike. Along the 10 mile stretch, you will conduct five 15 person-minute surveys that are at least ½ mile apart and complete one habitat assessment at each site. You will catch, photograph, record, and release bees at one site before moving to the next; essentially conducting five “mini” point surveys.

Often times, these 15-minute surveys allow for easy participation because roadsides are readily accessible and do not require walking long distances or across uneven terrain. However, roadsides tend to host many nonnative plants and a goal of the Atlas is to understand how bumble bees are interacting with native plant communities.

Roadside surveys may be conducted when traveling to or from a point survey site (as to complete your 2-survey minimum in a single day), or on their own, but should take place within your adopted grid cell. Please be sure to respect private property, follow posted signs and regulations, and obtain permits or permission if necessary.

**Safety vests or bright colors are highly recommended for roadside surveys.**

### Phase 1: Plan Your Route

Within your adopted grid cell, select a stretch of road or trail that is at least 10 miles long. Ideally, the stretch will have several obvious open patches when looking at aerial photos or maps. To find a route, we suggest using the Google Map that displays the Atlas grids. This way you can save locations, create start and end points, and get directions. The map link can be found at: <https://www.mobumblebeeatlas.org/resources.html>.

If you are surveying on US Forest Service property (see page 13), download Avenza Maps apps to access the Motor Vehicle Use Map (MVUM). This map will show you which roads are open to the public. Avenza Maps app: <https://www.avenzamaps.com/maps/how-it-works.html>

### Phase 2: Begin Bumble Bee Survey

At the start of your selected route, pull over at the first patch of blooming flowers that you observe. Please park carefully, follow local regulations and be aware of any safety hazards. Before filling out the bumble bee data sheet, observe the flower patch—if you observe bee activity, begin the survey. If there is no bee activity, drive to the next patch of flowers.

Before starting your timer, fill out the top of the bumble bee data sheet (name, date, location, time, weather, etc.) and then start your 15-minute timer. While looking for bumble bees, you should wander from flower patch to flower patch along the roadside area. Focus on *ALL* flowering plants, not just those that are most abundant or showy, because different bumble bees are sometimes attracted to different flowers.

**Pro Tip:** Pay attention to where your shadow falls on the flowers to avoid spooking the bee.

When you find a bumble bee, capture it in a vial (either directly or using an insect net), note the plant species that it was visiting, and place the vial in a chilled cooler. If you are unsure of the plant, take a few photographs of the flower head, stem and leaves for later identification. The smartphone app *iNaturalist* is a great identification resource for wildflowers and has the capability to save photos and locations of all your observations.

**Pro Tip:** Assign a number to each vial and write the same number on your data sheet to keep each bee connected to its flowering plant. Alternatively, place a petal of the flower into each vial to remind you which plant species that particular bee was visiting.

### Phase 3: Photo Document Each Bumble Bee

After the first 15-minute survey, photograph and release all the chilled bees you collected at that site **before moving to the next survey**. If the bee is still moving too much, leave the vial on ice for 5-10 more minutes while you fill out the Habitat Assessment form for that site.

Please follow [Phase 4 of the Point Survey](#) for instructions on how to photo document your bees.

### Phase 4: Habitat Assessment

After photo documenting your bumble bees, fill out a Habitat Assessment form for each roadside stop. Be sure to carefully record which bumble bee data sheet matches each habitat form.

### Phase 5: Check for Completeness

While still at your survey area, double check both of your data sheets to ensure that they are complete. Make sure you know which bumble bee survey data sheet is associated with which habitat assessment form. It may be tempting to fill out some of this information for later, or to finish when you get home, but taking the time to do it while on site will reduce errors and increase the quality of the data you collect.

### Phase 6: Repeat

Drive or bike at least ½ mile down the road, find another patch of flowering plants, and conduct another survey starting at Phase 2. The roadside survey is complete when you have surveyed 5 different locations along your 10-mile route. You will have 5 bumble bee survey data sheets and 5 habitat assessment forms, one pair from each stop.

### Phase 7: Submit Your Data

Submit each of the five stops to BumbleBeeWatch.org separately. For help, refer to [Step 5: Submit Your Data](#) or click *Help* under the *Data* tab online.

## Habitat Assessments

At each location that you conduct a bumble bee survey (Point or Roadside) you will need to conduct a Habitat Assessment. This information will help us to understand what landscape features are important for bumble bees. The habitat form should take between 5 and 15 minutes to complete, it is not meant to be intensive.

### Phase 1: Fill Out Site Information

Fill out the top of the form so it matches the information you recorded on the bumble bee survey data sheet. For point surveys, complete one habitat assessment, for roadside surveys complete one habitat assessment at each of your five stops.

### Phase 2: Fill Out Habitat Information

1. Check **one** primary habitat type to represent the **survey area** from the list provided
2. Check the **top three** habitat types that represent the **surrounding area** (surrounding area refers to habitat just beyond the direct survey area, must be within sight distance). If there is only one surrounding habitat type, leave the following two options blank.

3. Walk your entire survey area and then circle the estimated percentage of available flowering resources (i.e. flowers that provide nectar and/or pollen, not unopened or dying flowers).



Images depict survey areas with estimates of percent bloom at low end: 0-10% (left), and high end: 90-100% (right). Images: J. Meissen; Xerces Society/Anne Stine (right)

4. Scan the area for bunch grasses, rodent holes, rock piles, and the other items listed on the data sheet and check off all that you see. These are landscape features associated with bumble bee nests.
5. Do your best to assess management occurring in or near the survey area. Take on a “What do you see right now?” approach. Can you tell if there was a fire recently? Is the ground coated in ash and free of leaf litter? Is there a pasture neighboring your survey area? This assessment aims to provide a general snapshot of the landscape.

