



# BUMBLE BEE BRIGADE

## Volunteer Manual

[wiatri.net/inventory/bbb](http://wiatri.net/inventory/bbb)



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## Mission Statement

The mission of the Bumble Bee Brigade is to improve our understanding, management, and conservation of Wisconsin bumble bees.

## Objectives

- Develop an accurate map of species distributions
- Identify species-habitat associations
- Assess habitat conditions and determine conservation threats
- Determine baseline population status and monitor trends over time

## Contact Information

<https://wiatri.net/inventory/bbb>

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## Why bumble bees?

In Wisconsin and throughout the world, many bumble bee species are in decline. Of the twenty bumble bee species that are found or have been found historically in Wisconsin, one is listed as federally endangered, seven are considered state species of greatest conservation need (SGCN), and an additional three are classified by the state as species with information needs (SIN).

Much remains unknown about the distribution and biology of all Wisconsin's bumble bee species. Accurate information on species distributions, habitat requirements (especially overwintering habitat), phenology, and population status are needed to improve conservation planning and management actions.

Bumble bees play an important role as pollinators in both natural and agricultural ecosystems. When bumble bees pollinate food crops like tomatoes, peppers, cranberries, or blueberries, they increase crop yield and provide a significant benefit to food production and the economy. When bumble bees pollinate native plants, they assist the plant in reproducing and help to maintain a healthy ecosystem.

Furthermore, part of DNR's mission is to protect and enhance our natural resources. That includes protecting and managing native species, enhancing and restoring populations and habitats of rare and endangered species, and promoting knowledge, appreciation, and stewardship of those species. Regardless of the importance of bumble bees as pollinators we are tasked with protecting and managing them, and we are pleased to partner with the public to do so.

Table 1. Wisconsin Bumble Bee Species and Their Conservation Status

Species	Common Name	Status <sup>1</sup>
<i>Bombus affinis</i>	rusty patched bumble bee	Endangered
<i>Bombus auricomus</i>	black and gold bumble bee	
<i>Bombus bimaculatus</i>	twospotted bumble bee	
<i>Bombus bohemicus</i>	Ashton's cuckoo bumble bee	SIN
<i>Bombus borealis</i>	northern amber bumble bee	
<i>Bombus citrinus</i>	lemon cuckoo bumble bee	
<i>Bombus fervidus</i>	yellow bumble bee	SC/SGCN
<i>Bombus flavidus</i>	Fernald cuckoo bumble bee	SIN
<i>Bombus frigidus</i>	frigid bumble bee	SC/SGCN
<i>Bombus griseocollis</i>	brownbelted bumble bee	
<i>Bombus impatiens</i>	common eastern bumble bee	
<i>Bombus insularis</i>	indiscriminate cuckoo bumble bee	SC/SGCN
<i>Bombus pensylvanicus</i>	American bumble bee	SC/SGCN
<i>Bombus perplexus</i>	confusing bumble bee	SC/SGCN
<i>Bombus rufocinctus</i>	redbelted bumble bee	
<i>Bombus sandersoni</i>	Sanderson bumble bee	SC/SGCN
<i>Bombus ternarius</i>	tricolored bumble bee	
<i>Bombus terricola</i>	yellow-banded bumble bee	SC/SGCN
<i>Bombus vagans</i>	half-black bumble bee	
<i>Bombus variabilis</i>	variable cuckoo bumble bee	SIN

<sup>1</sup>Status:

**Endangered**- federally listed as endangered under the Endangered Species Act and listed as SC/SGCN in Wisconsin

**SC/SGCN**- listed as state special concern by the Wisconsin DNR and designated a species of greatest conservation need in the Wisconsin Wildlife Action Plan

**SIN**- designated a species with information needs in the Wisconsin Wildlife Action Plan

## **Bumble Bee Biology**

### **Colonies**

Bumble bees live in colonies with an annual life cycle. Only new bumble bee queens (called gynes) survive into the winter months. The queens are inactive throughout the winter and spend it burrowed into the soil or woody debris; because they are relatively inconspicuous over the winter, much remains unknown about overwintering timing and habitat. Early in the spring, the queens emerge and begin collecting nectar and pollen and searching for a place to nest. Bumble bees nest in holes or burrows in a variety of substrates, including animal burrows, hollow logs, and aboveground in human-made structures. The queen deposits a mixture of nectar and pollen into the nest and lays eggs on it. These eggs eventually develop into female worker bees who take over foraging for nectar and pollen while the queen remains in the nest and continues to lay eggs. In mid to late summer, queens produce males and new queens. These mate, and the mated queen overwinters to start the colony cycle anew in the spring.

Some bumble bees, called cuckoos, do not create and maintain their own colonies. Instead, they enter the nests of other bumble bee species (hosts) and lay eggs there. The host colony's worker bees feed and care for the cuckoo eggs, and eventually new adults of the cuckoo species, which are only queens and males, are produced.

### **Pollination**

Bumble bees eat both nectar and pollen. When they visit flowers to collect pollen, it sticks to the bees' bodies and they carry it with them to subsequently visited flowers. There is a chance that they will deposit pollen from one flower into the next, and when that happens when visiting flowers of the same species, it allows the plants to reproduce sexually. Bumble bees pollinate native flowers, garden plants, and agricultural crops.

## Project Description

### Overview

The Wisconsin Bumble Bee Brigade is a photography-based bumble bee monitoring project. As a volunteer, you will submit photos and additional information on the bumble bees that you observe. There are two ways that you can contribute (additional options might be available in future years): incidental observations and small area surveys. Both require photo vouchers.

**Small area surveys** are conducted when you purposefully look for, photograph, count, and record the bumble bees that you see at a single location, following the guidelines in this manual.

**Incidental observations** are basic, casual, or unplanned sightings made when your primary motive or activity was not monitoring for bumble bees or you were unable to complete a small area survey. This includes observations made immediately before or after a small area survey. They are a good way for new volunteers to participate as they develop their skillset.

For both small area surveys and incidental observations, there are three main steps to participate in the Bumble Bee Brigade (Figure 1). First, you will survey (or observe) bumble bees. This includes searching for, photographing, and counting (for small area surveys) bees. Second, you will curate your photos, by selecting the best images for identification purposes, zooming and cropping the photos to focus on the bees, and attempting to identify the species photographed. Third, you will submit your data, including photos, to the Bumble Bee Brigade's website.

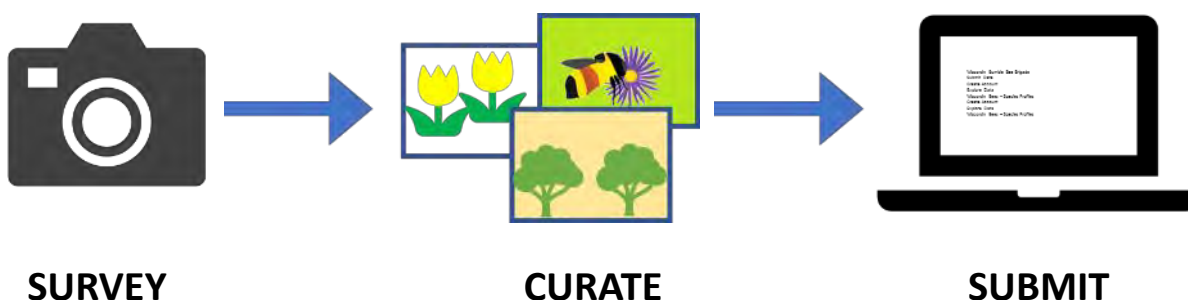


Figure 1. The three steps to participating in the Bumble Bee Brigade: survey for bumble bees, curate photos, and submit data and photos online.

## Surveys

You can conduct a survey by searching an area for bumble bees, tallying (counting) each bumble bee that you observe, and photographing each bumble bee morph that you observe. Use the field guide to identify species in the field. One set of photo vouchers is required per morph per survey. Submitted photos should be of the same individual.

**Bumble bee morphs** are visually distinct groupings that will help you count bees in the field. When you are conducting a bumble bee survey, you will not always be able to identify the species of each individual bumble bee that you see. In some cases, identification will need to wait until you can zoom in on a photograph after your survey is complete. Other times, you will be too busy counting and photographing bees to search through your field guide or an identification book to determine species. In those cases, categorizing the bees you see into morphs based on their appearance to the naked eye will simplify your surveys.

Morphs are based on color pattern and other easily distinguishable features, such as number of abdominal segments, or presence of corbicula (a flat area on a female's hindleg used to transport pollen, also called a pollen basket), and size. Males and females of the same species should be recorded as different morphs, as should individuals of the same species and sex that display different color patterns. During the data submission process, multiple morphs of the same species and sex are submitted as one observation. Figure 2 depicts four different morphs of *Bombus rufocinctus*.

**NOTE: This project does not include any handling of bumble bees. Please do not attempt to touch, pick up, or capture a bumble bee in order to acquire a better photo or for any other reasons.**



Figure 2. Four possible morphs of *Bombus rufocinctus*, including two females (left) and two males (right). Graphics by Elaine Evans, UMN Bee Lab.



## Small Area Surveys

### Overview

In a small area survey, you will tally the number of bees of each morph that you observe in an area with a 30m (~100ft) diameter. This is easiest when done with a partner or in a small group.

### Searching and Tallying

#### 1. Select a site location and a survey location

First select the site, or the general location you will monitor. You can monitor bumble bees anywhere in Wisconsin, as long as you have permission to access the land. One of the project objectives is to learn more about bumble bee habitat preferences and needs, so we need volunteers to monitor sites of many different types and qualities of habitats.

Within a site, select a specific survey location. Your small area survey should encompass an area 30m in diameter. You can move around within that area to look for and report bumble bees. The area can be a part of a larger site (Figure 3), but you should not survey more than the 30m diameter area. If part of a larger site, select a survey area that is safely accessible and contains nectar plants, with the highest likelihood of finding bumble bees. Avoid locations at which your ability to see bees is heavily obstructed.

**Sites** are a general location, such as a public park, State Natural Area, or street address.

**Survey locations** are the specific place where you conducted your small area survey. For instance, if your site is your property at 100 S Main St., the survey location might be the north yard.

If you want to conduct multiple surveys within the same general site, make sure that the borders of each survey location are at least 100m from each (Figure 4). At very small sites, like a small city lot, the survey location may take up the entire site. If your survey area is partially obstructed by an object like a shed or a paved path, you may still conduct a small area survey if that is the best location available. Simply survey all the space available. (Figure 5).

#### 2. Select a survey time

Surveys can be completed April through October during daylight hours. Avoid monitoring during rain, high winds, or severe weather. Bumble bees can fly at low temperatures, so surveys can be conducted at temperatures even in cool weather. At lower temperatures, bees will be slightly slower, making them easier to photograph.

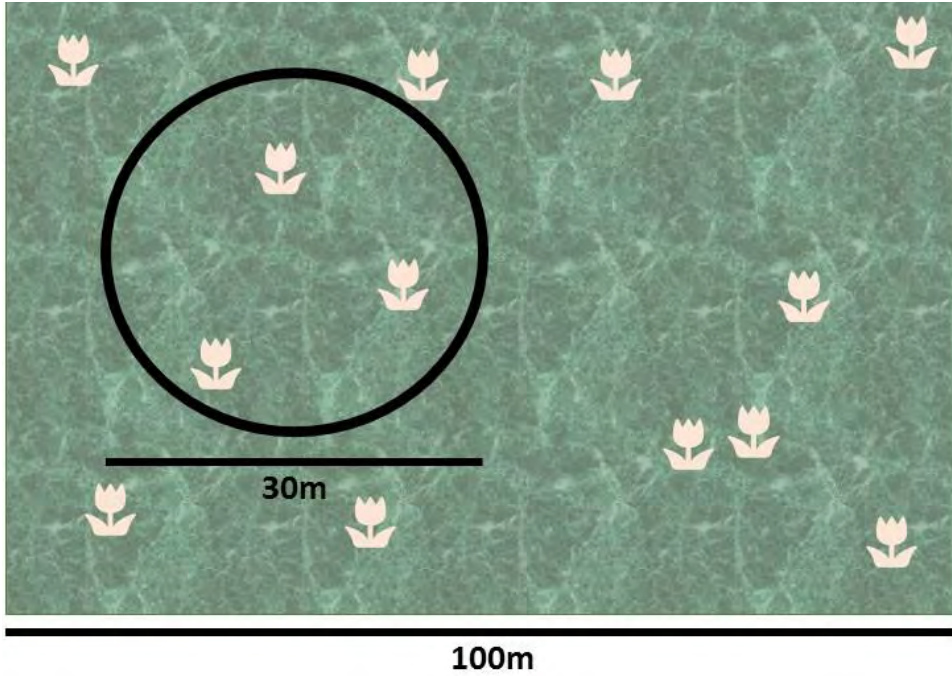


Figure 3. A small area survey (black circle) located within a larger site.

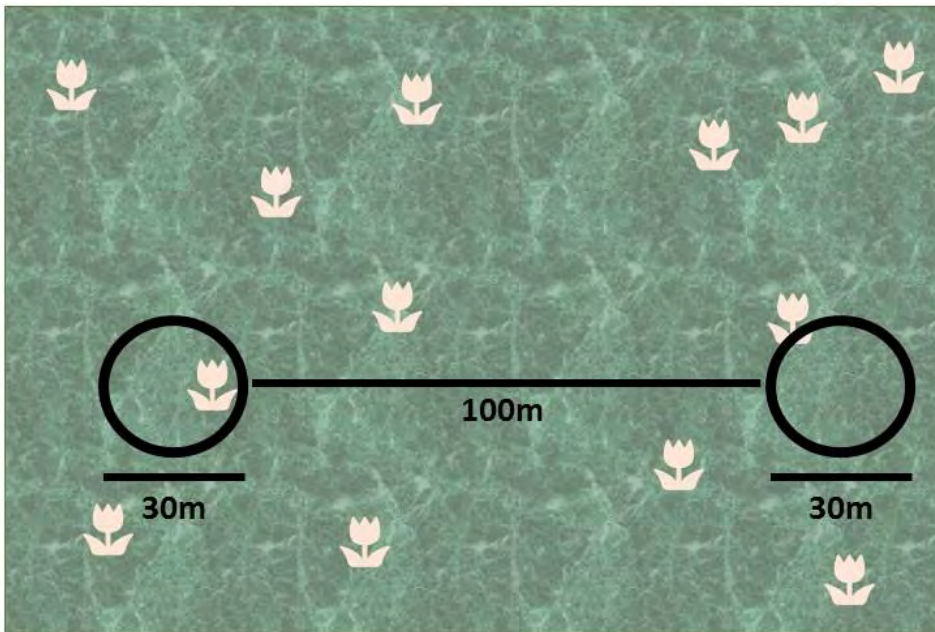


Figure 4. Two small area surveys (black circles) located within a larger site. Surveys must be at least 100m apart.

