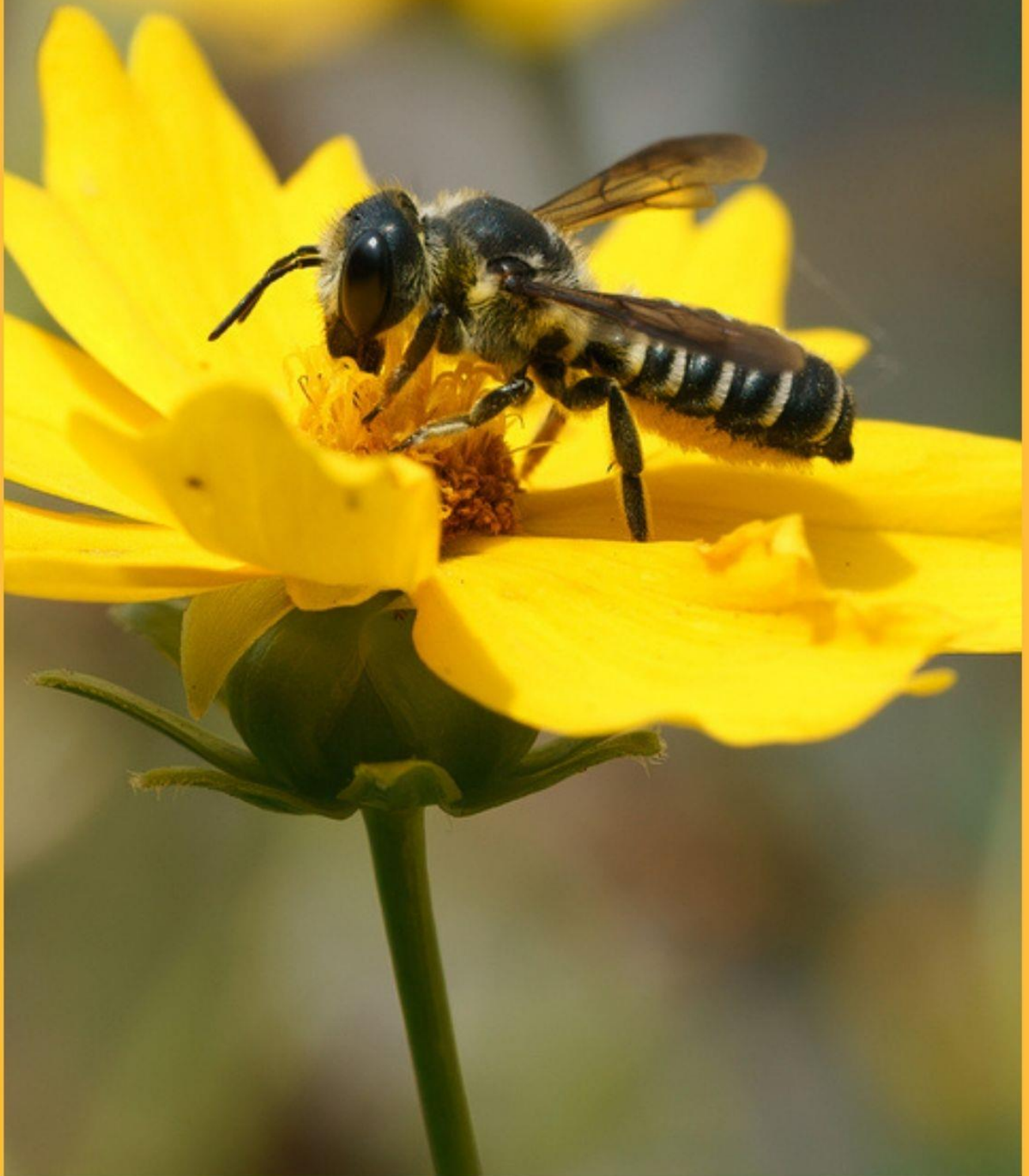


# Shutterbee Participant Handbook



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## Introduction

More than 85% of flowering plants require animal pollination, including many of the nutritious foods that we eat. However, many pollinator species throughout the world are declining. Insect pollinators are increasingly exposed to multiple stressors: too few flowers, lack of nesting sites, pesticide exposure, diseases and parasites, and climate change. For instance, bees rely entirely on plants throughout their entire life cycle for their food and nutritional needs. Many bees actually nest within the stems of flowering plants. Other bee species (around 70%!) nest in the ground. The lack of undisturbed soil or other nesting materials such as fallen trees and twigs limit bee diversity. Pesticide exposure and disease incidence has increased, resulting in lower reproductive success and smaller populations. Any one of these factors can harm populations of wild bees, but the interactions of them may exacerbate the effects each has alone.

Despite these challenges, urban landscapes can be havens for some bee species. In St. Louis alone, there are around 200 documented bee species. That is nearly 45% of the 452 species found in the state of Missouri. However, urban environments can also be restrictive, favoring some species over others. For instance, cavity nesting bees fair better relative to ground nesting bees in cities. Generalized bees that have more flexible diets or nesting habits are also more likely to be successful. As urban landscapes expand, it is vital that we better understand how to support biodiversity within human-dominated landscapes. Given that the majority of land is privately owned, that means that we need to “bring conservation home”!

The question is: how do we better support bee diversity in residential areas? Does a higher density of flowers and nesting sites in residential yards weaken the effects of urbanization? Are communities of plants and pollinators in urban environments more susceptible to stress? Do backyard conservation efforts weaken that stress? These are all important questions that are vital for determining how we can make residential areas and green spaces better habitat for bees. We are seeking to understand these questions and we cannot do it without your help!