### Phase 3: Document Blooming Plant Species

Flip the page over and start by circling the number of different plant species in bloom in your area. Do your best to fill in the plant names, trying to be as specific as possible using the common or scientific name. For example, if you can, submit “Tall Thistle” rather than “thistle” or “Red Clover” rather than just “clover.” This provides clear information as to which plant you observed in the field. For help with identifying plants, try using the smartphone app *iNaturalist*, or take photos to identify later at home. Plant photos taken for later identification are for your own use.

### Phase 4: Record your Volunteer Effort

Keep track of the hours spent planning, traveling, surveying, and submitting data, as well as mileage driven to and from your survey site.

## Incidental Observations

Now that you have *caught the bug*, observing bumble bees will occur naturally, whether you are walking your dog or passing a flower patch on your lunch break. This is great data too! Incidental observations can be submitted from anywhere in North America during any time, including past observations as long as you have the date and location of the photo.

Unlike formal surveys, incidental observations do not follow protocol or have data sheets. **These observations will not take the place of formal surveys, and do not count towards the minimum participation requirement.** To complete an incidental observation, simply snap a photo of a bumble bee and submit directly through the Bumble Bee Watch app or log in to the desktop website.

Only submit in-focus photographs that provide enough detail for identification. Submit different bumble bee species as different observations. If you observe the same bumble bee species on different flowers, submit those as separate observations.

When submitting an incidental observation, make sure your “project” is set to **Bumble Bee Watch**, otherwise you will be prompted to enter habitat data as if it were a formal survey.

## Bumble Bee Watch

Welcome, klamke [Batch Verify Sightings](#) [My Profile](#) [Sign Out](#)

[Home](#) [About](#) [Record a Sighting](#) [Bumble Bee Species](#) [Map](#) [Gallery](#) [Explore Data](#) [Resources](#)

● step 1:  
location

○ step 2:  
record(s)

### Bumble Bee Sighting

*This form is for submitting a bumble bee sighting*

*\*Required fields.*

**Project\***  
Please indicate if this sighting is part of a project. Choose Bumble Bee Watch if you aren't sure.  
Bumble Bee Watch


#### Location

*To pinpoint your sighting location, use the map, or search for an address below. You can place a pin, or change its location by clicking on the map. Coordinates will appear automatically.*

Enter a location

Map

Satellite



#### Select a Previous Location

**Your Locations**

Search for Previous Location

*Type in a previously used Site Name to generate coordinates from recently submitted location.*

Site name:\*

Enter a location

*Enter a site name and this location information will be saved as a Previous Location.*

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# Supplies

The following is a list of *recommended* supplies that will help you run bumble bee surveys efficiently.

## Insect Net

- Home Science Tools: [https://www.homesciencetools.com/product/standard-insect-net/?gclid=EAlaIQobChMI57vP9umF5AIVFYTIC3hmAygEAQYASABEgIKPfD\\_BwE](https://www.homesciencetools.com/product/standard-insect-net/?gclid=EAlaIQobChMI57vP9umF5AIVFYTIC3hmAygEAQYASABEgIKPfD_BwE)
- Search words for Amazon: “Aerial Insect Net”

## Collection Vials

- We like to use 50ml plastic vials, because they are lightweight, small, and chill relatively quickly, making them ideal for survey trips. However, many items that are easily found around the house can work for this purpose, such as empty jars or containers; just make sure they are thoroughly washed.
- Search words for Amazon: “30mL centrifuge tubes” or larger: “50mL centrifuge tubes”

## Camera

- The best type of camera for surveys are digital cameras that have a macro setting. We like to use the Olympus TG-6 mainly because it has an amazing macro setting, GPS capabilities, and has immense durability for use in the field. Smartphones work well if your camera remains focused as you zoom, and if desired, you can easily enhance your smartphone photos by purchasing a macro lens attachment. These lens attachments are relatively low cost, just be sure the lens fits your phone model.

## Ice Chest

- Smaller 7-9quart coolers work best, as they’re more portable

## Crushed Ice

- Crushed ice seems to chill bees faster than larger ice blocks or gel cold packs because vials can be fully submerged.

## Clipboard

- Helpful for filling out data sheets while in the field; can also be used as a surface to photograph bees on.

## GPS Device

- Smartphone, “drop a pin” in your Map app to retrieve location coordinates in Decimal Degrees. If recorded in an alternative format you can easily convert them online.

## Pencils

## Stopwatch/Timer

## Weather Device

# Field Guides

## Bumble Bee Identification Guides

*Bumble Bees of North America: An Identification Guide* (2014)

by Williams, Thorp, Richardson and Colla; Princeton University Press

Book: <https://press.princeton.edu/books/paperback/9780691152226/bumble-bees-of-north-america>

*Bumble Bees of the Eastern United States* (2012)

by Colla, Richardson and Williams; USDA Forest Service and Pollinator Partnership

PDF: <https://www.fs.fed.us/wildflowers/pollinators/documents/BumbleBeeGuideEast2011.pdf>

*Rusty Patch Bumble Bee Identification*

U.S. Fish & Wildlife Service

Online: <https://www.fws.gov/midwest/endangered/insects/rpbb/rpbbid.html>

## Plant Identification Guides

*Missouri Wildflowers* (2008)

by Denison; Missouri Department of Conservation

Book: <http://www.mdcnatureshop.com/product.php?productid=277>

*Shrubs and Woody Vines of Missouri* (2009)

By Kurz; Missouri Department of Conservation

Book: <http://www.mdcnatureshop.com/product.php?productid=348>

*Missouri Wildflowers and Grasses*

Online: [https://nature.mdc.mo.gov/discover-nature/field-guide/search?f\[0\]=field\\_fg\\_types:5592](https://nature.mdc.mo.gov/discover-nature/field-guide/search?f[0]=field_fg_types:5592)