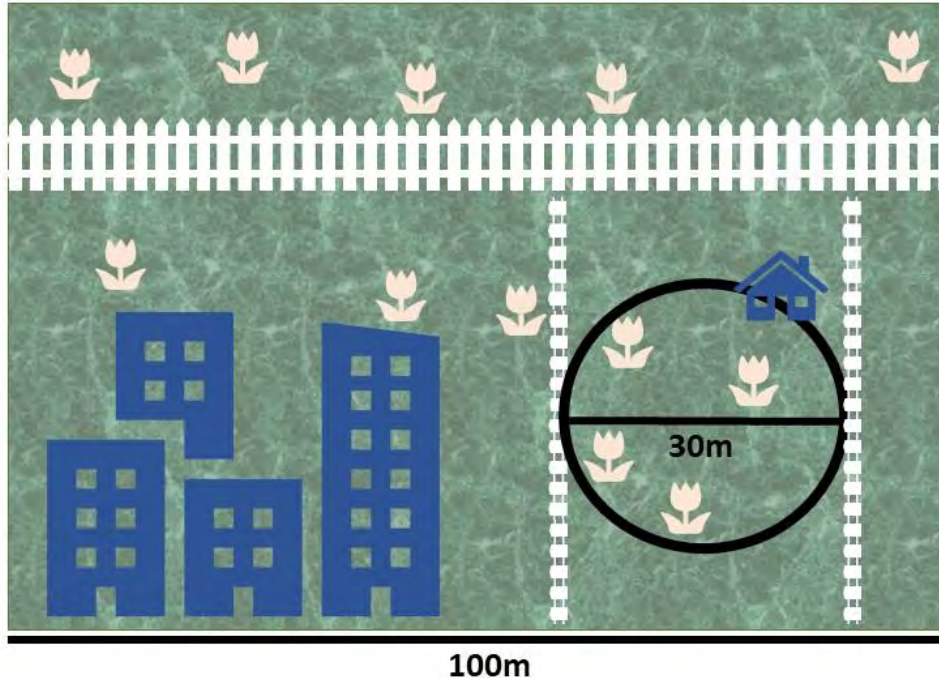


Figure 5. A small area survey (black circle) in a site in which some of the area is occupied by a structure but the entire area is accessible/viewable.

### 3. Record basic survey information

At the top of the datasheet, you are asked for some basic information about your survey.

- Primary Observer: The name of the individual who is making the majority of the observations
- Additional Observers: The name(s) of any other individuals who are conducting the survey
- Date: The date that you surveyed for bumble bees, including the day, month, and year
- Start Time: The time at which you began looking for bumble bees, including am or pm
- End Time: The time at which you stopped looking for bumble bees, including am or pm
- Site Name: The name of the location you are surveying, such as James Madison Park Rain Garden, Rush Lake State Natural Area, or Smith Residence
- Latitude: Your location north or south of the equator, e.g. 43.064430
- Longitude: Your location east or west of the Prime Meridian, e.g. -89.546194
- Details to Help Relocate Site: Street address and/or enough details to help someone relocate your surveying location. If your survey location is part of a larger area, include directions on how to reach it and any landmarks to identify it
- Land Use/Habitat: The primary land use or habitat type included in your survey location (Table 2)

Table 2. Land Use/Habitat Types

Land Use/Habitat Type	Description
Agricultural	Land under cultivation for food or fiber. Includes active crop land, pastures, hayfields, orchards, commercial nurseries, and cranberry bogs.
Forest	An upland area of land covered with woody perennial plants, the tree reaching a mature height of at least 6 feet tall with a definite crown. Includes, deciduous forests, coniferous forests, mixed forests, woodlots or plantations, and forest gaps.
Grassland/Shrubland	Lands covered by non-cultivated herbaceous vegetation predominated by grasses, grass-like plants, or forbs. Includes prairie, savanna, old fields, surrogate grasslands, and shrubland.
Wetlands	An area with water at, near or above the land surface long enough to be capable of supporting aquatic or water-loving vegetation, and which has soils indicative of wet conditions. Includes forested and non-forested wetlands.
Shoreline	Land immediately adjacent to bodies of water, including lakes, ponds, reservoirs, rivers, streams, and Great Lakes beaches and dunes.
Urban/Suburban/Rural Development	Structures and areas associated with intensive human activity and land use, including small city parks, small prairie plantings, gardens, yards, vacant lots, and golf courses.
Right-of-way	Land immediately adjacent to roads, paths, railroads, pipelines, and power lines.

#### 4. Survey for bumble bees

When you are ready to begin your survey, record your start time and begin looking for bumble bees. On the datasheet, record the number of each morph (each type of bumble bee that looks different based on color pattern, size, and shape) that you see by placing a tally on the datasheet. For each new morph that you observe, take photographs of the face, side, and dorsal view. To make it easier to match the morph that you observe with the photos you take, consider recording the photo file name, the time stamp, or other information to connect your photo to the morph.

The datasheet has two options for recording your bumble bee observations. On page 1, you can either write the name of the bumble bee species and caste (queen, worker, drone) that you are observing, or sketch or write a description of the morph. Then place a tally in the number column each time you see an individual bee of that morph (Figure 6A). If you observe a bumble bee nest, please record it on the bottom of page 1. If possible, photograph bees leaving or entering the nest. Provide a description of the nest location and features in the Description field.

On page 2, you are provided with a graphics of the state's known bumble bees. Be aware that many species have some variation in their color patterns; the datasheet provides the most common variation. To record your observations on this page, simply place a tally beneath the graphic that looks like the bee you have observed. Keep a separate tally for queens, females (workers or females that can't be distinguished as workers or queens), and males. You can use the notes space to record photo file name, time stamp, or other details (Figure 6B).

You are welcome to use a combination of page 1 and page 2. For instance, you might record most of your observations on page 2 but then see a bee that doesn't quite match any of the graphics on that page. In that case, you can describe it on page 1 and place your tally there. Be sure to only record one tally for each bee, either on page 1 or page 2; do not place a tally on both pages for the same bee.

The summary sheet will help you compile the information on your datasheet into a simple summary of the information that you will submit online. When you submit your data, for each species that you observed, you will be asked for:

- number of males
- number of females (workers and unknown females)
- number of queens
- if any nests were observed

**NOTE: If you conduct a survey and do not see any bumble bees, please still enter your survey information online. We need to know where people are looking for bees but not finding them.**

Figure 6 provides an example of how to complete a datasheet. In this example, two observers conducted a survey at Tenney Park and observed two female *B. impatiens*, one female *B. pensylvanicus*, three individuals of a morph they were unable to identify in the field, and one *B. impatiens* nest.

On Page 1 of the datasheet (Figure 6A), the observers have entered all the basic survey information along the top, including details to re-find the survey location and the land use/habitat type. Under Bumble Bee Observations, one unknown *Bombus* morph is described. The observers have noted that the morph was female, described the color pattern, and recorded seeing three individuals of this morph. Under additional notes, they have recorded the photo numbers (or file names) associated with that morph. At the bottom of the sheet, the observers have noted that they observed one *B. impatiens* nest.

On Page 2 of the datasheet (Figure 6B), the observers have recorded seeing two female *B. impatiens* and one *B. pensylvanicus*, along with the photo numbers for those observations.

After completing the survey, the observers identified the unknown female morph as *B. rufocinctus* and selected the images that best depict the head, dorsal, and side views of each morph. The summary sheet reflects the tallies for each species and caste, the presence of the nest, and the images to be uploaded to the Bumble Bee Brigade website. The observers did not determine if the females seen were workers or queens (although likely queens given the time of year), so the queen column is left blank.

A survey with only a few observations might not require the use of the summary sheet, but it can be very valuable in organizing and summarizing results for surveys with many observations.



























































Small Area Survey Datasheet- Page 1

Primary Observer: <i>Eva Lewandowski</i>		Additional Observers: <i>Jay Watson</i>	
Date: <i>5/1/18</i>	Start Time: <i>8:05 am</i>	End Time: <i>8:55 am</i>	
LOCATION			
Site Name: <i>Tenney Park</i>		Details to find survey location: <i>from Thornton Ave Parking, travel W to central island, survey on SE side of island.</i>	
Latitude (DD):	Longitude (DD):		
Agricultural <input type="checkbox"/> ; Forest <input type="checkbox"/> ; Grassland/Shrubland <input type="checkbox"/> ; Wetland <input type="checkbox"/> ; Shoreline <input type="checkbox"/> ; Urban/Suburban/Rural Development <input checked="" type="checkbox"/> ; Right-Of-Way <input type="checkbox"/>			
BUMBLE BEE OBSERVATIONS			
Species & Caste (if known)	Morph Description (color pattern, size, shape)	Number (e.g., 3 or III)	Additional Notes to help with ID (nectar plants, photo name/numbers)
<i>Female unknown</i>	<i>- black face, yellow vertex - yellow, red, and black on abdomen</i>	<i>III</i>	<i>photos 2-9, 15-19, 23-26</i>
<input checked="" type="checkbox"/> Bumble bee nest observed	Species: <i>impatiens</i>	Description: <i>small tussock of grass near log</i>	

Submit survey data to Wisconsin Bumble Bee Brigade – <http://wiatri.net/inventory/bbb>

Figure 6A. Page 1 of the datasheet.

Small Area Survey Datasheet- Page 2

<b><i>B. affinis</i></b> (Rusty Patched)			<b><i>B. auricomus</i></b> (Black and Gold)			<b><i>B. bimaculatus</i></b> (Twospotted)			<b><i>B. bohemicus</i></b> (Ashton's Cuckoo)		
											
Queens	Females	Males	Queens	Females	Males	Queens	Females	Males	Queens	Females	Males
notes			notes			notes			notes		
<b><i>B. borealis</i></b> (Northern Amber)			<b><i>B. citrinus</i></b> (Lemon Cuckoo)			<b><i>B. fervidus</i></b> (Yellow)			<b><i>B. flavidus</i></b> (Female Cuckoo)		
											
Queens	Females	Males	Queens	Females	Males	Queens	Females	Males	Queens	Females	Males
notes			notes			notes			notes		
<b><i>B. frigidus</i></b> (Frigid)			<b><i>B. griseocollis</i></b> (Brownbelled)			<b><i>B. impatiens</i></b> (Common Eastern)			<b><i>B. insularis</i></b> (Indiscriminate Cuckoo)		
											
Queens	Females	Males	Queens	Females	Males	Queens	Females	Males	Queens	Females	Males
notes			notes			notes photos 10-14, 20-22 nests			notes		
<b><i>B. pensylvanicus</i></b> (American)			<b><i>B. perplexus</i></b> (Confusing)			<b><i>B. rufocinctus</i></b> (Redbelled)			<b><i>B. sandersoni</i></b> (Sanderson's)		
											
Queens	Females	Males	Queens	Females	Males	Queens	Females	Males	Queens	Females	Males
notes photos 27-33			notes			notes			notes		
<b><i>B. ternarius</i></b> (Tricolored)			<b><i>B. terricola</i></b> (Yellowbanded)			<b><i>B. vagans</i></b> (Half-black)			<b><i>B. variabilis</i></b> (Variable Cuckoo)		
											
Queens	Females	Males	Queens	Females	Males	Queens	Females	Males	Queens	Females	Males
notes			notes			notes			notes		

Submit survey data to Wisconsin Bumble Bee Brigade – <http://wiatri.net/inventory/bbb>

Figure 6B. Page 2 of the datasheet.





# BUMBLE BEE BRIGADE

**Summary Sheet:** After you have identified the bees in your survey photos, use this sheet to summarize your observations before submitting the data online.

Survey Date 5/18 Site Name Tenney Park

Species (scientific name, common name)	Number of Males	Number of Females	Number of Queens	Nest (Y/N)	Photo Name/ID
<i>B. affinis</i> , rusty patched					
<i>B. auricomus</i> , black and gold					
<i>B. bimaculatus</i> , twospotted					
<i>B. bohemicus</i> , Ashton's cuckoo					
<i>B. borealis</i> , northern amber					
<i>B. citrinus</i> , lemon cuckoo					
<i>B. fervidus</i> , yellow					
<i>B. flavidus</i> , Fernald cuckoo					
<i>B. frigidus</i> , frigid					
<i>B. griseocollis</i> , brown-belted					
<i>B. impatiens</i> , common eastern		11		Y	20-22
<i>B. insularis</i> , indiscriminate cuckoo					
<i>B. pensylvanicus</i> , American		1			27, 30, 31
<i>B. perplexus</i> , confusing					
<i>B. rufocinctus</i> , redbelted		111			15-19
<i>B. sandersoni</i> , Sanderson's					
<i>B. ternarius</i> , tricolored					
<i>B. terricola</i> , yellowbanded					
<i>B. vagans</i> , half-black					
<i>B. variabilis</i> , variable cuckoo					
Unknown <i>Bombus</i> 1					
Unknown <i>Bombus</i> 2					
Unknown <i>Bombus</i> 3					

Figure 6C. The summary sheet.

## 5. Counting Bees

- Tally bees according to morph.
- Take photos of one or a few bees of each morph; don't photograph every single bee.
- Do your best to avoid double-counting or skipping bees; some error is expected, especially when many bees are present. Aim for 90-100% accuracy in your counts.
- Report as incidental observations if you are not confident in your counts.

## Incidental Observations

There may be times when you are not conducting a small area survey that you observe and photograph a bumble bee. Please submit those records as incidental observations. If you photograph a bee just outside your survey area, submit it as an incidental observation.

Volunteers who are new to photographing bumble bees can benefit from practicing by taking and submitting incidental observations, before they attempt to both tally and photograph bees for the small area survey.

## Choosing Between Incidental Observations & Small Area Surveys

Both incidental observations and small area surveys provide useful information about bumble bees. More information is provided by small area surveys, but it is not always possible to complete one. Follow this guidance when choosing between small area surveys and incidental observations.

### **Choose Incidental Observations when any of the following apply:**

- Still learning to sort bees into morphs in the field
- Don't have enough people power to count the bees present
- Can't access a full 30m diameter circle
- Short on time

### **Choose Small Area Surveys when all of the following apply:**

- Able to sort bees into morphs in the field
- Have enough people power to count the bees present
- Can fully access a 30m diameter circle
- Have the time to complete a survey

## Photography tips

*Adapted from “Tips for Documenting Bumble bees with Photography,” by Susan Carpenter, UW- Madison Arboretum*

If you are calm and the bees are nectaring and/or collecting pollen, you can be quite close without disturbing them. I’ve never been stung while photographing bees. (The males cannot sting.) Bees are slower in cool weather, so photographing them is often easier on cool days or early in the morning.