The Shutterbee project collaborates with community (citizen) scientists, like yourself, to monitor the bees in their backyards or neighborhood park using photographs. The surveys required for the project encourage you to spend time outside learning about local organisms. While you familiarize yourself with bees, their behavior, and native plants, you are also helping expand scientific knowledge of urban bees and how we can conserve them. We thank you for your participation in the Shutterbee Community Science Program, and we look forward to working with you!

## Shutterbee Goals

The overarching goal of the Shutterbee Program is to understand how landscape features and land management decisions affect bee diversity and behavior. It is also opportunity to collaborate with and learn from one another. You are the expert on your backyard! You have insights that we might not otherwise know. Only by working directly with people like you do we hope to achieve our goals. We hope to work with you to create more sustainable habitat for native bees. Finally, we are interested in how community science participation might influence human conservation behaviors (but that is beyond the scope of this handbook. More for another day!).

**Your Role:** As a Shutterbee participant, you will conduct 20 to 45-minute walking photo surveys once every two weeks and upload your observations using our protocol to iNaturalist. You will

receive 4-6 hours of training, depending on your familiarity with photographing bees and conducting standardized surveys. In the first training, we explain our project goals in more detail and introduce you to our focal group: bees! The second training consists of smaller groups of participants to provide tailored training on navigating the iNaturalist platform on your device and implementing our survey protocol in your own yard. The last set of trainings are individualized and may include in-person training session(s) and feedback on your iNaturalist submissions.

### Bee Anatomy – How do you know you are seeing a bee?

There are 20,000 bee species worldwide and around 4,000 in the United States. Missouri hosts around 450 bee species, and in 2017, Camilo et al. published the records of 198 species in the St. Louis metro area. That's nearly half of the entire state's bee species in a single, urban city! Around 95% of those species are native to the region. The most species-rich family in the area is Apidae, which includes bumblebees, carpenter bees, and honeybees. The second most abundant family of bees in St. Louis were the Megachilidae, the family of leaf-cutter and mason bees. Perhaps not as abundant but still quite common are the sweat bee family (Halictidae) and the mining bee family (Andrenidae). The least diverse family present in the St. Louis region is the polyester bee family (Colletidae).



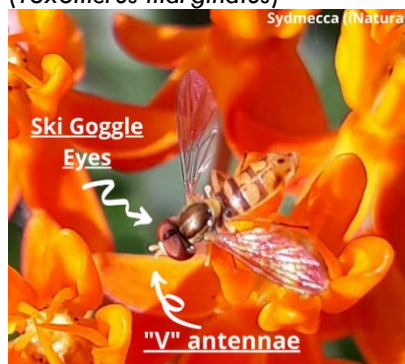
**Figure 1.** Several bee species that are common to the St. Louis region. Bees vary dramatically in size from less than half the length of a dime to the size of a quarter. (Photo credit: James Faupel)

Bees have incredible diversity in size, shape, and color (**Figure 1**). They vary from the size of a quarter to less than half the size of a dime. They can be black, metallic, green, red, orange, or striped. They can be incredibly hairy all over their bodies or have no hair at all. To further complicate matters, there are many other insects that look like bees (**Figure 2**). These mimics gain a benefit: a potential predator may mistake it (for instance a defenseless fly) for a bee with a stinger. However, there are few features that help to distinguish bees from wasps and flies (**Table 1**). While there are exceptions to every rule, these traits are fairly reliable when comparing local species that may

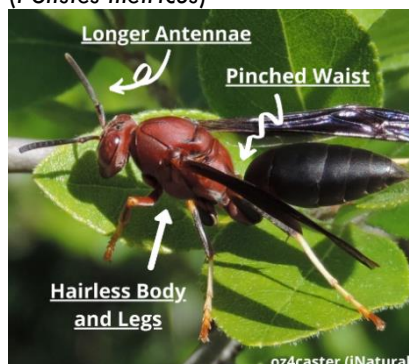
appear similar. When photographing bees in your backyard, it may be challenging to know if you are looking at a bee, fly, or wasp (especially the small ones!) through your lens. Unless you are 100% sure, we recommend that you take its picture.



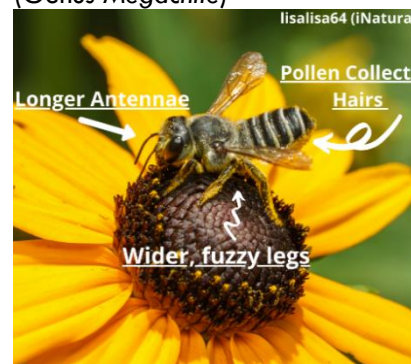
A margined calligrapher fly  
(*Toxomerus marginatus*)



A metric paper wasp  
(*Polistes metricus*)



Leaf-cutter bee  
(Genus *Megachile*)



**Figure 2.** Examples of a bee-mimic fly, a common wasp species, and a leaf-cutter bee.

**Table 1.** Physical characteristics that can be used to distinguish bees, flies, and wasps.

Trait	Bee	Wasp	Fly
eyes	no ski goggle	no ski goggle	ski google
antenna	long	long	short, v-shaped
waist	pinched	very narrow	wide
legs	wide, hairy*	narrow, hairless	narrow, hairless
hairs	on legs/belly*	few	variable
wings	two pairs	two pairs	one pair

\* denotes exception: not all bees are hairy!

## The Shutterbee Survey Method

In order to accurately compare bee diversity and behavior across your backyards, the Shutterbee protocol uses a **standardized survey method**. This approach attempts to control for the duration of the survey (also known as effort), the time of day, and the weather conditions. When done repeatedly over months or years, those data can then be compared, because we know they were collected under similar conditions. Below are details on how to conduct your biweekly photo surveys and submit your data to iNaturalist. After you submit your observations to iNaturalist, we will identify the bees and plants in your photographs to see if bees behave differently in urban, suburban, and rural environments.