## Further Reading

*Bumblebees: Behaviour, Ecology, and Conservation* (2009)

by Goulson; Oxford University Press

Book: <https://global.oup.com/academic/product/bumblebees-9780199553075?cc=us&lang=en&>

*Conserving Bumble Bees: Guidelines for Creating and Managing Habitat for America's Declining Pollinators* (2012)

by Hatfield, Jepsen, Mader, Black and Shepherd; Xerces Society

PDF: [https://xerces.org/sites/default/files/2018-05/12-028\\_01\\_XercesSoc\\_Conerving-Bumble-Bees-Guidelines\\_web.pdf](https://xerces.org/sites/default/files/2018-05/12-028_01_XercesSoc_Conerving-Bumble-Bees-Guidelines_web.pdf) (hard copy included when you attend a workshop)

*The Solitary Bees: Biology, Evolution, Conservation* (2019)

by Danforth, Minckley, Neff and Fawcett; Princeton University Press

Book: <https://press.princeton.edu/books/hardcover/9780691168982/the-solitary-bees>

*The Very Handy Manual: How to Catch and Identify Bees and Manage a Collection* (2015)  
by Droege; USGS

PDF: <https://bee-health.extension.org/wp-content/uploads/2019/08/TheVeryHandyBeeManual.pdf>

## Other Online Resources

*Bug Guide:* [www.bugguide.net](http://www.bugguide.net)

An online resource devoted to North American insects, spiders and their kin, offering identification, images, and information.

*Discover Life:* <https://www.discoverlife.org/>

An interactive encyclopedia about the taxonomy, natural history, distribution, abundance & ecology of species.

*USDA Plants Database:* <https://plants.sc.egov.usda.gov/java/>

Provides standardized information about plants, including ranges, native status and scientific names for species in the U.S. and its territories.

*USGS Pollinator Library:* <https://www.npwrc.usgs.gov/pollinator/home>

An online database of plant-pollinator interactions, searchable by plant, pollinator, location.

*Xerces Society for Invertebrate Conservation:* <https://xerces.org/publications>

Publications and resources produced by Xerces Society.

## Project Websites

Missouri Bumble Bee Atlas: <https://www.mobumblebeeatlas.org/>

Xerces Society for Invertebrate Conservation: <https://xerces.org/>

Missouri Department of Conservation: <https://mdc.mo.gov/>

University of Missouri: <https://cafnr.missouri.edu/>

Pheasants Forever and Quail Forever: <https://missouripfqf.org/>

# Data Sheets

Complete this form for every site that is surveyed

Date Data Entered: \_\_\_\_\_ By: \_\_\_\_\_

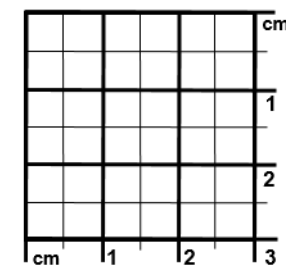
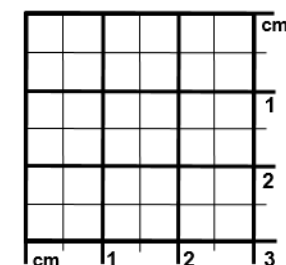
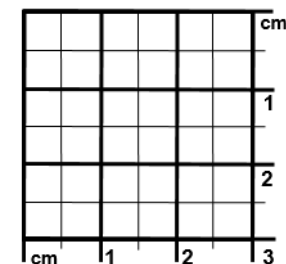
## Site and Weather Information

<b>Site Name:</b>	<b>Date:</b>	<b>Grid ID:</b>		<b>Temp (F):</b>
<b>Latitude (DD):</b>	<b>Start Time:</b>	<b>Survey Type:</b> Point	Roadside (Survey ___/5)	<b>Wind (mph):</b>
<b>Longitude (DD):</b>	<b>End Time:</b>	<b>Num. of Surveyors:</b>		<b>Cloud Cover (%):</b>
<b>Survey Minutes</b> (# minutes x # surveyors): <i>Point = 45 total minutes; Roadside = 15 min/stop</i>				<b>Weather Notes:</b>
<b>Collection Method</b> (circle one): Capture and Photo: all observed bees    Capture and Photo: only bees that look different    Photo only				

## Bumble Bee Observations

Entered in BBW	Bumble Bee Species	Host Plant	Photo Numbers	Notes
<input type="checkbox"/>				
<input type="checkbox"/>				
<input type="checkbox"/>				
<input type="checkbox"/>				
<input type="checkbox"/>				
<input type="checkbox"/>				
<input type="checkbox"/>				
<input type="checkbox"/>				
<input type="checkbox"/>				
<input type="checkbox"/>				
<input type="checkbox"/>				

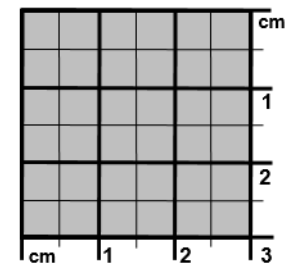
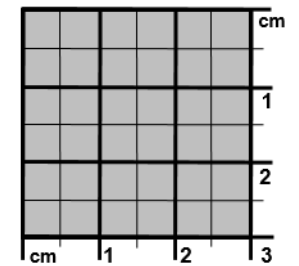
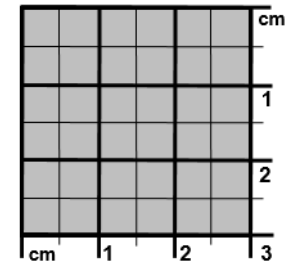
Photograph bees on a grid.