With my camera, I use macro setting and 200mm lens, auto exposure, and auto focus. Experiment with your camera setup to see what works best for you. Take the photos at high resolution so that you can crop images and enlarge images to see the key features. Sometimes even a fuzzy photo can allow you to identify the bee.

Take a series of photos of the bee as it moves around on the flowers: try to get at least a clear dorsal (top) view, side view, and view of the face, Figure 7.

After taking photos of one bee, take a “spacer” photo (for example, of the ground or your hand), so that you know that the next set of photos is a different individual. Or you can take a photo of the datasheet, with your pen or finger pointing to the line corresponding to the morph you just photographed. You might also want to record the photo file names or the time stamps on your datasheet as you take them.



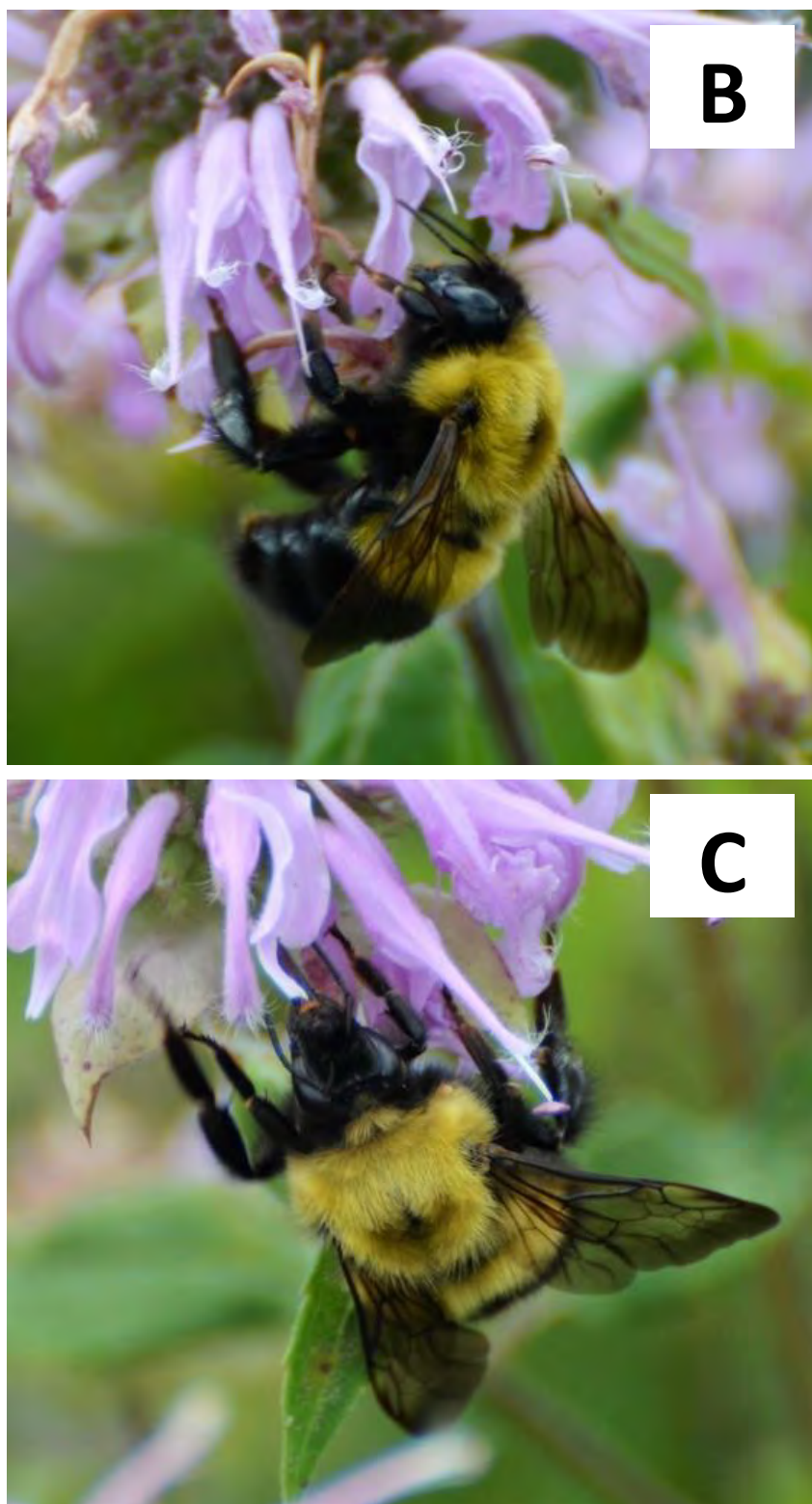


Figure 7. When possible, take dorsal (a), side (b) and head (c) photographs to maximize the potential of species identification.

## Bumble Bee ID

When identifying bees in the field or from photographs taken in the field, it's important to be familiar with several key parts of bumble bee anatomy (Figure 8). Looking for differences in these features will help you identify bees.

**The head** is the foremost part of the bee that contains the mouth, eyes, and antennae. In the field, look for colored hairs on the vertex (top) and face of the head to aid in identification (Figure 9). Coloration of the vertex and the face are both key. When looking at photographs, fine details such as cheek length, tongue length, eye size, and number of segments in the antennae can occasionally be used to make identification, but the last usually is difficult to discern.

**The thorax** is middle portion of the bee, to which the legs and wings attach. In the field, look to see if the thorax is yellow with a black spot or oval, yellow with a black stripe between the wings, or yellow towards the front and black towards the rear. Note if the black extends end before it reaches the wings, extends to the wings, or extends beyond the wings.

**The abdomen** is the rear-most part of the bee, comprised of segments called terga. Females have six terga and the final one comes to a point. Males have seven terga, and the final one is round. The terga are numbered one through six or seven, with one being closest to the front and six or seven being at the rear of the bee. You might see the terga abbreviated as T1, T2, etc. In the field and in photographs, look closely at the color patterns on the terga. Sometimes the bee's black exoskeleton shows through the hair; this is not part of the color pattern.

**The corbicula**, or pollen basket, is a flat, bare area on a female's hindleg that is used to store and transport pollen. Males do not have corbiculae; note that Wisconsin's five cuckoo bees also lack a corbicula.

The overall size of the bee occasionally can also be used in identification. Some species are larger than others, and queens are generally larger than workers or males.

Other insect species can sometimes be mistaken for bumble bees. Flies have large protruding eyes, short antennae, and only one pair of wings (Figure 10). Wasps are long and thin, and unlike bumble bees, they don't have thick hair (Figure 11). Honey bees (non-native) and some native bee species may also look like bumble bees. They will often have less hair or different color patterns than bumble bees, and other native bees will lack a corbicula.

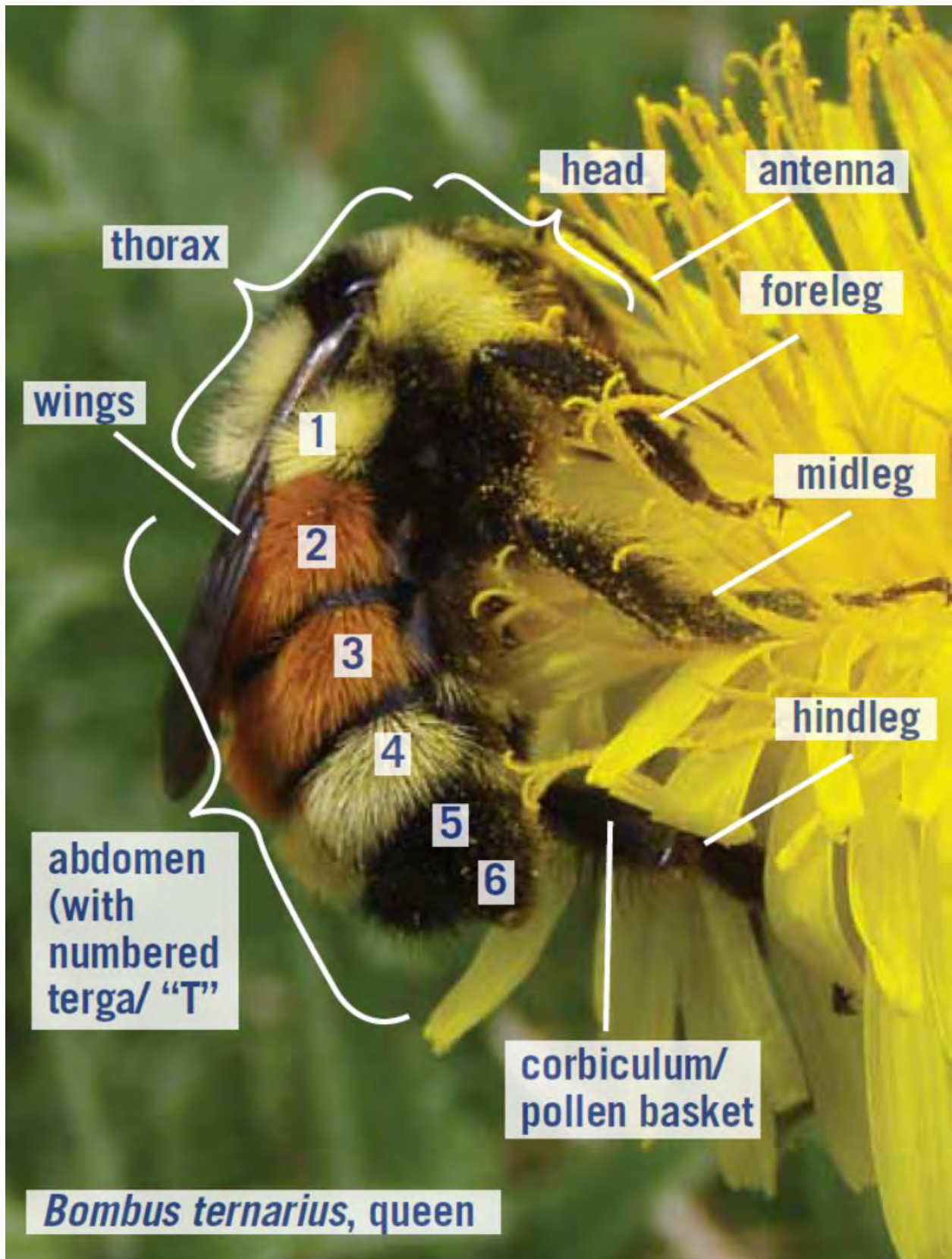


Figure 8. Bumble bee anatomy. Photo: Williams et al. 2014

FACE

VERTEX



Figure 9. Bumble bee face and vertex.



Figure 10. A bumble bee mimic, a fly. Note the single pair of wings, large eyes, and short antennae.





Figure 11. A wasp, *Cerceris fumipennis*. Note the long, thin body and minimal hair, in contrast to a bumble bee. Photo: Bruce Lund.

## Curating Photos

You might take dozens, or even a hundred photos during a small area survey. Even an incidental observation might require you to take a large number of photos. Before you enter your data online, you will need to curate your photos by:

- Identifying the morphs in each image to species and sex.
- Selecting one to three images per species-sex combination that best depict the bee's head, dorsal, and side views. Ideally, these images should be from the same individual bee.
- Cropping and centering the images you plan to upload so that the bee takes up the majority of the frame.
- Checking that your file size is less than 1 MB. If it larger than 1 MB, you will need to do additional cropping or compress the image.
- Submit only one observation per species-sex combination for a single survey.

## Record of Volunteer Effort

At the end of each season, we will ask you to report how much time you spent volunteering with the Wisconsin Bumble Bee Brigade. You can use the Record of Volunteer Effort to keep track of the hours that you are participating in the project. In addition to time spent conducting surveys, we would also like to track time spent:

- Preparing for surveys by looking at maps or brushing up on bumble bee identification.
- Traveling to a survey location.
- Curating your data by identifying morphs and prepping photos.
- Entering data.
- Sharing information about the Bumble Bee Brigade with others.

## Frequency of Data Submission

Many volunteers enjoy repeatedly monitoring the same site, either with small area surveys or checklist style incidental observations. Regular monitoring is beneficial because it provides important information about bumble bee phenology, increases the chance of observing a rare bee, and helps you learn more about the property. To respect volunteers' time, streamline the observation verification process, and continue to receive important data, we provide guidance on how frequently you should submit observations from the same site. **Note that the following guidance is for the frequency of submission, not observation.** You are welcome and encouraged to observe bumble bees as often as you like.