## Conducting a Photo Survey

Observations will occur **between 10am and 3pm** when the temperature is **above 60° F but below 100° F**. Data are important, but your health and safety are more important! If you feel ill or are getting too hot, it is okay to cut your survey short as long as you record the actual time spent on your survey in iNaturalist. Survey length will vary and will be assigned depending on the size of your yard, but typically they will be between **20-45 minutes**. For a typical city lot, about a tenth of a hectare, we suggest 20-minute surveys and going up from there as your yard size increases. If you feel you need more time or want longer, you can take more time as long as you record the time spent surveying. We recommend setting a timer before your survey begins to keep track of how long you are surveying. If your yard is large, we will be in contact with options about time and sectioning of your yard for surveys. It is important that you use the same path

through your yard for each survey. Be sure to plan out the path in advance to maximize efficiency. We will assist you with that during training.

For your photo surveys, focus on photographing bees—**ALL BEES! Don't forget to photograph the small ones.** If you are not sure if it is a bee, wasp, fly, or other insect, still take a picture. It's better to later identify it than miss an opportunity. **Don't forget to look high and look low** for bees on flowering plants. Survey as much area as you can. Each individual bee you photograph will be uploaded as a separate submission on iNaturalist. Try to get multiple photos, especially of different angles such as a dorsal or top view for a view of its head and body and a lateral or side view of it. In between individual bees and the collection of pictures you take of them, **take a photo of your hand or the sky to indicate it is a new submission.** Taking many photos of many bees can be confusing when you are trying to organize them later, so having a clear indicator like your hand or the sky will help when uploading to iNaturalist later.

Not every photo is going to be perfect or clear, and that's okay! The key is to focus on identifying features with multiple photos. The best photos will have the top of the head, the thorax (middle section), and abdomen visible in the collection for that individual. In order to get these photos, we suggest getting close. Bees are highly unlikely to sting you unless they feel threatened, but they may fly off if you get too close. Move slowly and carefully when approaching, just one foot in front of the other when moving near plants to reduce disturbing the pollinators. Aim for a distance between 5-10 inches from the bee. If you had the option of macro settings on your camera or phone, use it! It'll help with those clear, close photos. Enabling the "live" feature or taking "burst" shots with your phone or camera also helps with gathering multiple pictures. For information on how to enable these features, check out the section "Enabling 'Continuous or Burst' on a Camera" in the Appendix. Taking videos, especially with the "slowmo" feature activated, is also another viable way of getting multiple photos of a bee.

Be aware of your surroundings. Lighting matters! Keeping the sun behind or to the side of you will reduce glare in your photos which makes for a clearer shot. You also don't want to block the light, when possible, so your bees are clear in the picture. If you have an area of your yard that is densely packed with flowers, then you can pause momentarily to ensure you are looking all over for any bees. If there is a patchy area or walk-way in your garden, try to get into the middle when possible to survey all available blooms. Sometimes bees will get away before you can get your shot. It happens, just be patient. These are live organisms so they will not always do what you want nor what you expect them to do. With practice, you'll get the hang of photographing bees! Before the official surveys begins is the perfect time to familiarize yourself with your yard and potential visitors. Try different approaches and experiment to find a way that works best for you to capture the best photos of bees you can.

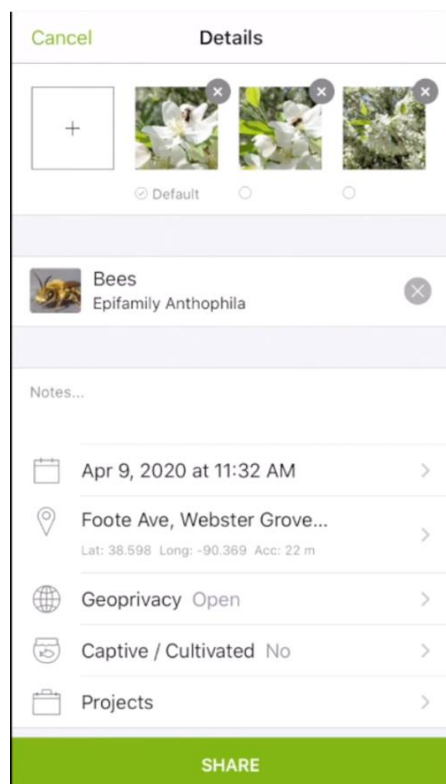
Check out this [video](#) for tips and tricks on how to complete a walking transect.

\*Before you begin your photo surveys, there are two steps to ensure your Geolocation is activated. Your Photo application will request permission to use your GPS location and the iNaturalist application will also need permission (see details below). That way when you upload your photographs, they will already be georeferenced, so you won't need to choose the location on your map. If you are using a camera that does not have GPS capabilities, you will need to manually select the location for every observation. (It also helps to make sure your phone is well charged, and the lens is clean).

**\*\*If you do not encounter any bees** during a survey (which we hope won't happen often), you will fill out this [“No Bees”](#) form to indicate to us that you did a survey.

## Using iNaturalist to Submit Survey Observations

After you have completed your survey, submit your **photographs** and **metadata** to



iNaturalist. Each “**observation**” that you submit to iNaturalist should include images of *one individual bee*. You can submit multiple pictures of a given individual, but they must be uploaded as the same iNaturalist observation (otherwise, that individual will be counted twice, which is inaccurate). You can upload your observations directly from your phone app or using the website, [www.inaturalist.org](http://www.inaturalist.org). Each version is a bit different, so see below for specific details on uploading with your device.