## MISSOURI BUMBLE BEE ATLAS - HABITAT ASSESSMENT FORM

**Complete this form for every site that is surveyed**

Date Data Entered: \_\_\_\_\_ By: \_\_\_\_\_

[illegible]

# MISSOURI BUMBLE BEE ATLAS - HABITAT ASSESSMENT FORM



Complete this form for every site that is surveyed

Date Data Entered: \_\_\_\_\_ By: \_\_\_\_\_

## Site and Weather Information

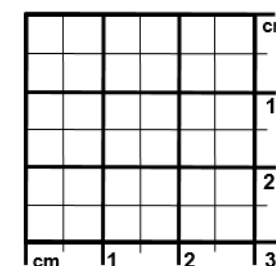
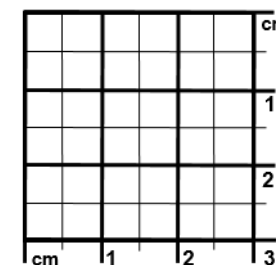
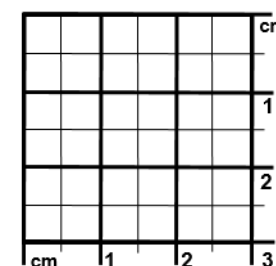
Site Name: <i>Pete's ranch</i>	Date: <i>6/15/22</i>	Grid ID: <i>MO_37</i>	Temp (F): <i>68</i>
Latitude (DD): <i>41.3365</i>	Start Time: <i>10:20 am</i>	Survey Type: <span style="border: 1px solid green; border-radius: 50%; padding: 2px;">Point</span> Roadside (Survey ___/5)	Wind (mph): <i>10</i>
Longitude (DD): <i>- 96.1476</i>	End Time: <i>10:35</i>	Num. of Surveyors: <i>3</i>	Cloud Cover (%): <i>25</i>
Survey Minutes (# minutes x # surveyors): <i>45</i>			Weather Notes:
Collection Method (circle one): <span style="border: 1px solid green; border-radius: 50%; padding: 2px;">Capture and Photo: all observed bees</span> Look different Photo only			

EXAMPLE

## Bumble Bee Observations

Entered in BBW	Bumble Bee Species	Host Plant	Photo Numbers	Notes
<input type="checkbox"/>	<i>Brown-belted bumble bee</i>	<i>Asclepias syriaca</i>	<i>IMG_77, IMG_78, IMG_79, IMG_80, IMG_81</i>	
<input type="checkbox"/>	<i>Brown-belted bumble bee</i>	<i>Sweetclover</i>	<i>IMG_82, IMG_83, IMG_84, IMG_85</i>	
<input type="checkbox"/>	<i>Unknown</i>	<i>Sweetclover</i>	<i>IMG_86, IMG_87, IMG_88, IMG_89, IMG_90</i>	<i>Brown-belted or two-spotted?</i>
<input type="checkbox"/>	<i>American bumble bee</i>	<i>Unknown (took photos)</i>	<i>IMG_91, IMG_92, IMG_93, IMG_94, IMG_95</i>	<i>Plant photo #s on habitat sheet</i>
<input type="checkbox"/>	<i>Black and Gold bumble bee</i>	<i>prairie wild rose</i>	<i>IMG_101, IMG_102, IMG_103, IMG_104</i>	
<input type="checkbox"/>				
<input type="checkbox"/>				
<input type="checkbox"/>				
<input type="checkbox"/>				
<input type="checkbox"/>				
<input type="checkbox"/>				
<input type="checkbox"/>				

Photograph bees on a



Complete this form once for each point survey or five times for each roadside survey (one per stop)

## Site Information

Enter the same information from your associated bumble bee survey data sheet.

<b>Site Name:</b>	<b>Date:</b>	<b>Survey Type:</b> Point Roadside (Survey ___/5)
-------------------	--------------	---