**Regular monitoring, either as small area surveys or incidental observations:** Submit no more than once per week; we recommend once per week, twice per month, or once per month

**Additional incidental observations:** If the first sighting of a species-sex combination at a site for the season is not part of your regular monitoring submission, report:

- the first queen of each species seen in the spring
- the first newly produced queen of each species seen in the later summer/fall
- the first female (worker or unable to determine if queen or worker) of each species
- the first male of each species
- the first instance of each morph you are unable to identify (submit as unknown)

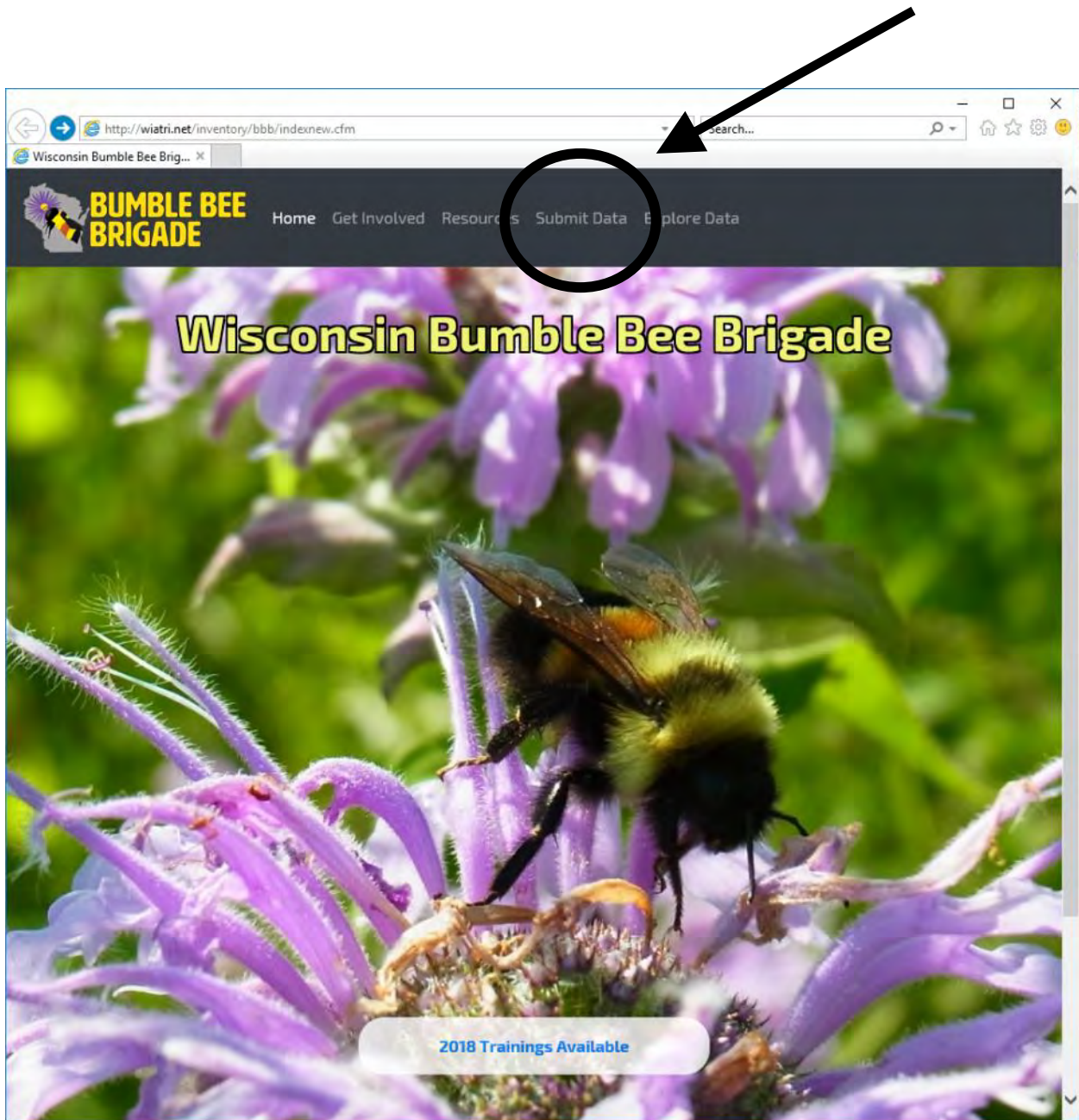
**Nests:** Submit the first time you confirm each nest. If you find the nest of a rare species (*affinis*, *fervidus*, *frigidus*, *pensylvanicus*, *perplexus*, *sandersoni*, or *terricola*) please report it immediately; we might work with you to gather additional information on the nest.

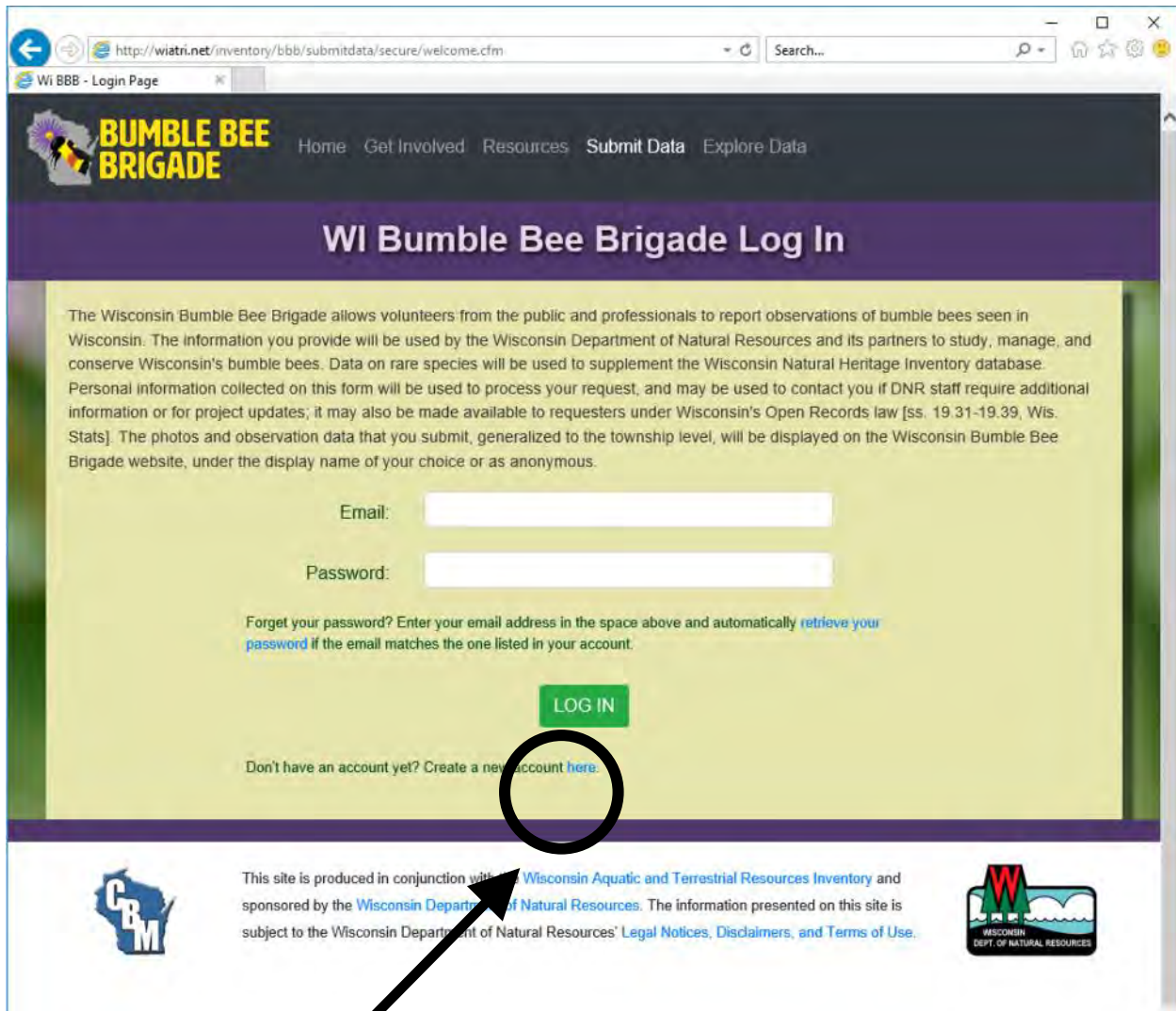
For all observations, you are welcome to include information in the observation comments about how often you have seen that species-sex combination (e.g. "I saw *impatiens* worker 4 days this week" when submitting an *impatiens* female as part of your regular observations).

## Submitting Data Online

### Creating an Account

1. On the Bumble Bee Brigade homepage, [wiatri.net/inventory/bbb](http://wiatri.net/inventory/bbb), click on “Submit Data.”





2. Click “here” in “Create a new account here.”

**New Registration** \*\*Required Fields

**\*\*Name:** First Name  Last Name

Display Name:   
Observations on the website will be listed using this name. If this is left blank, the observation will be anonymous.

Address 1:

Address 2:

City:

State: WI  Zip:


Level of Expertise:

Year WI Bumble Bee Brigade Training Taken:

**\*\*Phone:**

**\*\*Email:**

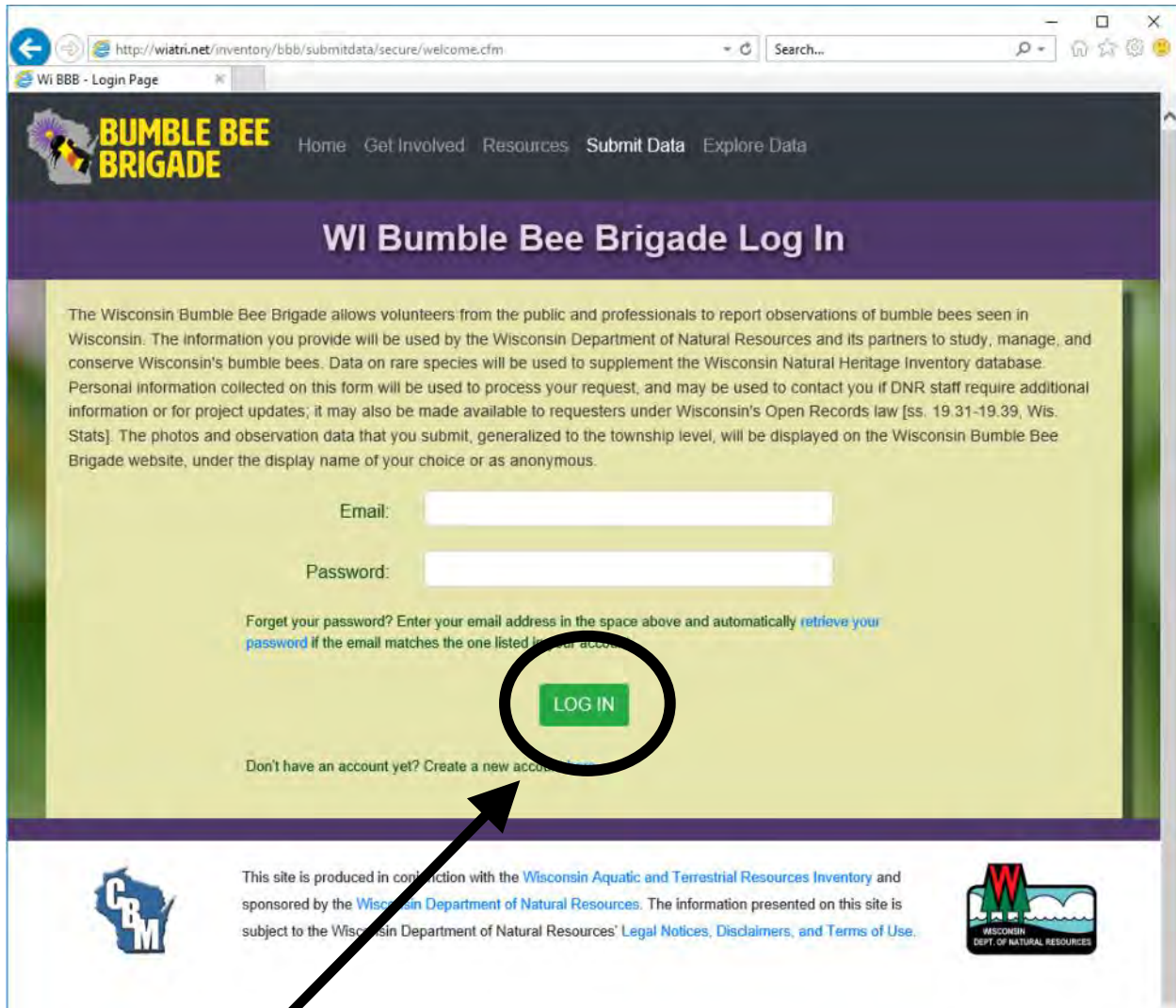
**\*\* Confirm Email:**

I'm not a robot.  reCAPTCHA  
Privacy Terms

Submitting this form will generate an email containing a valid password to the address specified. If this email does not arrive within 24 hours (and you have checked your junk mail folder), please contact [Jill.Rosenberg@wisconsin.gov](mailto:Jill.Rosenberg@wisconsin.gov).

3. Complete the registration form, being sure to enter a display name that you want publicly visible when people view your data; leave it blank to have your data publicly anonymous. When complete, click "SUBMIT." You will receive an email from Jill Rosenberg with your account password. Once you have received the email, you can log into your account.

## Entering Data– Signing In



2. Once you have created an account, go to the Log In page and enter your email and password. Then click “LOG IN.”

3. The first time you log in, or whenever you want to update your password, click on “Change Password.” You can also update your information, like your email or phone number, by clicking “Edit Information.”

**WI Bumble Bee Brigade Account**

Eva Lewandowski  
608-264-6057  
eva.lewandowski@wisconsin.gov

[Edit Information](#)  
[Change Password](#)

[Add/View Observations](#)

**Observation List**

[Export Observations to Excel](#)

(Click year to see list of observations for that year)

Survey Year: 2018

**Totals by Site/Survey/Species**

Tally	Life	2019	Last 30 Days	2018
Total species (verified)	6	0	0	6
Total species (unverified)	1	0	0	1
Total surveys	22	0	0	22
Sites surveyed	14	0	0	14
Percent of species id's where submitted = verified (verified observations only)	97%			97%

**Total Species Observed by County**

County	Life	2019	Last 30 Days	2018
Brown	1	0	0	1
Dane	5	0	0	5
Marquette	3	0	0	3
Portage	1	0	0	1
Vernon	1	0	0	1

**Admin Controls**

[LOGOUT](#)



### Entering Data– Adding a Site

1. The first time you collect data at a site, you need to add the site to your account information by clicking “Add/View Observations.” This will take you to the site list page.