**iPhones:** Open the app. On the bottom center of the screen there is a camera icon with “observe” written underneath. Tapping this will bring up three options: “No photo”, “Camera” and “Camera roll”. Click on the “Camera roll” to select photos that you’ve already taken. You can tap on multiple photos at one time to add them to your observation. After tapping on all the photos, you want to include in your observation, click “add” on the top right of your screen. This will take you to the details screen. Check out this video for a step-by-step guide on how to upload photos to iNaturalist on [iPhone](#).

**Androids:** Open the app. On the main page, there is a green plus sign on the bottom right. Pressing this brings up a few options, but the only one you need is the “choose image” function. Pressing “choose image” will bring you to your

pictures. You can select multiple images by holding down on an image until a blue check mark appears. Once you have selected the photos, hit “open” or “select” (this may say something slightly different depending on the model) on the top righthand side of the screen; this will bring you to the details screen. Check out this video for a step-by-step guide on how to upload photos to iNaturalist on an [Android](#).

**Computer:** Save time by logging onto the website and submitting multiple photos at one time! Once you log into the website, click the green ‘upload’ button in the top right corner. This directs you to screen with a “Choose Files” option. Click on it and it will display the file directory for your computer. You can upload multiple images at once by selecting the first image then holding the shift key before clicking the last image you want to upload. This highlights all files in between the two images. Make sure to include only the images you want to upload. Each image will be uploaded as a separate observation, but you’ll want to combine photos that are for the same bee. To combine photos of the same bee, just click on the image and drag it to the observation you’d like to add it to. Check out this video for a step-by-step guide on how to upload photos to iNaturalist on a [Computer](#).

## Adding Data about your Data (aka Metadata J)

In order for your data to be used in our study, we have to know a few things about your observations: (1) verification that you used the Shutterbee protocol, (2) the duration of your survey (how long you photographed bees that day), and (3) the plant species that the bee is visiting (optional). Each iNaturalist observation on iNaturalist includes a **Details** page, where you can add/or verify the location, time and date, or add additional information into the “notes” section. We will be using the notes section for three key pieces of information: the survey protocol (“sbee”), duration of the survey (“min”), and the plant name, if you know it.

1. Under the “**What Did You See?**” field, below the photos of your observation, make sure to indicate the “bees” epifamily. This will ensure iNaturalist users know you are focusing on the bee in the photo and not the plant. If you are comfortable with identifying the bee to a lower taxonomic level (e.g. family, tribe, or genus), do so! It is okay if you leave it at “bee.” Without these tags, it will take longer for your bees to get added to the project and identified. Don’t waste your time and hard effort spent finding those bees!
- A screenshot of the iNaturalist 'What Did You See?' field. On the left is a small square photo of a bee. To the right of the photo, the word 'Bees' is displayed in a large blue font, and below it, 'Epifamily Anthophila' is displayed in a smaller blue font.
2. The “**Notes**” section is where we will have you put your most important metadata. The metadata protocol consists of 3 pieces of information and must be added on **EVERY** submission: **sbee, duration of survey in minutes, and the plant species (if known)**. Between each piece of information, it is very important that you put a **comma**, so we can separate the three pieces of information. *Sbee* stands for our project Shutterbee and indicates that you used our protocol. The duration of the survey refers to how long you photographed bees during your survey on that day and should be recorded in minutes. During your training, we will assign the duration of your photo surveys based on our satellite measurement of your pervious yard area. For the plant species, you can use scientific or common names, but leave it blank if it is not known. An example: “Sbee,20,coreopsis” or “sbee,20,”. **\*Note that capitalization does not matter, but don’t forget those commas!**\*Any additional information, besides these 3 things should be added as a comment after you post the observation, rather than the Notes text box.
  3. Verify that the **date** is correct. If your time/date is incorrect you can click it in iNaturalist and change it on the calendar and clock.
  4. Verify that the **location** is correct. If it is not or if the longitude and latitude show zeros, you may not have given the iNaturalist app to access the GPS location of your phone. You can allow iNaturalist to view the location of your phone during your surveys by changing the permissions in your app settings or your phone’s privacy settings. If that does not work, you can manually add your location using the map provided on the application.

**iPhone:** Tap the box that looks like an upside-down teardrop. In the bottom left, tap the green arrow. This takes you to your current location. Adjust as needed to where you took the photo, then hit ‘save’ in the upper right corner. Check out this guide on how to adjust your app permissions on an [iPhone](#) so you can allow location on iNaturalist.



**Android:** Select location then type in your street name. You can “pin current location” in the top right-hand corner of the map screen; this saves your address to the “choose pinned location” tab so you do not have to type it in each time you submit a photo. Make sure when you leave the map screen you hit the check mark that is on the top right, NOT the back arrow, or your changes will not be saved. Check out this guide on how to adjust your app permissions on an [Android](#) so you can allow location on iNaturalist.

**Computers:** Click on ‘location.’ This opens the world map. In the top ‘search for a location’ bar, type in your address and hit enter or select it when it pops up. This should take you to your location showing a red circle. This is the range it will show if you set your privacy to ‘Obscured’, while the center point is what will appear if left on ‘Open’. When satisfied with the point or range, click on the blue ‘Update Observations’ beneath the map, which is also by the Geoprivacy setting.

If there are many observations missing information or incorrect, you can use iNaturalist’s “Batch edit” function to quickly editing multiple items at once. Once you are logged into the website, click on your username in the top right of the page then go to the “Edit Observations” tab. From there, select “Batch edit” to begin. You can mark “select all” or “select today” to highlight many or go through and click the specific observations you need to edit. When you have selected all that you need, click “Edit Selected.” There you will be able to change or add any information needed in the fields listed. Check out a video guide on how to used batch edits [here](#).