## Habitat Information

<b>SURVEY AREA</b> Check <i>ONE</i> category that represents the dominant habitat type  If you are doing a roadside survey, please remain easily visible to vehicles.	Habitat Type (Select One)		Example				
	<input type="checkbox"/>	Agricultural Land	Cropland, Pastureland, Orchard, etc.				
	<input type="checkbox"/>	Developed/Roadside	Urban/Suburban; Manicured Park; Garden				
	<input type="checkbox"/>	Grassland	Grasses make up dominant vegetation; Natural area				
	<input type="checkbox"/>	Riparian	Along a stream or creek				
	<input type="checkbox"/>	Shrub/Steppe	Arid land; Low-rainfall grassland				
	<input type="checkbox"/>	Wetland	Bogs, Marshes, Swamps, etc.; Saturated land				
	<input type="checkbox"/>	Woodland	Trees make up dominant vegetation				
<b>SURROUNDING AREA</b> Select the top three most abundant habitat types that are directly outside of your survey area within sight distance.  If there is only one surrounding habitat type, leave 2 <sup>nd</sup> and 3 <sup>rd</sup> categories blank.	1 <sup>st</sup> Most Abundant (Select One)		2 <sup>nd</sup> Most Abundant (Select One)		3 <sup>rd</sup> Most Abundant (Select One)		
	<input type="checkbox"/>	Agricultural Land	<input type="checkbox"/>	Agricultural Land	<input type="checkbox"/>	Agricultural Land	
	<input type="checkbox"/>	Developed/Roadside	<input type="checkbox"/>	Developed/Roadside	<input type="checkbox"/>	Developed/Roadside	
	<input type="checkbox"/>	Grassland	<input type="checkbox"/>	Grassland	<input type="checkbox"/>	Grassland	
	<input type="checkbox"/>	Riparian	<input type="checkbox"/>	Riparian	<input type="checkbox"/>	Riparian	
	<input type="checkbox"/>	Shrub/Steppe	<input type="checkbox"/>	Shrub/Steppe	<input type="checkbox"/>	Shrub/Steppe	
	<input type="checkbox"/>	Wetland	<input type="checkbox"/>	Wetland	<input type="checkbox"/>	Wetland	
	<input type="checkbox"/>	Woodland	<input type="checkbox"/>	Woodland	<input type="checkbox"/>	Woodland	
<b>How much of the survey area has flowering resources available? (Circle one)</b> 0%    10%    20%    30%    40%    50%    60%    70%    80%    >90%							
<b>Which of the following features do you see in or near the survey area? (Check all that apply)</b>							
<input type="checkbox"/>	Bunch Grasses	<input type="checkbox"/>	Rodent Holes or Tunnels	<input type="checkbox"/>	Brush Piles	<input type="checkbox"/>	Loose, Bare Soil
<input type="checkbox"/>	Leaf Litter	<input type="checkbox"/>	Pine Needle Duff	<input type="checkbox"/>	Rock Piles	<input type="checkbox"/>	Mulch
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	None of the Above
<b>I see evidence of, or know that the following have occurred in or near the survey area this season:</b> Circle Yes, No, or Suspect for each category							
Mowing			Yes	No	Suspect		
Livestock Grazing (Do you see animals, cow pies, hoof prints, etc.)			Yes	No	Suspect		
Native Grazing (Do you see animals, scat, hoof prints, etc.)			Yes	No	Suspect		
Agriculture			Yes	No	Suspect		
Insecticide use			Yes	No	Suspect		
Herbicide use			Yes	No	Suspect		
Fire (Controlled or Wild)			Yes	No	Suspect		
Honey Bee Hives (Num. of Hive Boxes Seen: _____ )			Yes	No	Suspect		
<b>Management Notes:</b>							

# MISSOURI BUMBLE BEE ATLAS - HABITAT ASSESSMENT FORM

Complete this form once for a point survey or five times for a roadside survey (one per stop).



## Plant Species in Bloom

**How many different flower species (including trees and shrubs) are blooming in the survey area that were *not* visited by bumble bees? (Circle one)**

0

1-2

3-5

6-10

>10

**Record the name of each blooming plant (including trees and shrubs) that was not visited by a bumble bee see in the survey area.** If you do not know the name of a plant, use plant identification field guides or apps, like iNaturalist. Alternatively, take pictures of the plant for later identification, these will not be submitted to the data portal.

	Plant Common Name	Plant Scientific Name	Photo Numbers <i>Optional, see above</i>
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

## Volunteer Data

If this survey was *not* a volunteer effort, skip this section. For Roadside surveys: You will submit your 5 surveys separately, but record TOTAL volunteer effort here and submit only once. For remaining 4 surveys you submit to Bumble Bee Watch, leave the volunteer effort boxes blank.

**What time did you start and stop volunteering on the day of your survey?**

Include planning and driving time.

**Start:**

**Stop:**

**How many miles, roundtrip, did you drive to conduct your survey?**

# MISSOURI BUMBLE BEE ATLAS - HABITAT ASSESSMENT FORM

Complete this form once for a point survey or five times for a roadside survey (one per stop).



## Site Information

Enter the same information from your associated bumble bee survey data sheet.

Site Name: <i>Pete's ranch</i>	Date: <i>6/15/22</i>	Survey Type: <i>Point</i> Roadside (Survey ___/5)
--------------------------------	----------------------	---

## Habitat Information

<b>SURVEY AREA</b> Check <i>ONE</i> category that represents the dominant habitat type  If you are doing a roadside survey, please remain easily visible to vehicles.	Habitat Type (Select One)		Example				
	<input checked="" type="checkbox"/>	Agricultural Land	<i>Cropland, Pastureland, Orchard, etc.</i>				
	<input type="checkbox"/>	Developed/Roadside	<i>Urban/Suburban; Manicured Park; Garden</i>				
	<input type="checkbox"/>	Grassland	<i>Grasses make up dominant vegetation; Natural area</i>				
	<input type="checkbox"/>	Riparian	<i>Along a stream or creek</i>				
	<input type="checkbox"/>	Shrub/Steppe	<i>Arid land; Low-rainfall grassland</i>				
	<input type="checkbox"/>	Wetland	<i>Bogs, Marshes, Swamps, etc.; Saturated land</i>				
	<input type="checkbox"/>	Woodland	<i>Trees make up dominant vegetation</i>				
<b>SURROUNDING AREA</b> Select the top three most abundant habitat types that are directly outside of your survey area within sight distance.  If there is only one surrounding habitat type, leave 2 <sup>nd</sup> and 3 <sup>rd</sup> categories blank.	1 <sup>st</sup> Most Abundant (Select One)	2 <sup>nd</sup> Most Abundant (Select One)	3 <sup>rd</sup> Most Abundant (Select One)				
	<input checked="" type="checkbox"/>	Agricultural Land	<input type="checkbox"/>	Agricultural Land			
	<input type="checkbox"/>	Developed/Roadside	<input type="checkbox"/>	Developed/Roadside			
	<input type="checkbox"/>	Grassland	<input checked="" type="checkbox"/>	Grassland			
	<input type="checkbox"/>	Riparian	<input type="checkbox"/>	Riparian			
	<input type="checkbox"/>	Shrub/Steppe	<input type="checkbox"/>	Shrub/Steppe			
	<input type="checkbox"/>	Wetland	<input type="checkbox"/>	Wetland			
	<input type="checkbox"/>	Woodland	<input type="checkbox"/>	Woodland			
<b>How much of the survey area has flowering resources available? (Circle one)</b> 0%    10%    20%    30% <i>40%</i> 50%    60%    70%    80%    >90%							
<b>Which of the following features do you see in or near the survey area? (Check all that apply)</b>							
<input checked="" type="checkbox"/>	Bunch Grasses	<input checked="" type="checkbox"/>	Rodent Holes or Tunnels	<input type="checkbox"/>	Brush Piles	<input checked="" type="checkbox"/>	Loose, Bare Soil
<input type="checkbox"/>	Leaf Litter	<input type="checkbox"/>	Pine Needle Duff	<input type="checkbox"/>	Rock Piles	<input type="checkbox"/>	Mulch
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	None of the Above
<b>I see evidence of, or know that the following have occurred in or near the survey area this season:</b> Circle Yes, No, or Suspect for each category							
Mowing	Yes	<i>No</i>	Suspect				
Livestock Grazing (Do you see animals, cow pies, hoof prints, etc.)	<i>Yes</i>	No	Suspect				
Native Grazing (Do you see animals, scat, hoof prints, etc.)	<i>Yes</i>	No	Suspect				
Agriculture	<i>Yes</i>	No	Suspect				
Insecticide use	Yes	<i>No</i>	Suspect				
Herbicide use	Yes	<i>No</i>	Suspect				
Fire (Controlled or Wild)	Yes	<i>No</i>	Suspect				
Honey Bee Hives (Num. of Hive Boxes Seen: _____ )	Yes	<i>No</i>	Suspect				
<b>Management Notes:</b>							