**WI Bumble Bee Brigade Account**

Eva Lewandowski  
608-264-6057  
eva.lewandowski@wisconsin.gov

[Edit Information](#)  
[Change Password](#)

**Add/View Observations**

**Observation List**

[Export Observations to Excel](#)

(Click year to see list of observations for that year)

Survey Year: 2018

**Totals by Site/Survey/Species**

Tally	Life	2019	Last 30 Days	2018
Total species (verified)	6	0	0	6
Total species (unverified)	1	0	0	1
Total surveys	22	0	0	22
Sites surveyed	14	0	0	14
Percent of species id's where submitted = verified (verified observations only)	97%			97%

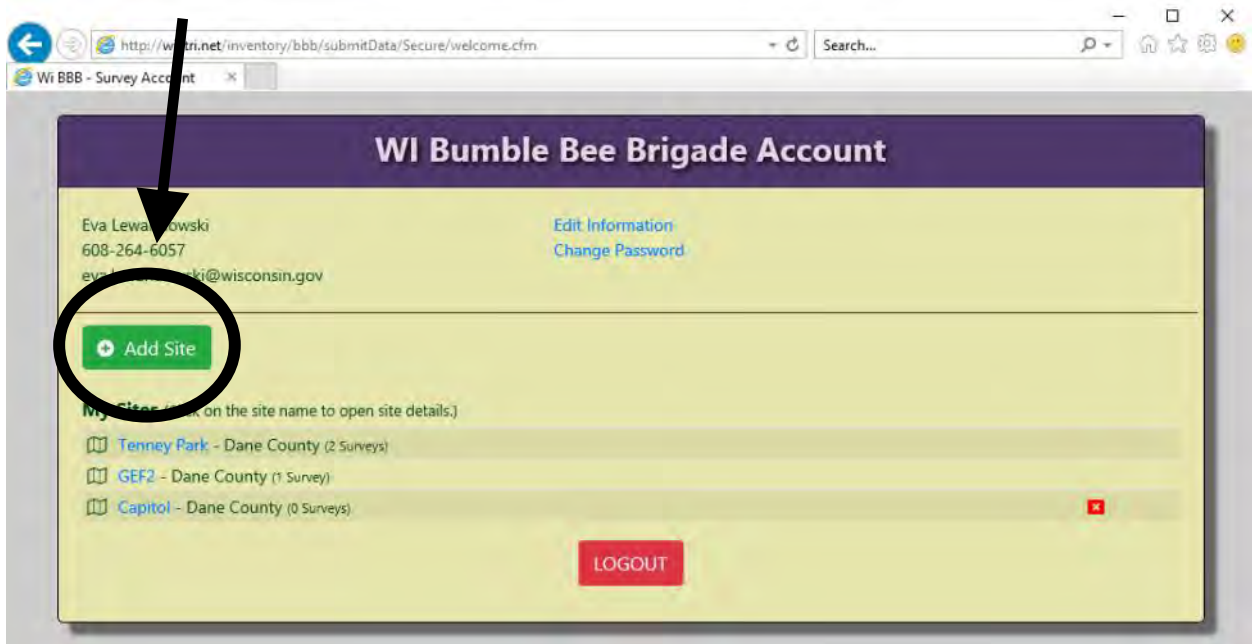
**Total Species Observed by County**

County	Life	2019	Last 30 Days	2018
Brown	1	0	0	1
Dane	5	0	0	5
Marquette	3	0	0	3
Portage	1	0	0	1
Vernon	1	0	0	1

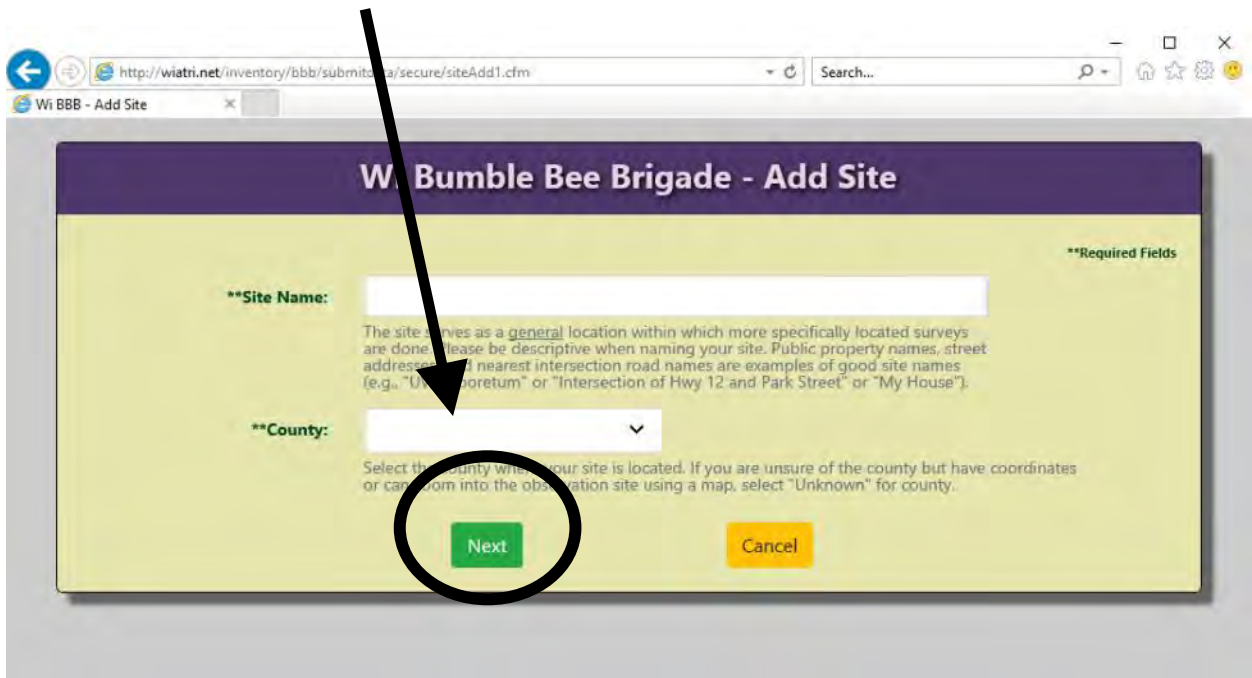
**Admin Controls**

**LOGOUT**

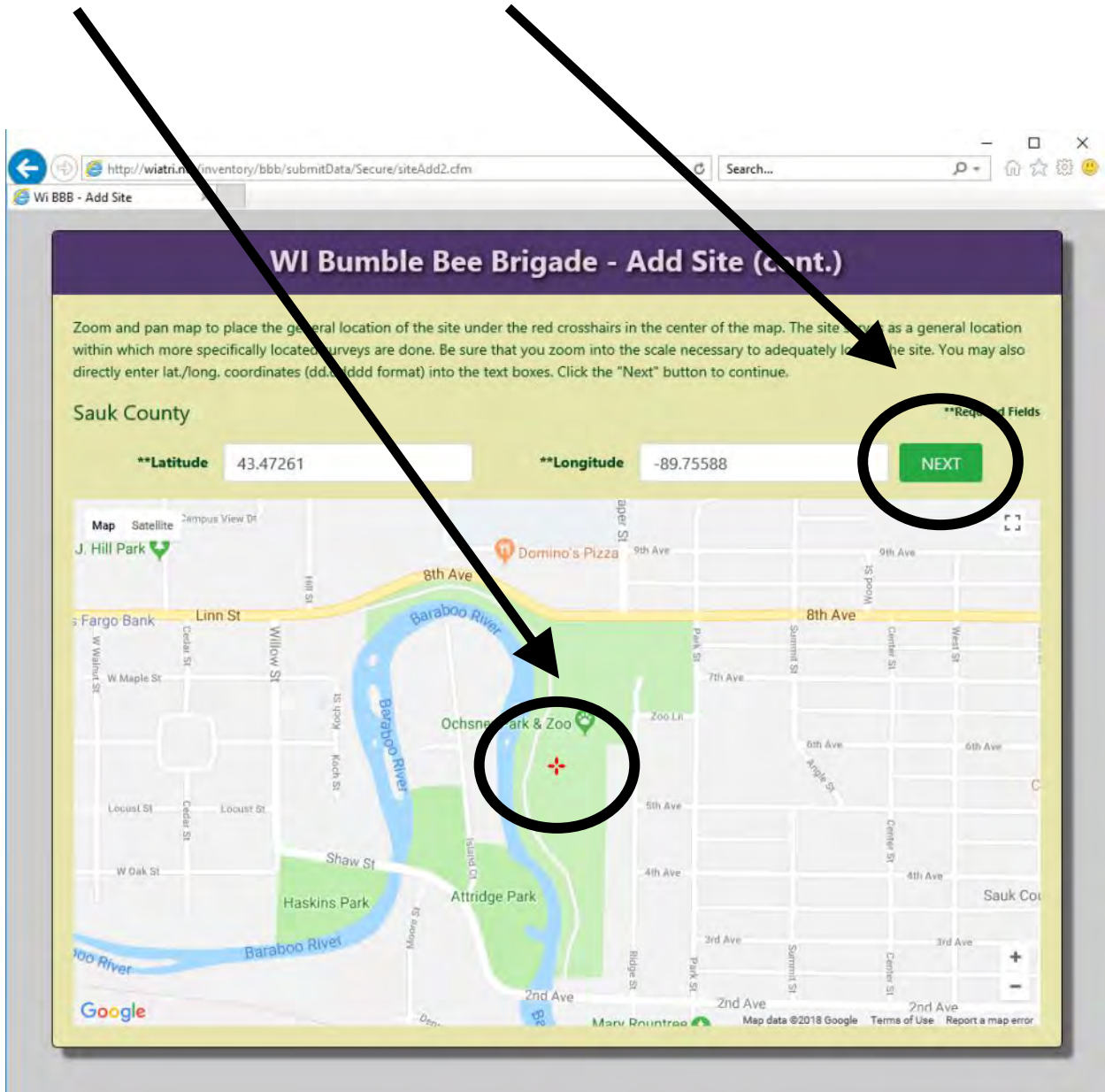
2. Click "Add Site."

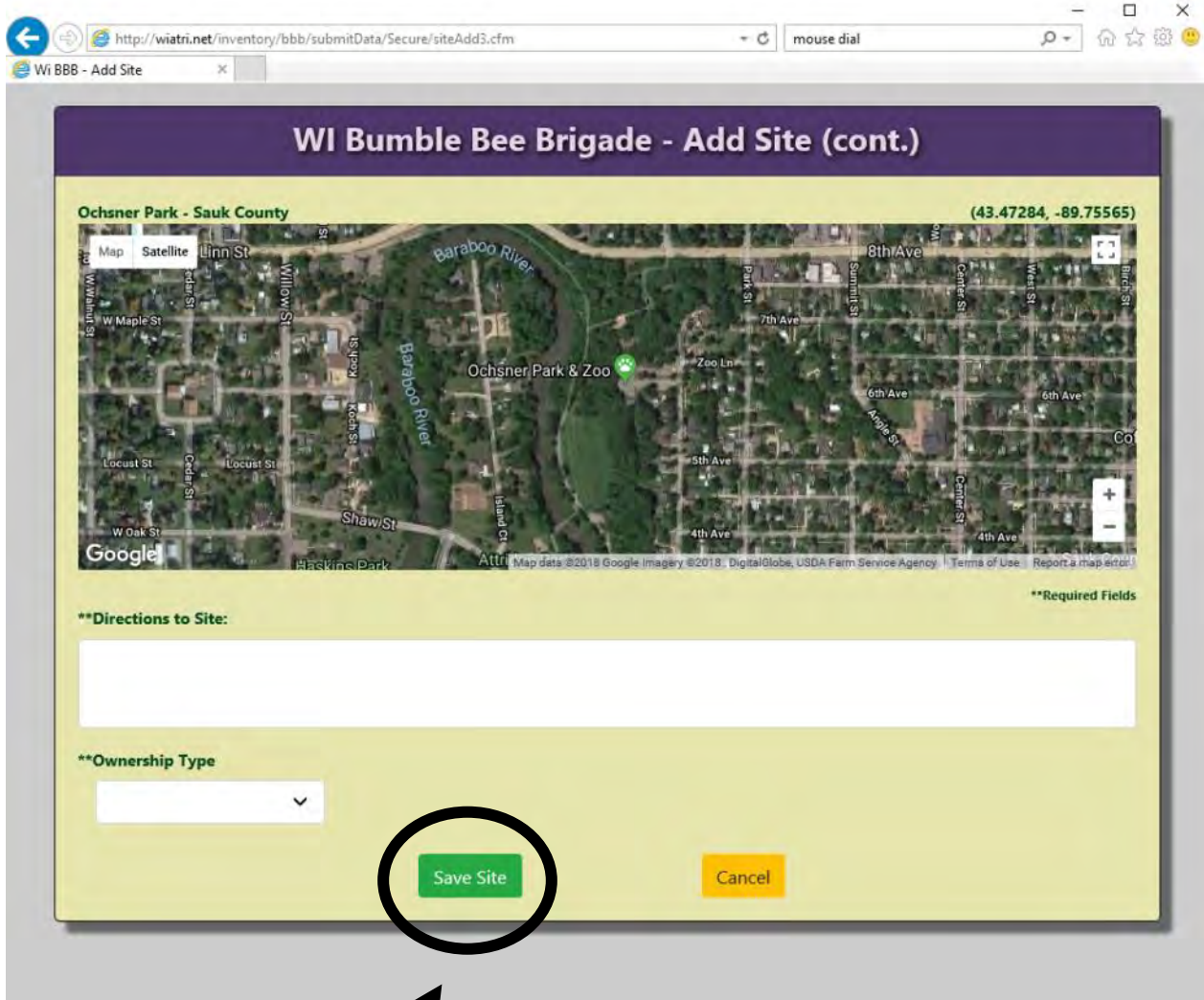


3. Enter a Site Name. Choose a name that identifies the general location at which you collected data, such as Diamond Lake State Natural Area, Warner Park, or My House. If you know what county your site is in, select it from the drop-down menu. If you're not sure, select "Unknown." Then click "Next."



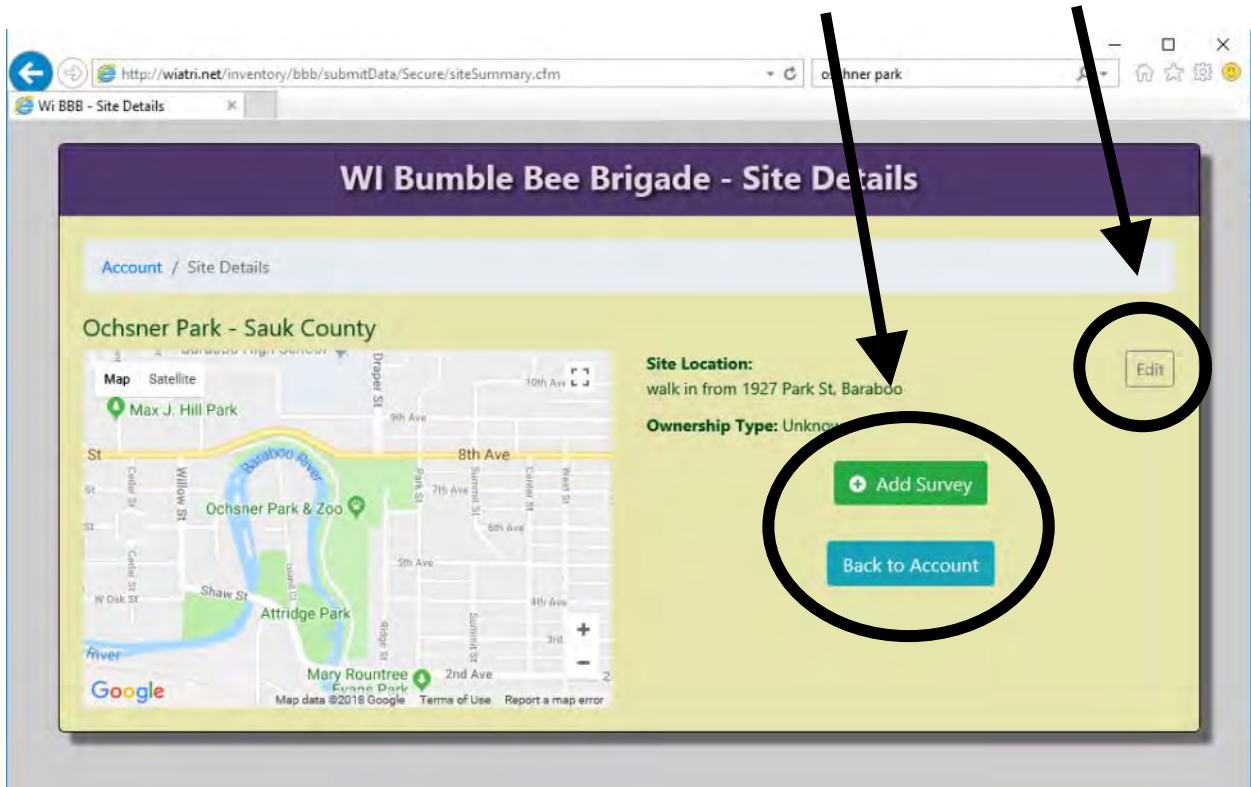
4. Zoom (using your mouse scroll wheel or the buttons in the bottom right of the map) and move the map using your mouse until the red crosshair is centered at your general site location. Be sure to zoom far enough in that you can precisely locate your site. You can also directly enter the latitude and longitude coordinates of your site into the form. When the red crosshair is centered at your site, click "NEXT."