**Note:** If privacy is a concern for you, you can set “Geoprivacy” to “obscured” for your observations. That will provide the general area that the photo was taken but not the specific coordinates. Tap on “Geoprivacy” or “Location Visibility” and select the “obscured” option to activate this option. **Please do not select “Private” or we will not be able to use your observation in our project.**

5. Select “Share” and move on to the next observation!

**Note:** You do not need to manually add each observation to the Shutterbee project in your iNaturalist app. They will automatically populate into the project as long as they are within the St. Louis area and are identified as bees. We do, however, highly recommend that you join the Shutterbee project, so you can see what you and others are finding in your backyards!

## Final Notes

Thank you for being a part of the Shutterbee project! We could not do this without you. If you’re interested, please follow us at any of our social media accounts ([Instagram](#), [Facebook](#) or [Twitter](#)) for fun facts, identification tips, cool discoveries, and more. We will also be sending out a regular Bee Brigade Bulletin via email, though current and past bulletins can be found on the Shutterbee website [here](#). If you have any questions and need to contact us, do not hesitate to reach out to us at [Shutterbee@webster.edu](mailto:Shutterbee@webster.edu)!



# Appendix

Cheat Sheet to the Shutterbee Protocol

Creator: Raven Ritrovato

## SHUTTERBEE

### Photo Survey Protocol

 **ALL BEES!**

 Between 10am - 3pm

 > 60° F, partly to mostly sunny

 Consistent path through your yard

 about 30 min. (record if go long or short)

 Submit 1 bee per observation in iNaturalist

Add photos from other angles

Add the following in “Note” or “Description”

Fly      Wasp






SBEE

,



TIME

,



PLANT



SAINT LOUIS  
UNIVERSITY



Webster  
UNIVERSITY



Saint Louis Zoo  
Animals Always™



Academy of Science  
St. Louis  
COMMUNITY SCIENCE & FIELD COLLECTING TRAINING APP



MISSOURI BOTANICAL GARDEN

# Cheat Sheet to Common St. Louis Bees

Creator: Raven Ritrovato



## Enabling “Continuous or Burst” on a Camera

This section will cover how to change your camera settings to take multiple photos in succession, helping you to photograph fast-moving bees!

### Featured Brands

[Canon](#): Continuous Shooting

[Nikon](#): Continuous Shooting

[Olympus](#): Sequential Shooting

### Other Brands

[Sony](#): Burst Mode

[Fujifilm](#): Continuous Shooting (CH/CL)

[Panasonic](#): Burst Mode

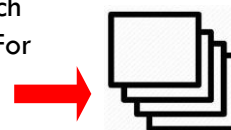
**Note:** your camera may not have these settings or differ from the instructions below. Check the links for instructions to your model.

Canon: Continuous Shooting

**For specific models, see Canon user manual:**

<https://www.usa.canon.com/internet/portal/us/home/support/camera-user-manual>

On the menu of your camera, find the Sequential Shooting icon, which looks like the stack seen here. The location will vary based on your model. For specifics to your camera model, see the user manual linked above. You may also hold down the shutter button when shooting to take multiple shots.



Nikon: Continuous Shooting

**For specific models, see Nikon user manual:** <https://downloadcenter.nikonimglib.com/en/index.html>

On the menu of your camera, find the Continuous Shooting icon, seen here. The location will vary based on your model. For specifics to your camera model, see the user manual linked above. You may also hold down the shutter button when shooting to take multiple shots.

### Olympus: Sequential Shooting

For specific models, see Olympus user manual:



[https://www.olympusamerica.com/cpg\\_section/cpg\\_download\\_manuals.asp](https://www.olympusamerica.com/cpg_section/cpg_download_manuals.asp)

On the menu of your camera, find the Sequential Shooting icon, which looks like the stack seen here. The location will vary based on your model but for some it is on the DOWN button pad. For specifics to your camera model, see the user manual linked above. You may also hold down the shutter button when shooting to take multiple shots.

### How to Use “Live” for iPhone

**Note: Older models may be slightly different.**

Look for the “bull’s eye” icon when you open up your camera app. **The location of this will vary depending on which iPhone you have.** When off, this icon will usually have a line through it. Tap on it to turn it on. You’ll know it’s on if it either turns yellow, or if the line through the icon goes away (**some will stay white depending on your iPhone version**).

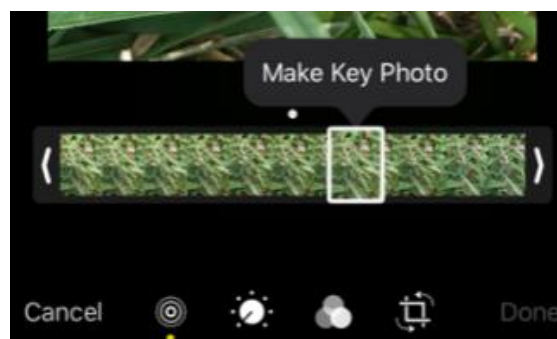
**Off:**



**On:**



After taking photos, you can go in and ‘edit’ the live photos to change your key photo. To do this, tap on the ‘edit’ option. Then, find the “bull’s eye” icon again and tap on it to edit the key photo. You can now swipe to scroll through until you find the best shot or angle! Once you’re on a shot that you like, tap on the “Make Key Photo” prompt. Then just tap “done” to save changes and move on to your next photos!