# MISSOURI BUMBLE BEE ATLAS - HABITAT ASSESSMENT FORM

Complete this form once for a point survey or five times for a roadside survey (one per stop).



## Plant Species in Bloom

How many different flower species (including trees and shrubs) are blooming in the survey area that were *not* visited by bumble bees? (Circle one)

0

1-2

3-5

6-10

>10

Record the name of each blooming plant (including trees and shrubs) that was not visited by a bumble bee see in the survey area. If you do not know the name of a plant, use plant identification field guides or apps, like iNaturalist. Alternatively, take pictures of the plant for later identification, these will not be submitted to the data portal.

	Plant Common Name	Plant Scientific Name	Photo Numbers <i>Optional, see above</i>
1	Unknown (caught American bb on this)		IMG_96 – IMG_100
2	Tall thistle	Cirsium altissimum	
3	Red Clover	Trofolium pratense	
4	Cup plant	Silphium integrifolium	
5	Dandelion	Taraxacum	
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

## Volunteer Data

If this survey was *not* a volunteer effort, skip this section. For Roadside surveys: You will submit your five surveys separately, but record TOTAL volunteer effort here and submit only once. For the remaining 4 surveys you submit to Bumble Bee Watch, leave the volunteer effort boxes blank.

What time did you start and stop volunteering on the day of your survey?

Start: 8:00am

Stop: 12:30pm

Include planning and driving time.

How many miles, roundtrip, did you drive to conduct your survey? 120 miles

When you enter this data online, keep track of the hours you spend organizing and entering your data.

# Bumble Bees of Missouri

# Steps for Identifying a Bumble Bee:

- After determining you have a bumble bee (not a carpenter bee, wasp or fly) check to see if it is a female or a male, and if it is a cuckoo bee.
  - Female: pollen basket on hind leg (shiny, hairless zone); 6 tergites
  - Male: No pollen basket on hind leg; 7 tergites; some with bulgy eyes
  - Cuckoo: No pollen basket on hind leg, instead with dense, long hair

- Examine the **hair color and pattern** on the following sections:

- Head:

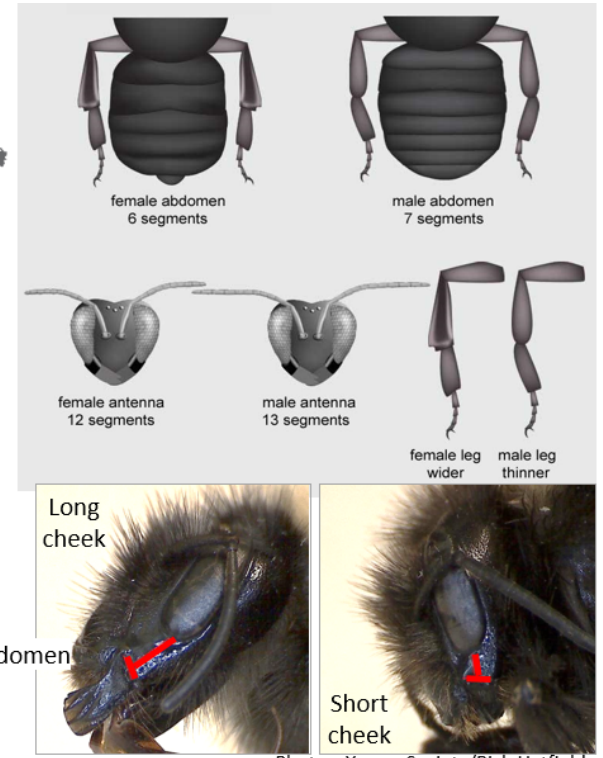
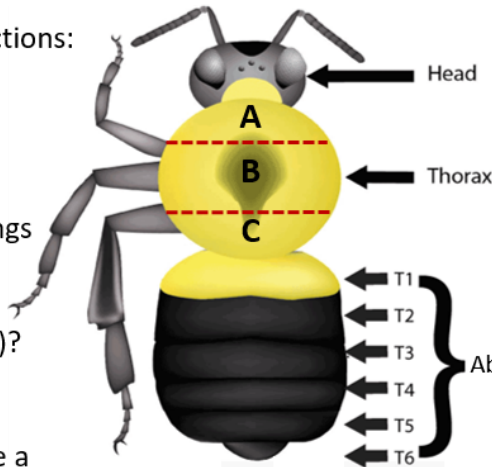
- ☐ Front of the face
- ☐ Top of the head

- Thorax:

- ☐ Front of (A), between (B), and behind (C) the wings
- ☐ Side of thorax/under the wings
- ☐ Is there a circle or stripe between the wings (B)?
- ☐ Is there a black notch or "v" behind the wings (C)?