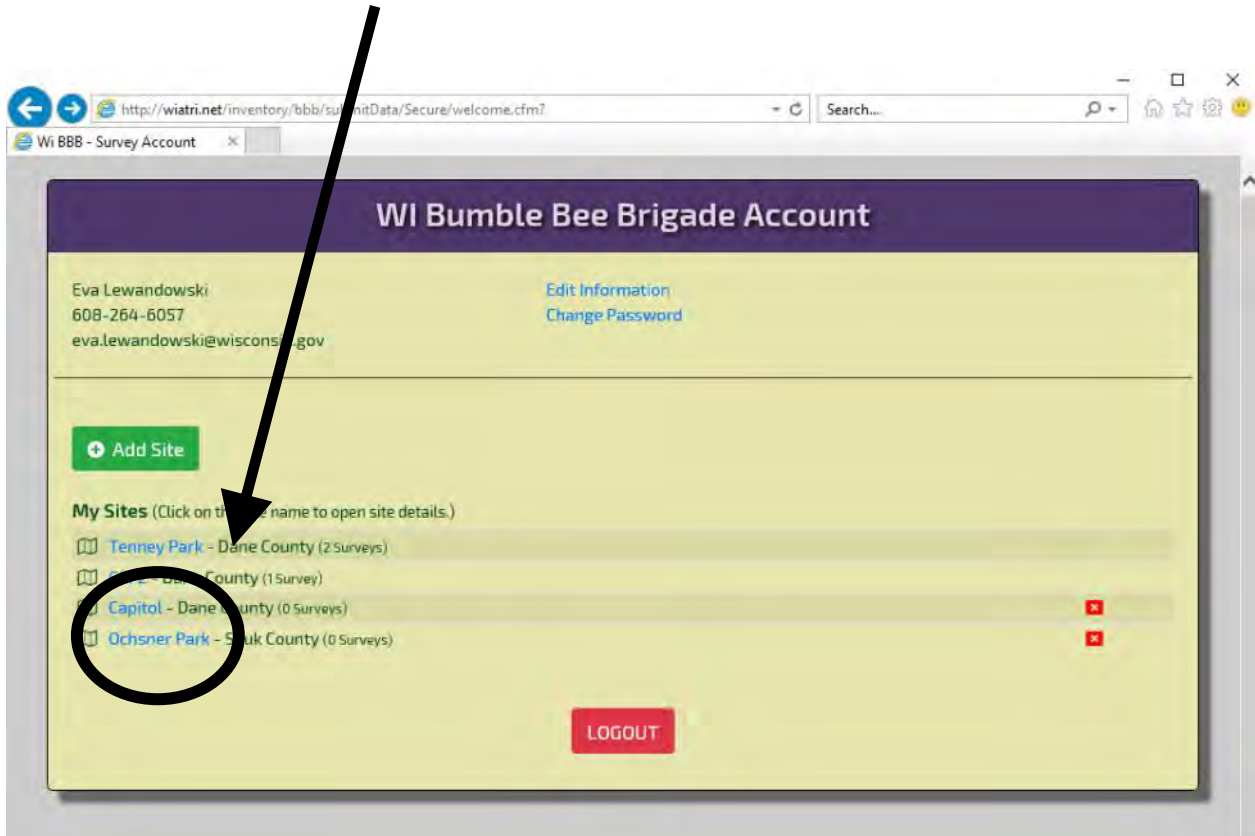
5. Enter directions to help relocate the site. This can be a street address, directions from the nearest intersection, or walking/hiking trail instructions for more remote locations. Enter the site's ownership type using the dropdown menu, and click "Save Site."

6. Your site is now saved! From the Site Details page, you can edit site information (site location can only be edited by an administrator), add a survey, or return to your account.

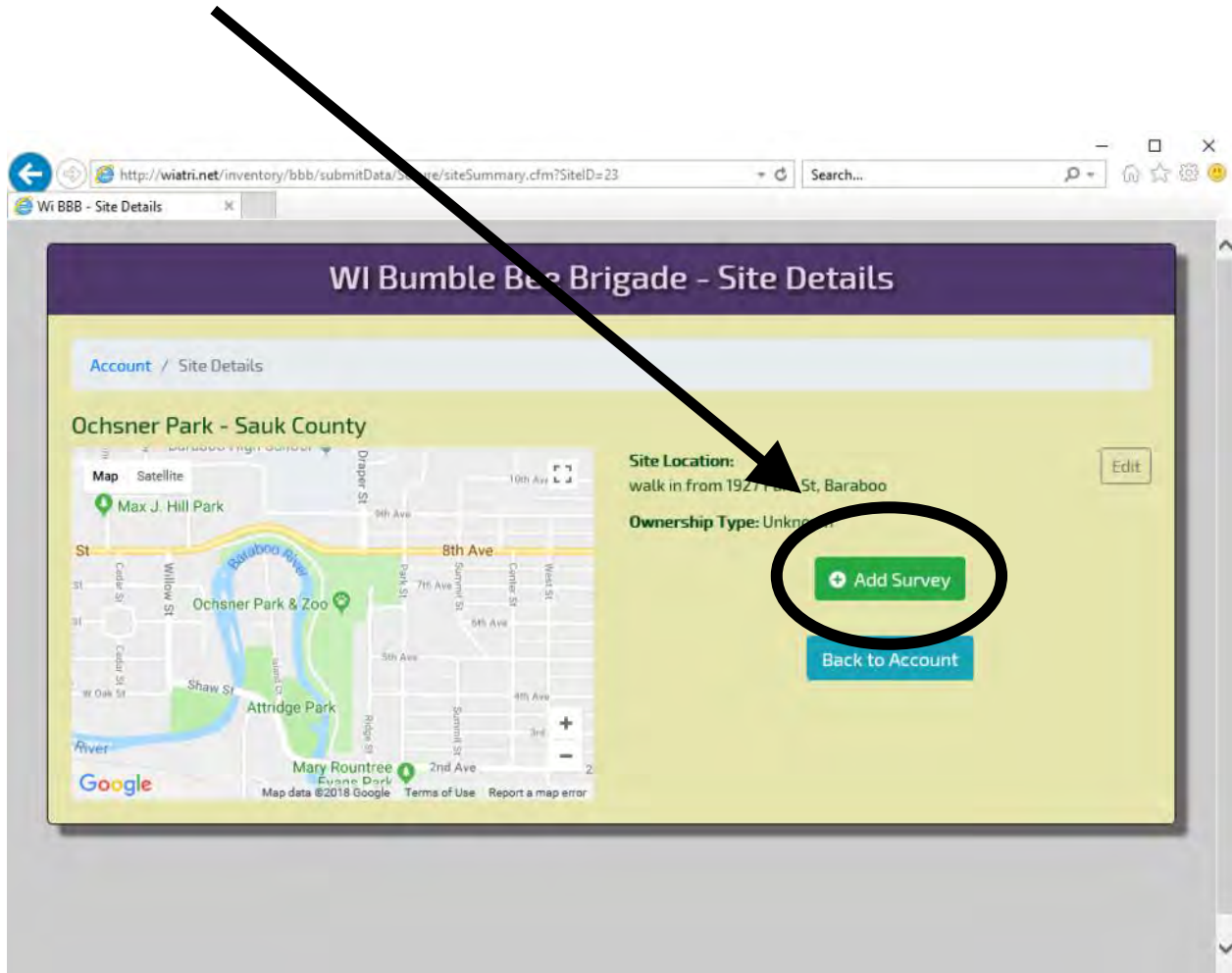


### Entering Data– Adding a Survey

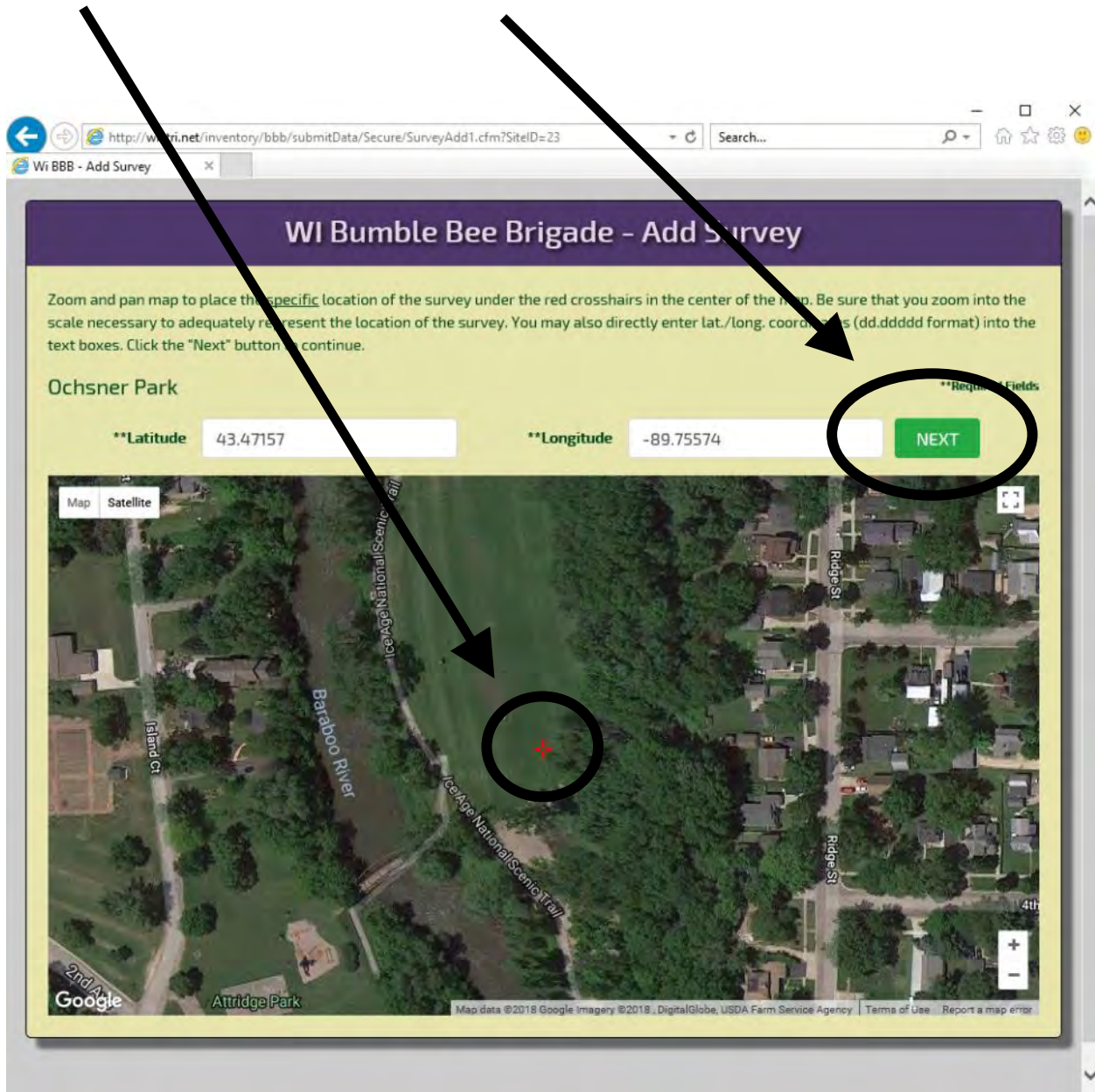
1. If you have just entered the site for the first time, you will immediately be given an option to add a survey. In all other instances, navigate to the site list page. From their, under “My Sites” click on the name of the site at which you completed your survey.



2. Click "Add Survey."



3. Zoom (using your mouse scroll wheel or the buttons in the bottom right of the map) and move the map using your mouse until the red crosshair is centered at your specific survey location. Be sure to zoom far enough in that you can precisely locate your survey area. You can also directly enter the latitude and longitude coordinates of your site into the form. When the red crosshair is centered at your site, click “NEXT.”



Note: For very small sites at which the survey location is the same as the site, simply click “NEXT” without adjusting the location.



**WI Bumble Bee Brigade - Add Survey (cont.)**

Site: Ochsner Park

Map Satellite

**\*\*Survey Type**

Please select...

**\*\*Survey Date: (mm/dd/yyyy)**

**\*\*Primary Observer:**  Me

OR

Additional Observer(s):

**\*\*Primary Land use:**

Please select...