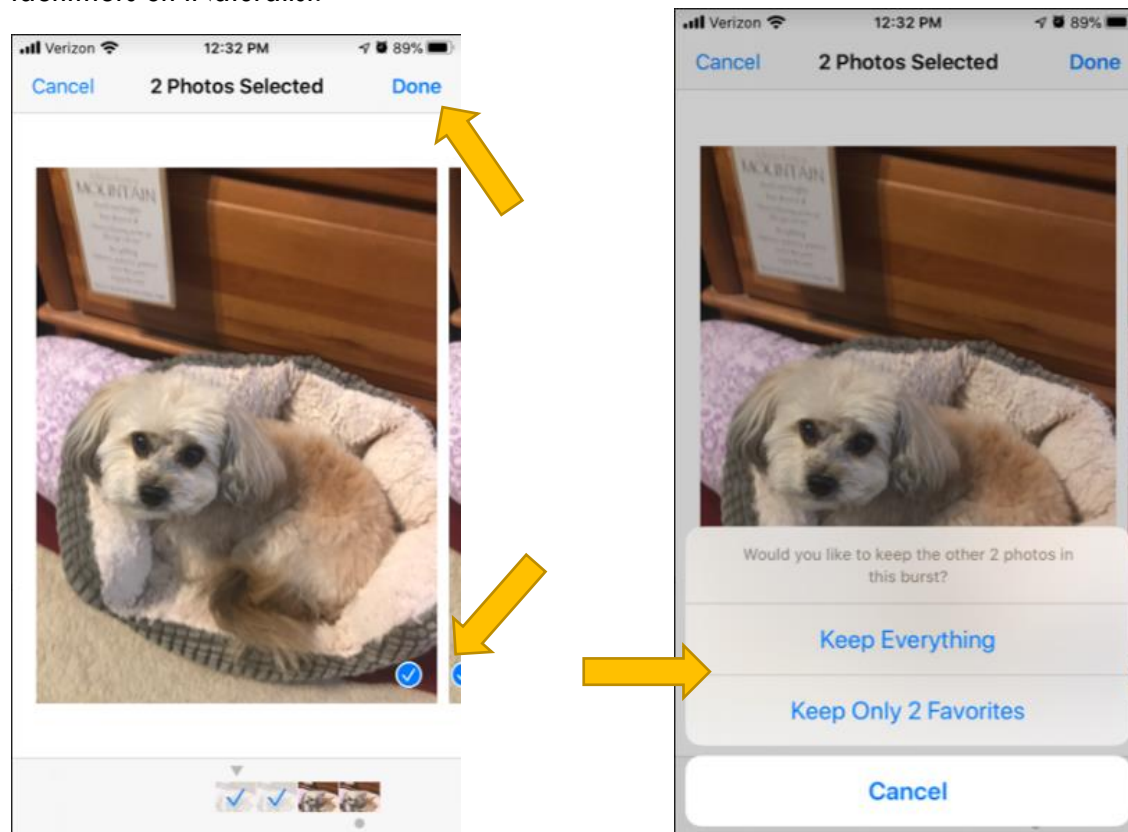
### Using Burst with iPhone

In addition to using the “Live” function on iPhones, you can also take “Burst” shots of the bees by **holding down the shutter button** for as long as you want to take photos rather than tapping it each individual time. Open your gallery and locate your burst images. They should be grouped together. Tap on the group you’d like to sort through and then tap on ‘Select.’ Now, you can look at each image to see which ones turned out the clearest. You can select photos by tapping on the circle in the bottom right of the photo. Selected photos should have indicators to show they’ve been selected (for example, blue checkmarks). Tap on ‘Done’ once your selections



are finished. Tap on “Keep Only Favorites” (number will vary) to finish selecting photos from this burst set. The rest of the photos will be deleted. Alternatively, you can select “Keep Everything” to keep all the images. They will then be separated so you can upload them all to iNaturalist.

It’s important to note that in Shutterbee we encourage you to upload all the photos of your bees, even the blurry ones, as often times even blurry bees can still be identified to genus. So even if you don’t think a photo turned out well it’s best to keep it in case it can be useful to identifiers on iNaturalist.



### Using “Motion” with Galaxy Phones

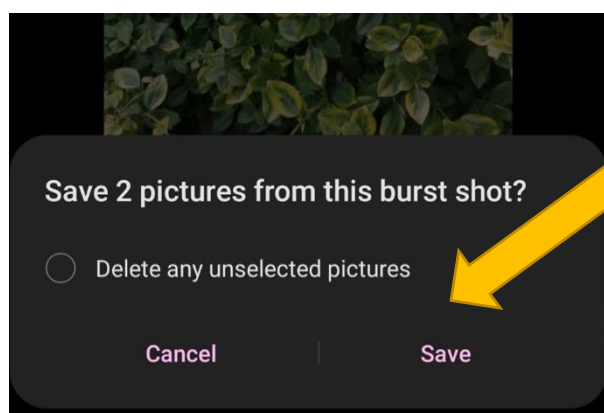
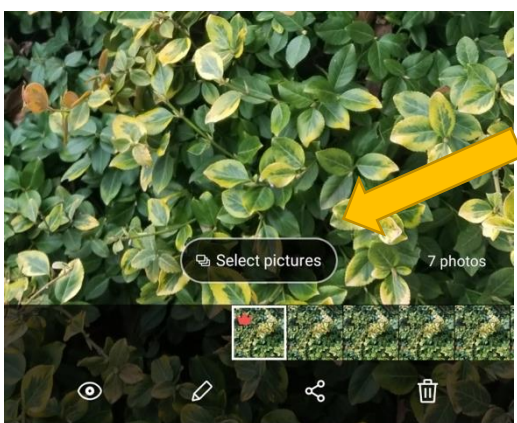
From your camera app settings, often located towards the top of the screen when you have your camera open, you can turn on the “Motion” function. This takes a short clip before the picture allowing you to select from multiple frames in the video. Depending on the type of phone you have, the picture selection will vary. Some models allow you to slide through each frame taken in the clip and select the best one. In models like this, you need to swipe up on the photo to view the clip taken by Motion. Once you find an image you want to keep, hit the “Save copy” button in the top right corner of the screen. Other models play a video that you pause to capture pictures from. In models with this feature, you will have a “View motion photo” button appear at the bottom of the screen. Select that to view the clip. When you find an image you want to save, tap the screen to pause it then select the “Capture” button in the top right corner to save the photo. Once you are finished selecting the best photos to download, you can then upload them to iNaturalist.