- Abdomen:

- ☐ What color is T1? T2? T3? ...T6?
- ☐ Does the color cover the entire tergite or is there a pattern to (i.e. crescent shape or gap in the center)?



Photos: Xerces Society/Rich Hatfield

- Examine the cheek length; is it long or short?

- Make sure your photos show the features in the above checklist.

## Symbol and Term Descriptions:

**Uncommon:** Species occurs infrequently or in low abundance.

**Species of Conservation Concern:** Evidence-supported rare or declining species that are in need of conservation. The Missouri Department of Conservation manages the list of species and prioritizes them when planning conservation efforts.

**Tergite:** A tergite is an abdominal segment. Females have 6 tergites, males have 7. The tergite nearest the thorax is Tergite 1 or "T1" and the terminal segment is Tergite 6 or "T6." Hair color of T1-T6 helps determine the species.

**Male Identification:**  
Visit [BumbleBeeAtlas.org](http://BumbleBeeAtlas.org)  
for alternative guides.

## Look-alikes!

- American vs Black-and-Gold Bumble Bee:** American has black hairs on top of the head, Black-and-Gold has yellow. T1 of American is often times ½ black and ½ yellow, Black-and-Gold is all yellow.

**Photos need to include: Top of head and T1**

- American (Male) vs Yellow Bumble Bee (Male):** American has mixed hair colors (yellow and black) behind the wings and on the sides of the thorax, while the Yellow bumble bee has yellow hair in these areas. Often, T7 of American will have orange coloration.

**Photos need to include: Thorax (top and side) and T6/T7**



**Bumble bee illustrations:** Paul Williams (identification and color patterns), Elaine Evans, Rich Hatfield (bee body design).

# Missouri Bumble Bee Identification Guide (Females)

This guide separates bees into two sections based on the color of the first tergite: (1) T1 is yellow or (2) T1 is black.  
All of these species occur statewide except for Lemon Cuckoo Bumble Bee, which is found near the N. and E. borders.

**Key** (See reverse side for descriptions)



Common    **T** = Tergite



Species of Conservation Concern

## If first abdominal segment is yellow:



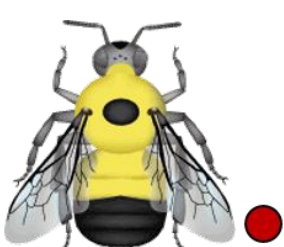
*Bombus griseocollis*  
**Brown-belted Bumble Bee**  
T2 color is crescent-shaped



*Bombus impatiens*  
**Common Eastern Bumble Bee**  
Thorax with teardrop shape



*Bombus bimaculatus*  
**Two-spotted Bumble Bee**  
Yellow "W" shape on T2

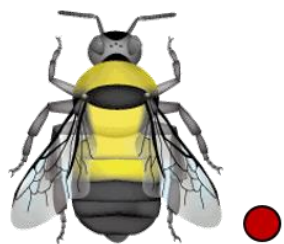


*Bombus vagans*  
**Half Black Bumble Bee**  
Spot on thorax is black & yellow



*Bombus fervidus*  
**Yellow Bumble Bee**  
Black hairs on top of head

\*Males very similar to *B. pensylvanicus*, see **Look-alikes** on reverse side.



*Bombus fraternus*  
**Southern Plains Bumble Bee**  
T1/T2 hairs appressed/lay flat

## If first abdominal segment is black:



*Bombus auricomus*  
**Black and Gold Bumble Bee**  
Yellow hairs on top of head

\* Very similar to *B. pensylvanicus*, see **Look-alikes** on reverse side.



*Bombus pensylvanicus*  
**American Bumble Bee**  
T1 often ½ black, ½ yellow

\* Males very similar to *B. fervidus*, see **Look-alikes** on reverse side.



*Bombus variabilis*  
**Variable Cuckoo Bumble Bee**  
Very short hair; Uncommon



*Bombus citrinus*  
**Lemon Cuckoo Bumble Bee**  
All yellow thorax

## Rusty Patch Bumble Bee (*Bombus affinis*)



This species has not been detected in Missouri since 1998.

This species is protected under the Endangered Species Act. If you are surveying in Cole, Franklin, Gasconade, Jefferson, Maries, Miller, Osage, St. Charles, St. Louis and St. Louis City Counties, please see guidance from the US Fish and Wildlife Service before handling:

[www.fws.gov/midwest/endangered/insects/rpbb/](http://www.fws.gov/midwest/endangered/insects/rpbb/)

# Missouri Dept. of Conservation Volunteer Agreement

Please complete this form **IF** you plan to survey on any of MDC's natural areas and return it to the appropriate Area Manager. Only one form needs to be filled out per year, but if you plan to survey areas that are managed by different regions, you will need on form for each region. To view the regions and find the Area Manager of your intended survey site, please visit:

<https://mdc.mo.gov/contact-engage/regional-offices>



MISSOURI DEPARTMENT OF CONSERVATION  
**CONSERVATION SERVICE VOLUNTEER AGREEMENT (INDIVIDUALS) – Form 2a**

<b>I. VOLUNTEER INFORMATION (PLEASE PRINT)</b>			
VOLUNTEER NAME		NAME OF RESPONSIBLE ADULT/CHAPERONE, IF VOLUNTEER IS UNDER 18	
MAILING ADDRESS	CITY	STATE	ZIP CODE
TELEPHONE NUMBER		EMAIL	
CONSERVATION AREA/SITE			
STARTING DATE		ENDING DATE	
<b>II. PERFORMANCE GUIDELINES</b>			
<p>The volunteer is expected to:</p> <ul style="list-style-type: none"> <li>• support the mission of the Department</li> <li>• follow Department rules and policies</li> <li>• work with other Department staff in a cooperative manner</li> <li>• report any problems or issues to Department staff on a timely basis</li> <li>• only carry out authorized responsibilities and exercise proper care in performing all volunteer activities</li> </ul>		<p>The Department is expected to provide:</p> <ul style="list-style-type: none"> <li>• guidance regarding volunteer activities</li> <li>• training for the volunteer project, if necessary</li> <li>• a receptive work environment</li> </ul>	
<b>III. TASKS AND ACTIVITIES</b>			
<p>DESCRIPTION OF VOLUNTEER TASK/PROJECT (INDICATE IF THIS IS AN ONGOING OR SHORT-TERM PROJECT, AS WELL AS HOW MUCH TIME YOU ANTICIPATE SPENDING):</p> <ol style="list-style-type: none"> <li>1. Volunteer must complete 4-hour on-line Bumble Bee Atlas training prior to surveying bumble bees on any conservation area.</li> <li>2. Only bumble bees may be sampled using the methods prescribed by the Bee Atlas program.</li> <li>3. Other insects captured must be immediately released, unharmed.</li> </ol>			
<b>IV. AGREEMENT</b>			
<p>By signature below, I acknowledge that I have read this form completely and agree to voluntarily accept the risks connected with these activities. I further agree to release and hold harmless the Conservation Commission, the Missouri Department of Conservation and its employees from any and all liability, including injury. I do not expect future compensation or favor for being a volunteer. This agreement in no way constitutes an offer of employment; therefore, I understand that the Missouri Department of Conservation does not provide worker's compensation.</p>			
SIGNATURE OF VOLUNTEER			DATE
SIGNATURE OF AUTHORIZED GUARDIAN (IF UNDER THE AGE OF 18)			DATE
SIGNATURE OF CONSERVATION AREA MANAGER OR STAFF			DATE

ORIGINAL: MDC, AREA MANAGER OR STAFF

COPY: DIVISION OFFICE MANAGER

COPY AVAILABLE UPON REQUEST - VOLUNTEER

## IMPORTANT: CONSERVATION SERVICE VOLUNTEER GUIDELINES

Please make certain you have read and understood the following:

- Volunteers agree to perform service without compensation and are not considered unpaid employees of the State of Missouri. The Missouri Department of Conservation does not provide worker's compensation.
- A responsible adult must accompany volunteers under the age of 18.
- **A copy of the Volunteer Activity Consent and Parental Approval Form must be given to the area or site manager for each volunteer under the age of 18.**
- Volunteers and groups/organizations must have all signatures on this form upon or prior to arrival.
- Transportation to and from the project site is the responsibility of the group/volunteers.
- The Missouri Department of Conservation cannot guarantee volunteer placement. The Department will, however, make every effort to match volunteer applicants to volunteer opportunities based on the needs of the Department and the interests and abilities of the volunteers.
- The Department of Conservation accepts the service of all volunteers with the understanding that such service is at the sole discretion of the Department. Volunteers agree that the Department may at any time, for any reason, decide to terminate the volunteer's relationship with the Department. Volunteers may at any time, for any reason, decide to sever the volunteer's relationship with the Department. Notice of such a decision should be communicated as soon as possible to the volunteer's area contact. At any given time, the Department may approve, deny or modify any volunteer's activity.
- The responsible adult/chaperone is responsible for the safety and well-being of any youth volunteer under the age of 18. The responsible adult/chaperone is responsible for:
  1. Providing coordination and supervision while youth volunteer is volunteering;
  2. Ensuring youth volunteer is accompanied by a responsible adult;
  3. Ensuring youth volunteer is familiar with the volunteer guidelines;
  4. Ensuring youth volunteer adheres to Department rules and guidelines;
  5. Ensuring that youth volunteer supports the mission of the Missouri Department of Conservation;
  6. Ensuring that youth volunteer works with Department staff in a cooperative manner;
  7. Reporting any problems, issues, and any and all injuries incurred by youth volunteer, which occur while volunteering, to Department staff on a timely basis;
  8. Not allowing youth volunteer to attempt responsibilities for which they have not been trained or authorized; and,
  9. Ensuring the youth volunteer exercises proper care in performing all volunteer activities.

# Car Placard

Cut out the placard on the following page and place it in the window of your car when surveying. This may help alleviate questions and concerns from local individuals. If you need more than one placard, you may print additional at [www.mobumblebeeatlas.org/trainingpacket](http://www.mobumblebeeatlas.org/trainingpacket).

# VOLUNTEER SURVEYOR



MISSOURI  
BUMBLE BEE ATLAS  
MOBUMBLEBEEATLAS.ORG

Name: \_\_\_\_\_

Phone: \_\_\_\_\_

I am conducting fieldwork nearby in effort to document bumble bees. Sampling is non-lethal and there is no collection of bumble bees. See [MOBumbleBeeAtlas.org](http://MOBumbleBeeAtlas.org) for more information.

Project Coordinator: Katie Lamke  
Conservation Biologist,  
The Xerces Society  
(402) 256-5252  
[greatplains\\_bba@xerces.org](mailto:greatplains_bba@xerces.org)



# MISSOURI

## BUMBLE BEE ATLAS

MOBUMBLEBEEATLAS.ORG



May 2022