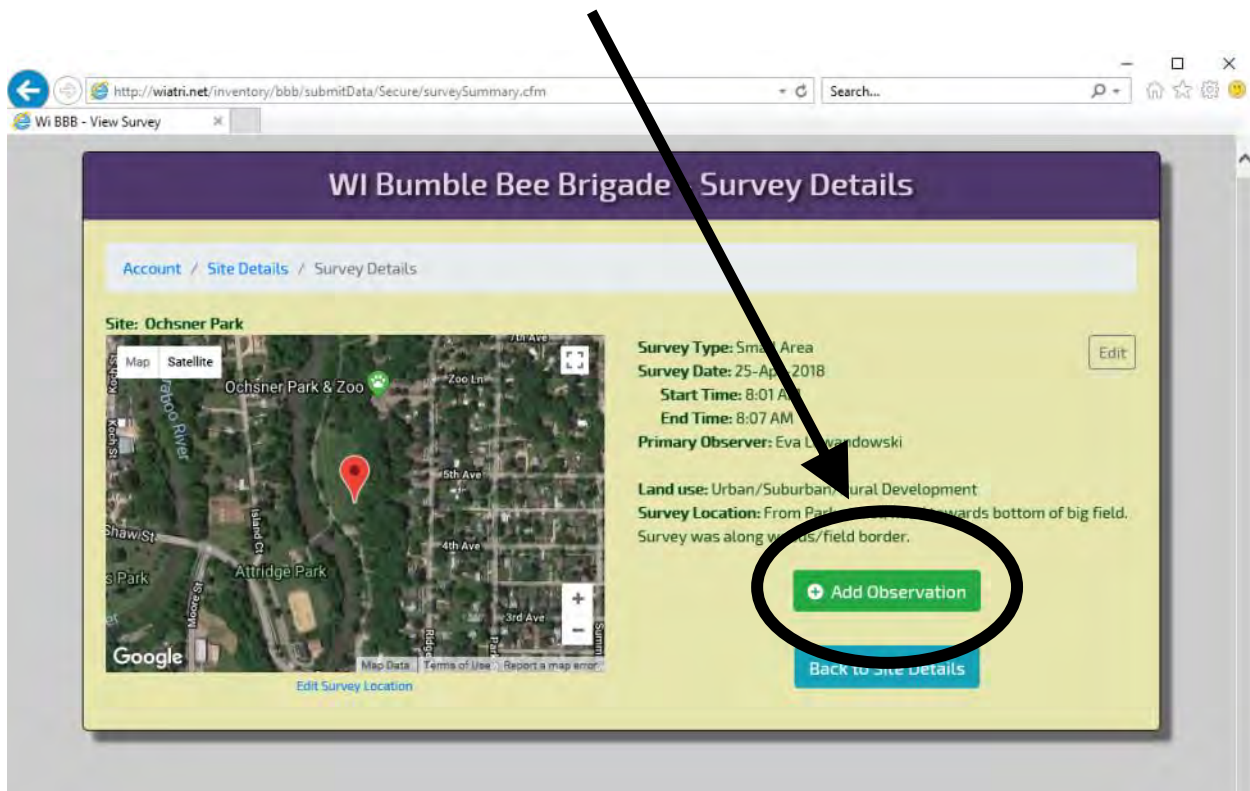
Details of how to find this survey location within the site:

Survey comments:

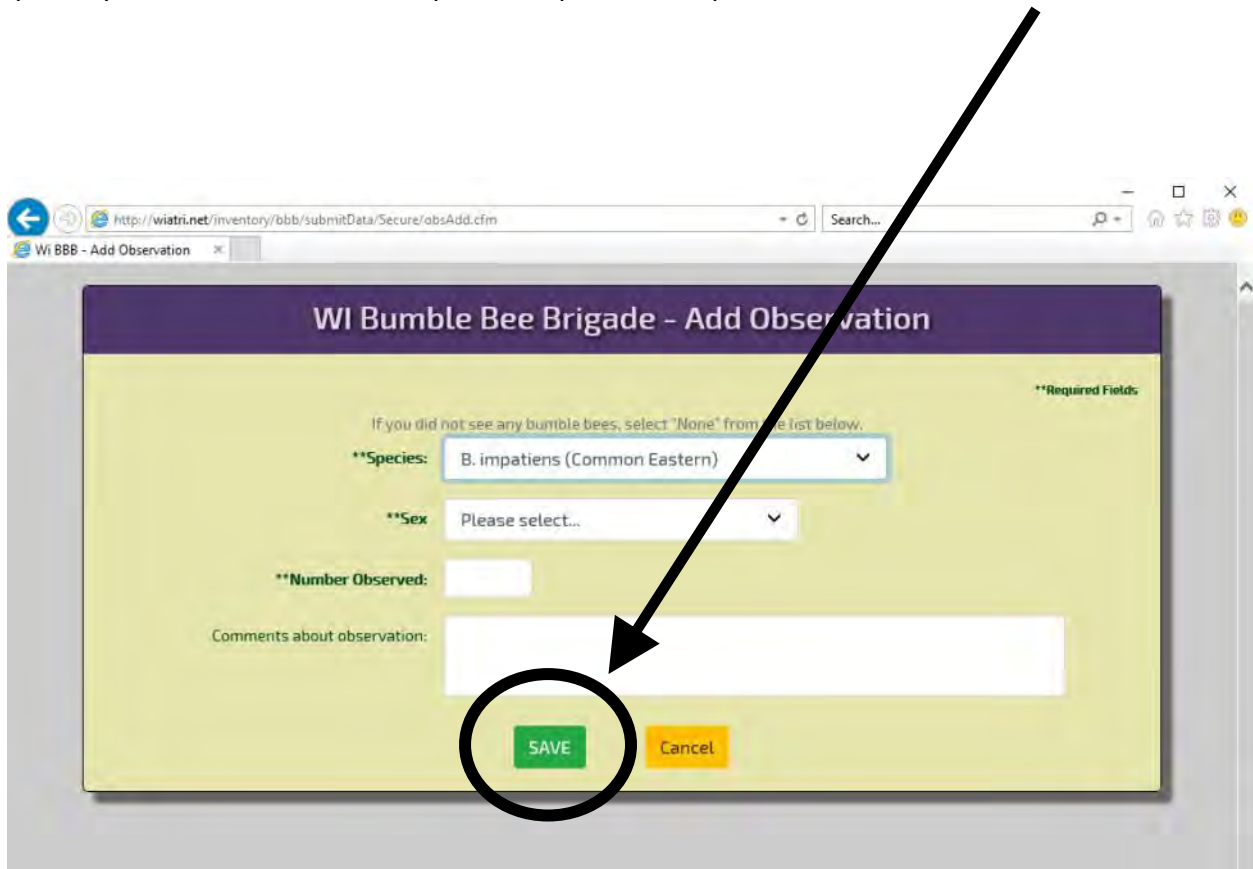
Save Survey Cancel

4. Complete the survey information. If you were not the primary observer (you are entering data for someone else) be sure to uncheck “Me” and type in the primary observer’s name. Note that survey comments will not be publicly viewable on the data exploration portal. When you have completed the form, click “Save Survey.”

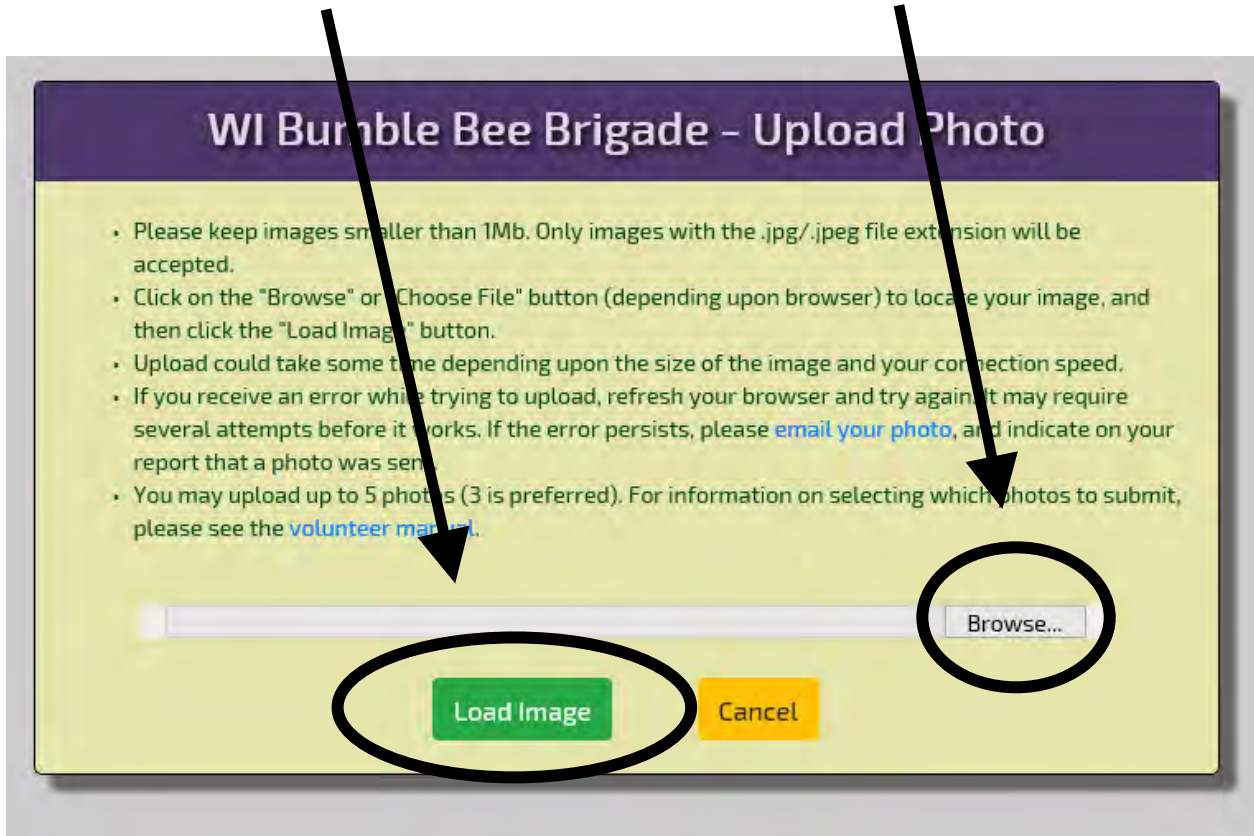
5. To add your survey results, click “Add Observation.”



6. Select a species that you observed from the dropdown menu. If you saw no bumble bees during your survey, select "None" from the dropdown menu. If you are unsure how to identify a bumble bee that you saw, and you cannot make an educated guess, you can select "Unknown Bombus" from the lists. When you have made your selection, the additional fields of sex, number observed, and comments will appear. Note that observation comments are publicly viewable on the data exploration portal. Complete those, and click "SAVE."

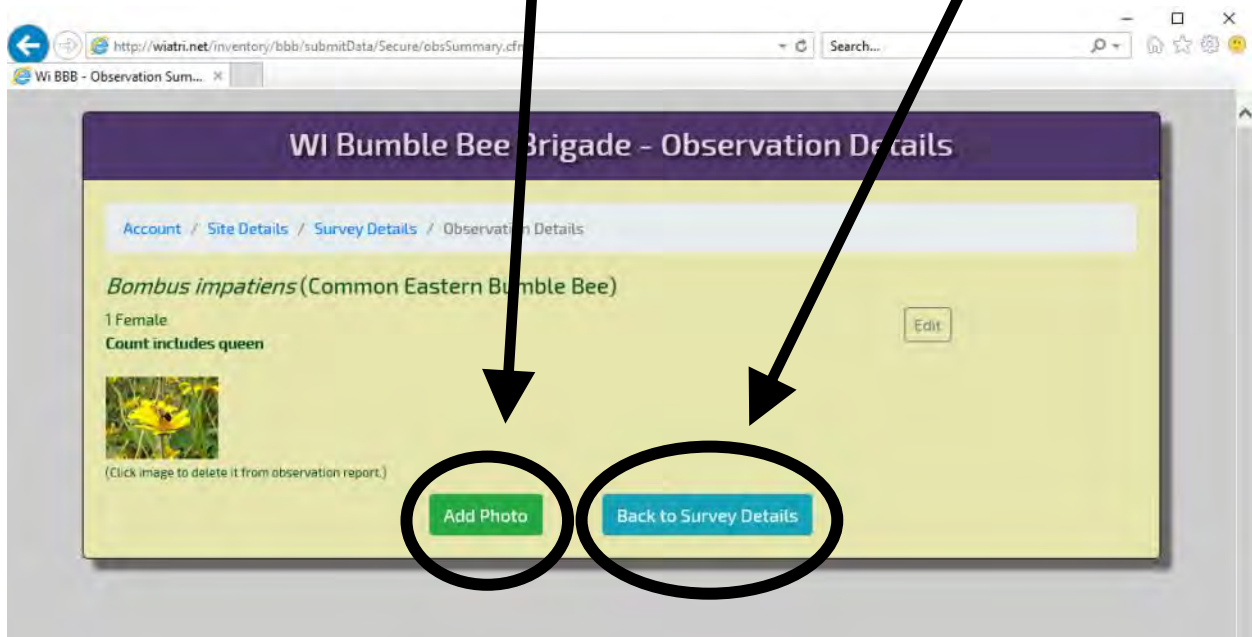


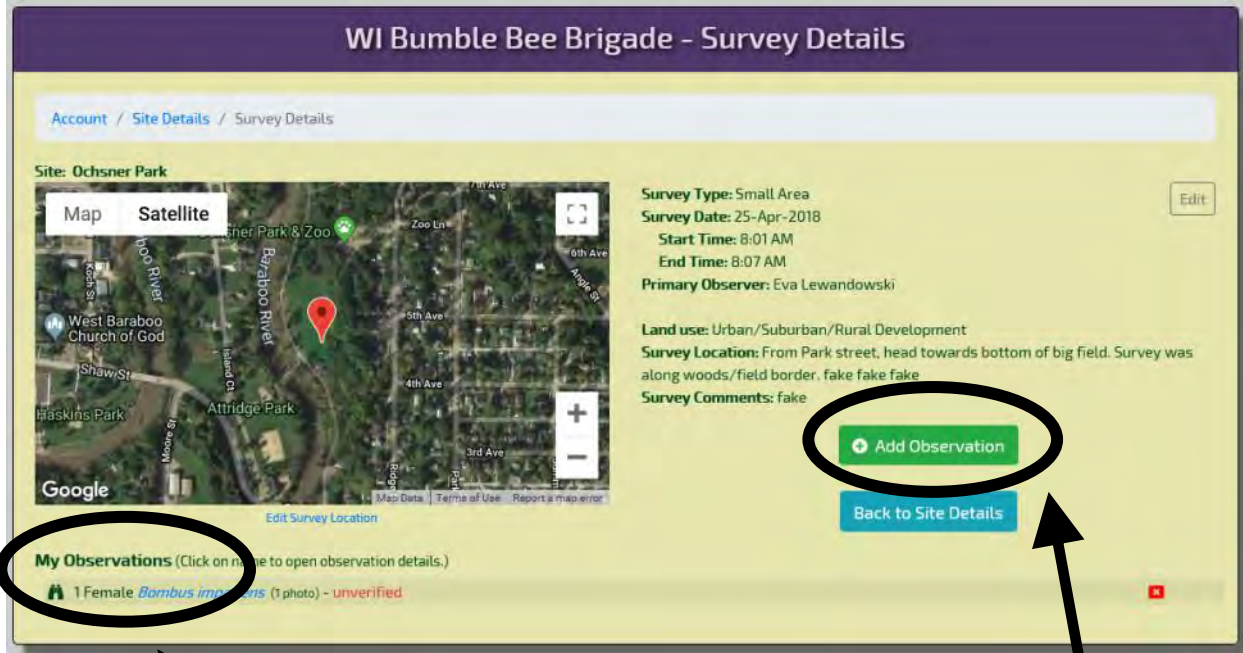
7. To upload a photo of your bumble bee, click “Browse,” and select the photo from the file directory; then select “Load Image.” Photos must be uploaded one at a time; there is a limit of five photos per observation. Remember to zoom and crop your images to focus on the bee and keep the file size below 1 MB. If you do not have any images to load, you can click “Cancel.” However, observations without photos will not be considered verified reports.