### Using Burst with Galaxy Phones

In addition to using the “Motion” function on Androids, you can also take “Burst” shots of the bees by **holding down the shutter button** for as long as you want to take photos rather than

tapping it each individual time. Burst shots and Motion cannot be used at the same time so you have to select which option works best for you. To use Burst shots, open your gallery and locate your burst images. They should be grouped together. Tap on the group you'd like to sort through and then tap on 'Select pictures.' Now, you can look at each image to see which ones turned out the clearest. You can select photos by tapping on them. Selected photos should have indicators to show they've been selected (for example, white checkmarks). Tap on the "save images" icon (a box with an arrow in it, indicated below) once your selections are finished. Tap on "save" (number will vary) to finish selecting photos from this burst set. The saved photos will then be separated so you can upload them all to iNaturalist.

If you want to delete the rest of the photos, then check the "delete any unselected photos" option. It's important to note that in Shutterbee we encourage you to upload all the photos of your bees, even the blurry ones, as often times even blurry bees can still be identified to genus. So even if you don't think a photo turned out well it's best to keep it in case it can be useful to identifiers on iNaturalist.



## iNaturalist Video Tutorials

<https://www.inaturalist.org/pages/video+tutorials>

[Adding an Observation on a Mobile Device](#)

[Adding an Observation via the Web](#)

[How to Take Identifiable Photos](#)

[How to Use the Identify Page](#)

[Geotagging DSLR Photos in the Field](#)

[Duplicating an Observation](#)

[Adding a photo or sound to an Observation](#)

[Exploring Observations with iNaturalist](#)

## Bee Keys/Guides

In addition to the [Shutterbee Bee Guide](#), we list various identification guides and keys below. There are also supplementary readings for anyone interested in learning even more about bees!

### Infographics

S Cameron, H Hines, J Sinn-Hanlon, and E Spevak. (2016) Key to Female and Male Bumble Bees of Illinois, Missouri, Indiana, & Ohio [Infographic]. Retrieved from [https://beepotter.org/topics/key/bumble\\_bee\\_key.html](https://beepotter.org/topics/key/bumble_bee_key.html)

A Moorehouse. (2020) Common Wild Bee Genera of Illinois, USA [Infographic]. Illinois Nature Preserves Commission. Retrieved from [https://drive.google.com/file/d/15\\_rOjt1sUwSB2q4YY4Q5xcGmohjthPyj/view](https://drive.google.com/file/d/15_rOjt1sUwSB2q4YY4Q5xcGmohjthPyj/view)

S Prajzner and M Gardiner. Bee Identification Guide [Infographic]. Retrieved from [https://www.wcparks.org/wp-content/uploads/2017/03/Bee\\_Guide3\\_2013.pdf](https://www.wcparks.org/wp-content/uploads/2017/03/Bee_Guide3_2013.pdf)

EM Spevak and M Arduser. Missouri Bee Identification guide [Infographic]. Retrieved from [https://www.stlzoo.org/files/9413/3303/3161/MO\\_Bee\\_Guide\\_w\\_boarder.pdf](https://www.stlzoo.org/files/9413/3303/3161/MO_Bee_Guide_w_boarder.pdf)

### Online guides

Bee Mimics: What is (and isn't) a bee? BeeSpotter project: <https://beepotter.org/topics/mimics/>

S Colla, L Richardson, and P Williams. (2011) Bumble Bees of the Eastern United States. USDA Forest Service and Pollinator Partnership Publication: <https://www.fs.fed.us/wildflowers/pollinators/documents/BumbleBeeGuideEast2011.pdf>

J Fowler and S Droegge. (2020) Pollen Specialist Bees of the Eastern United States. [https://jarrodfowler.com/specialist\\_bees.html](https://jarrodfowler.com/specialist_bees.html)

B Moisset and S Buchmann. (2011) Bee Basics: An Introduction to Our Native Bees. USDA Forest Service and Pollinator Partnership Publication: [https://efotg.sc.egov.usda.gov/references/public/SC/Bee\\_Basics\\_North\\_American\\_Bee\\_1\\_D.pdf](https://efotg.sc.egov.usda.gov/references/public/SC/Bee_Basics_North_American_Bee_1_D.pdf)

Native Bee Inventory and Monitoring Lab. USGS: [https://www.usgs.gov/centers/pwrc/science/native-bee-inventory-and-monitoring-lab?qt-science\\_center\\_objects=0#qt-science\\_center\\_objects](https://www.usgs.gov/centers/pwrc/science/native-bee-inventory-and-monitoring-lab?qt-science_center_objects=0#qt-science_center_objects)

Pollinators. U.S. Forest Service: <https://www.fs.fed.us/wildflowers/pollinators/>