Note: Once an image is uploaded or you hit “Cancel” to indicate you have no more images to upload, your observation is saved.

8. To add another photo, click "Add Photo." To add an observation of another bumble bee species, click "Back to Survey Details."

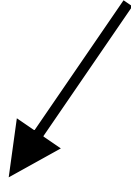




9. Once you have added information about an observation, it appears under “My Observations.” To edit or view the observation, click on the species name in blue. To add an observation of another bumble bee from the same survey, click “Add Observation.” If data are locked (happens a few months after each field season), you will need to contact us to edit the observations.

### Using Your Account– Breadcrumbs

Many pages offer “breadcrumbs” along the top to help you navigate back to your main account page or other pages. (Breadcrumbs are not available on pages when you are entering and saving data.) Click on the blue page name to navigate back to that page.



**WI Bumble Bee Brigade - Survey Details**

[Account](#) / [Site Details](#) / [Survey Details](#)

Site: Ochsner Park

Map Satellite

Survey Type: Small Area Edit

Survey Date: 25-Apr-2018

Start Time: 8:01 AM

End Time: 8:07 AM

Primary Observer: Eva Lewandowski

Land use: Urban/Suburban/Rural Development

Survey Location: From Park street, head towards bottom of big field. Survey was along woods/field border. fake fake fake

Survey Comments: fake

[Add Observation](#)

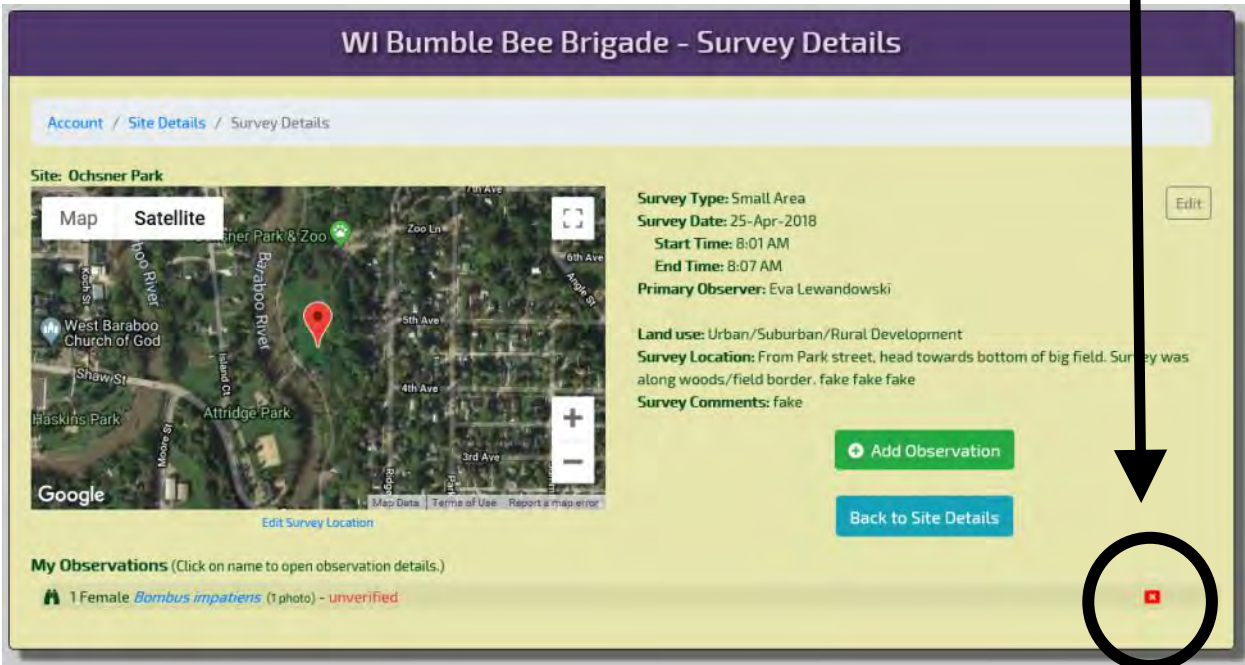
[Back to Site Details](#)

**My Observations** (Click on name to open observation details.)

1 Female *Bombus impatiens* (1 photo) - **unverified**

### Using Your Account– Deleting Information

Occasionally, you will make a mistake when entering data. When this happens, you can click the red “x” box to remove an observation, survey, or site. In order to remove a site, you must first remove all surveys at that site. In order to remove a survey, you must first remove all observations associated with that survey. If data are locked (happens a few months after each field season), you will need to contact us to edit or delete any data.





## Verification of Results

Each observation that you submit to the Wisconsin Bumble Bee Brigade is verified by DNR staff or partners. Our verifiers will examine your photos and observation comments and determine the identity of the species you observed. Sometimes, we will contact you for additional photos or information. You can see your verified results on the Account page or on the Survey Details page, under My Observations.

On the Account Page, click on the Survey Year to expand your list of observations and verification information.

**Wisconsin Bumble Bee Brigade Account**

Eva Lewandowski  
608-264-6057  
eva.lewandowski@wisconsin.gov

[Edit Information](#)  
[Change Password](#)

[Add/View Observations](#)

**Observation List**

[Export Observations to Excel](#)

Click Year to see list of observations for that year

**Survey Year: 2018**

**Totals by Site/Survey/Species**

Tally	Life	2019	Last 30 Days	2018
Total species (verified)	6	0	0	6
Total species (unverified)	1	0	0	1
Total surveys	22	0	0	22
Sites surveyed	14	0	0	14
Percent of species id's where submitted = verified (verified observations only)	97%			97%

**Total Species Observed by County**

County	Life	2019	Last 30 Days	2018
Brown	1	0	0	1
Dane	5	0	0	5
Marquette	3	0	0	3
Portage	1	0	0	1
Vernon	1	0	0	1

**Admin Controls**

[LOGOUT](#)

Once your observation list has been expanded, all your observations for the year are visible. In the observation column, observations that have not been verified yet will say “unverified” in red. If a verified identification differs from a reported identification, that is noted in brackets. Click on the species name in the observation column to view the verification comments. You can quickly view your most recently verified observations by clicking on the “Date Verified” label above the far right column. This will sort the column, with the most recently verified on top.

**WI Bumble Bee Brigade Account**

Eva Lewandowski  
608-264-6057  
eva.lewandowski@wisconsin.gov

[Edit Information](#)  
[Change Password](#)

[Add/View Observations](#)

**Observation List**

[Export Observations to Excel](#)

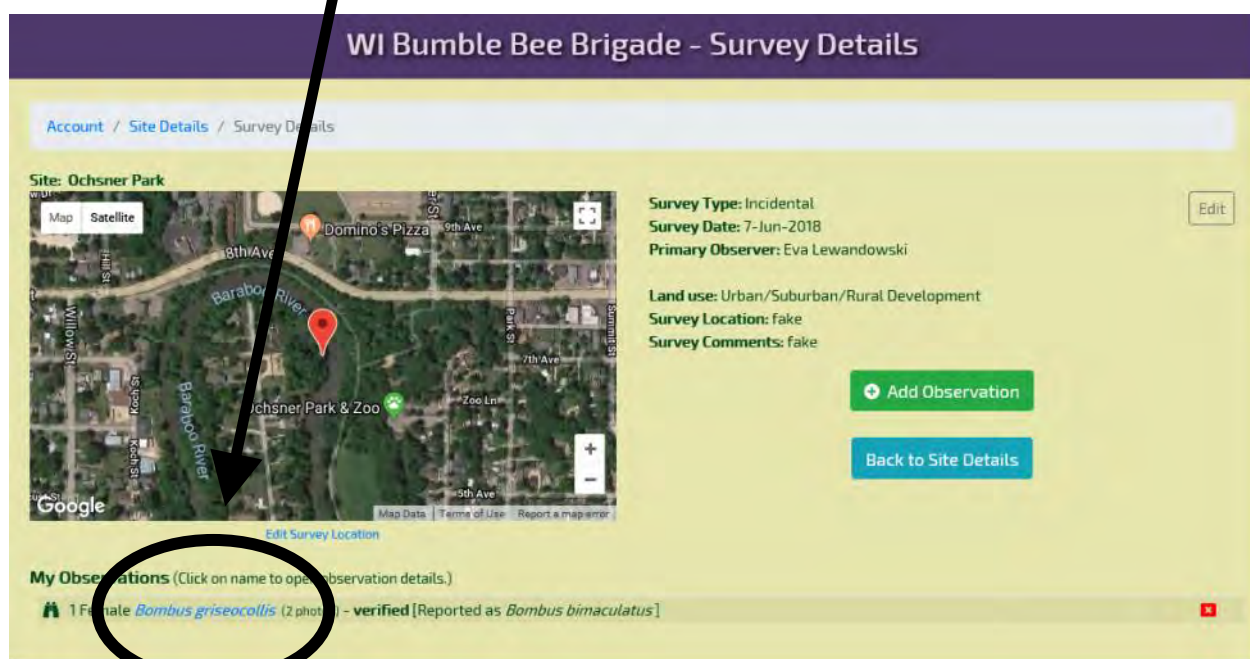
(Click year to see list of observations for that year)

Survey Year: 2018

Survey Date	Site Name	Observation	Date Submitted	Date Verified
09/19/2018	Empire Prairies Westport Drumlin SNA	14 Male <i>Bombus impatiens</i>		11/08/2018
09/19/2018	Empire Prairies Westport Drumlin SNA	2 Female <i>Bombus impatiens</i>		11/08/2018
09/16/2018	Tenney Park	3 Male <i>Bombus impatiens</i>		10/23/2018
08/31/2018	Tenney Park	1 Male <i>Bombus impatiens</i>		09/12/2018
08/31/2018	Tenney Park	5 Female <i>Bombus impatiens</i>		09/12/2018
08/31/2018	Burr Jones Park	None - <i>Unverified</i>		
08/26/2018	Chaffee Creek Meadow	1 Male <i>Bombus vagans</i>		10/11/2018
08/26/2018	Worzella Pines Park	1 Female <i>Bombus impatiens</i>		08/31/2018
08/26/2018	Chaffee Creek Meadow	1 Unknown <i>Bombus impatiens</i> [Reported as Female]		09/12/2018
08/26/2018	Chaffee Creek Meadow	2 Female <i>Bombus vagans</i>		10/11/2018
08/26/2018	Chaffee Creek Meadow	3 Queen <i>Bombus griseocollis</i>		11/08/2018
07/28/2018	Warner Park	1 Female <i>Bombus impatiens</i>		08/17/2018
07/28/2018	Warner Park	2 Male <i>Bombus bimaculatus</i>		08/15/2018
07/28/2018	Warner Park	1 Female <i>Bombus auricomus</i>		08/15/2018
07/27/2018	Burr Jones Park	10 Male <i>Bombus griseocollis</i>		07/27/2018
07/26/2018	Tenney Park	2 Female <i>Bombus impatiens</i>		07/27/2018
07/26/2018	Tenney Park	3 Male <i>Bombus griseocollis</i>		07/27/2018
07/26/2018	Tenney Park	1 Female <i>Bombus rufocinctus</i>		07/27/2018
07/26/2018	Tenney Park	1 Female <i>Bombus griseocollis</i>		07/27/2018

You can also access verification information from the Survey Details page.

Observations that have not yet been verified will say “unverified” in red. When an observation has been verified, the observation will be followed by “verified” in black. If the verified identification is different from your own (e.g. *Bombus bimaculatus* rather than *Bombus griseocollis*), you will see your original identification in brackets. To view comments about the verification, such as why an identification was changed, click on the blue species name under My Observations. This takes you to the Observation Details page, which contains comments from the verifier.



### WI Bumble Bee Brigade - Survey Details

Account / Site Details / Survey Details

**Site: Tenney Park**

[Edit Survey Location](#)

**Survey Type:** Small Area  
**Survey Date:** 15-Jun-2018  
**Start Time:** 12:45 PM  
**End Time:** 12:55 PM  
**Primary Observer:** Eva Lewandowski

**Land use:** Urban/Suburban/Rural Development  
**Survey Location:** path between road and lagoon

[Edit](#)

[+ Add Observation](#)

[Back to Site Details](#)

**My Observations** (Click on name to open observation details.)

- 1 Female *Bombus bimaculatus* (1 photo) - **verified** ✖
- 1 Female *Bombus griseocollis* (3 photos) - **unverified** ✖

A verified (top, in black) and unverified report (bottom, in red).

### WI Bumble Bee Brigade - Observation Details

Account / Site Details / Survey Details / Observation Details

*Bombus griseocollis* (Brownbelted bumble bee)

*Bombus bimaculatus* (Twospotted bumble-bee)

1 Female **verified**  
 test

**Comment from Verifier:** Note black on top of head (bimaculatus would have yellow) and brownish coloration on T2 (bimaculatus would have two yellow lobes on T2).

Delete Delete  
(Click image to enlarge it.)

[Add Photo](#)    [Back to Survey Details](#)

Verifications comments on the Observation Details page.

## Additional Resources\*

Wisconsin Bumble Bee Species Profiles. <http://wiatri.net/inventory/bbb/resources>

Bumble Bees of North America: An Identification Guide. 2014. Williams, P; Thorp, R; Richardson L & Colla, S. Princeton University Press

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

Minnesota Bee Atlas online bumble bee tutorial, flashcards, and species identification slides. University of Minnesota Extension. <https://apps.extension.umn.edu/environment/citizen-science/bee-atlas/bumble-bees/Resources>

Bee Spotter Keys to Bumble Bees of Illinois, Missouri, Ohio, and Indiana. <https://beespotter.org/topics/>

Bumble Bee Watch species identification key and anatomy resources. <https://www.bumblebeewatch.org/>

Wisconsin Wild Bee Guide. University of Wisconsin Great Lakes Bioenergy Research Center. <https://energy.wisc.edu/bee-guide/>

Bumble Bee Identification Guide. Discover Life. <http://www.discoverlife.org/mp/20q?guide=Bumblebees>

\*Many other identification and training resources are available on the Bumble Bee Brigade website. <https://wiatri.net/inventory/bbb/>