A Schnebelin, M Spring, and D Ellsworth. (2020) Bees of Ohio: A field Guide. *North American Native Bee Collaborative*: <https://cpb-us-w2.wpmucdn.com/u.osu.edu/dist/2/86606/files/2020/06/Bees-of-Ohio-A-Field-GuideV1.1.1.pdf>

M Shepherd. (2019) Xeres Classroom: North American Bee Diversity and Identification. Xeres Society: <https://www.youtube.com/watch?v=sOKGLn304s>

Xeres Society YouTube Page. <https://www.youtube.com/channel/UCAiPLPJuySOgn6CbjkOxqLQ>

### Books

H Holm. Bee and Pollinator Books by Heather Holm. <https://www.pollinatorsnativeplants.com/>

JS Wilson and OM Carril. (2015) *The Bees in Your Backyard: A guide to North America's Bees*. <https://press.princeton.edu/books/paperback/9780691160771/the-bees-in-your-backyard>

### Further Reading

Bee Issues. Pollinator Partnership Website: <https://www.pollinator.org/learning-center/bee-issues>

N Blüthgen and A Klein. (2011) Functional complementarity and specialization: The role of biodiversity in plant-pollinator interactions. *Basic and Applied Ecology*: 10.1016/j.baae.2010.11.001

A Burr, N Schaege, P Muñiz, GR Camilo, DM Hall. (2016) Wild Bees in the City: Reimagining Urban Spaces for Pollinator Health. *Columbia University*: <https://academiccommons.columbia.edu/doi/10.7916/D8GH9PNR>

SA Cameron, JD Lozier, JP Strange, JB Koch, N Cordes, LF Solter, TL Griswold. (2011) Patterns of widespread decline in North American bumble bees. *PNAS*: <https://doi.org/10.1073/pnas.1014743108>

G Camilo and E Spevak. (2017) A Checklist of the Bees (Hymenoptera: Apoidea) of St. Louis, Missouri, USA. *Journal of the Kansas Entomological Society*: 10.2317/0022-8567-90.3.175

MM Gardiner, CE Burkman, SP Prajzner. (2013) The Value of Urban Vacant Land to Support Arthropod Biodiversity and Ecosystem Services. *Environmental Entomology*: <https://doi.org/10.1603/EN12275>

RJ Gill, O Ramos-Rodriguez, NE Raine. (2012) Combines pesticide exposure severely affects individual- and colony-level traits in bees. *Nature*: <https://doi.org/10.1038/nature11585>

D Goulson, E Nicholls, C Botías, and EL Rotheray. (2015) Bee declines driven by combines stress from parasites, pesticides, and lack of flowers. *Science*: 10.1126/science.1255957.

H Gregory. (2019) Bees of Missouri. Washington University in St. Louis: <https://sites.wustl.edu/monh/bees-of-missouri/>

AS Hadley and MG Betts. (2011) The effects of landscape fragmentation on pollination dynamics: absence of evidence not evidence of absence. *Biological Reviews*: <https://doi.org/10.1111/j.1469-185X.2011.00205.x>

DM Hall, GR Camilo, RK Tonietto, J Ollerton, K Ahrné, M Arduser, et al. (2016) The city as a refuge for insect pollinators. *Conservation Biology*: <https://doi.org/10.1111/cobi.12840>

IPBES. (2016) The assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on pollinators, pollination and food production. <https://doi.org/10.5281/zenodo.3402856>

- JT Kerr, A Pindar, P Galpern, L Packer, SG Potts, SM Roberts, et al. (2015) Climate change impacts on bumblebees converge across continents. *Science*: 10.1126/science.aaa7031
- Native Bees. Illinois Department of Natural Resources:  
<https://www2.illinois.gov/dnr/education/Pages/PollinatorNativeBees.aspx#:~:text=How%20many%20types%20of%20native,of%20native%20bees%20in%20Illinois.>
- G Parham and T Smith. (2017) In a race against extinction, rusty patched bumble bee is listed as endangered. *U.S. Fish & Wildlife Service Newsroom*:  
<https://www.fws.gov/midwest/news/861.html>
- SG Potts, JC Biesmeijer, C Kremen, P Neumann, O Schweiger, WE Kunin. (2010) Global pollinator declines: trends, impacts and drivers. *TREE*: <https://doi.org/10.1016/j.tree.2010.01.007>
- Publications Library. Xerces Society for Invertebrate Conservation:  
<https://www.xerces.org/publications>
- MC Otterstatter and JD Thomson. (2008) Does Pathogen Spillover from Commercially Reared Bees Threaten Wild Pollinators? *PLOS One*:  
<https://doi.org/10.1371/journal.pone.0002771>
- JR Reilly, DR Artz, D Biddinger, K Bobiwash, NK Boyle, C Brittain, et al. (2020) Crop production in the USA is frequently limited by a lack of pollinators. *Proceedings of the Royal Society B: Biological Sciences*: <https://doi.org/10.1098/rspb.2020.0922>
- P Soroye, T Newbold, and J Kerr. (2020) Climate change contributes to widespread declines among bumble bees across continents. *Science*: 10.1126/science.aax8591
- P Williams and JL Osborne. (2009) Bumblebee vulnerability and conservation world-wide. *Apidologie*: 10.1051/apido/2009025
- SH Woodard. (2017) Bumble bee ecophysiology: Integrating the changing environment and the organism. *Current Opinion in Insect Science*:  
<http://dx.doi.org/10.1016/j.cois.2017.06.001>
- BA Woodcock, JM Bullock, RF Shore, MS Heard, MG Pereira, J Redhead, et al. (2017) Country-specific effects of neonicotinoid pesticides on honey bees and wild bees. *Science*: 10.1126/science.aaa1190