



# Butterfly and Odonata Monitoring Protocol:

**Who:** This protocol is intended for use by citizen science volunteers.

**Where:** The method used in this protocol can be conducted anywhere that is public or by permission from the landowner. This includes your own backyard.

**When:** The butterfly, dragonfly and damselfly season is between the first week of April to the last week of September. Species of dragonflies, damselflies and butterflies are active during different parts of the year, so it is important to monitor throughout.

**What:** Monitoring will be done of adult butterflies, dragonflies and damselflies. Participants can choose whether they want to monitor exclusively butterflies, exclusively odonates, or both. This cannot be changed throughout the season, but they can be introduced in subsequent years of continued surveying.

**How often:** Surveys should be completed at a minimum every 1-2 weeks with exception to unfavourable weather, and if participants are inclined, multiple surveys per week can be done.

## Background:

This protocol follows ['Guidelines for Standardised Global Butterfly Monitoring'](#) as part of the Geo Bon Technical Series and workshopped by the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) and Dutch Butterfly Conservation (De Vlinderstichting) with support of The Group on Earth Observations Biodiversity Observation Network (GEO BON) and the EC FP7 project 'EU BON - Building the European Biodiversity Observation Network', and involving a wide range of collaborating partners from around the world (Van Swaay, et al., 2015). The goal of

standardizing BMS's (Butterfly Monitoring Schemes) is to create a Global Butterfly Index and to analyse population trends long term (Van Swaay, et al., 2015). While these guidelines do not include dragonflies and damselflies (odonata), this protocol recommends transects be placed



near water sources and open areas for greater diversity in counts. However, the Pollard walk method used for this protocol will naturally miss species that are often found in the forest canopy or above water sources.

### **Participation level:**

Participants can choose to survey exclusively for butterflies, exclusively for odonates or both. This will determine site selection and transect placement for preferred habitat. The choice to survey one over another cannot be changed throughout the survey year, but participants can choose to survey both in subsequent years if they did not in previous years.

### **Methodology:**

The transect count method will be used by the surveyor following Pollard and Yates' (1993) methodology.

#### **How to survey:**

When arriving at a site:

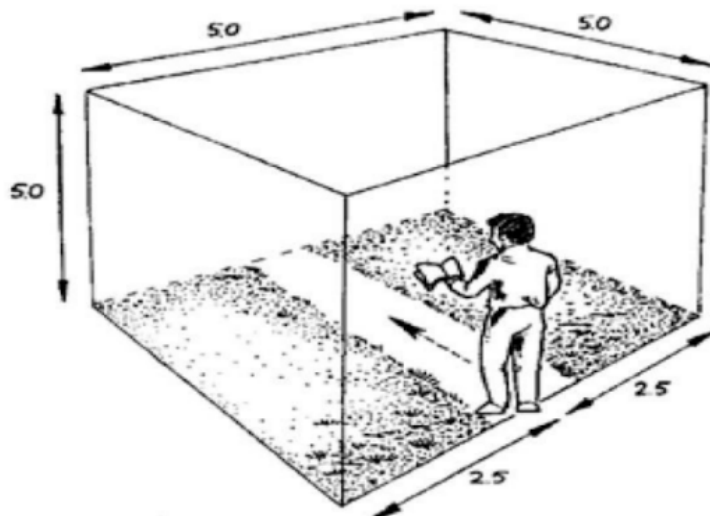
- Record all necessary information at the top of your data sheet, including your participant level.
- Enter the transect start coordinates and accuracy.
- Enter the beaufort wind scale number and the sky (cloud cover) conditions based on the chart at the bottom of the data sheet
- Enter habitat types and any notable land management
- The surveyor will walk the transect line at a slow, steady speed without stopping and record any butterflies, and odonates 2.5 meters to either side or 5 meters ahead of them (see Figure 2).
- If the species cannot be identified from the current position, the survey will “pause” and move to better identify the species. While the survey is “paused”, no other observations can be counted until the surveyor has returned to the spot on the transect where the survey was paused and until they are no longer stationary.
- Count all butterflies, and odonates, and record by tallies on your data sheet.
- At the end of your transect, mark the end coordinates and accuracy.

**Figure 1.**  
*Example of a transect*



**Figure 2.**

*Pollard Walk with 5 m<sup>2</sup> cube observation range.*



From Van Swaay, C., Regan, E., Ling, M., Bozhinovska, E., Fernandez, M., Marini-Filho, O.J., Huertas, B., Phon, C.-K., K'orösi, A., Meerman, J., Pe'er, G., Uehara-Prado, M., Sáfián, S., Sam, L., Shuey, J., Taron, D., Terblanche, R., and Underhill, L. (2015). *Guidelines for Standardised Global Butterfly Monitoring* (Report No. 1) Group on Earth Observations Biodiversity Observation Network, Leipzig, Germany.

<https://www.geobon.org/downloads/biodiversity-monitoring/technical-reports/GEOBON/2015/Global-Butterfly-Monitoring-Print.pdf>

### **Establishing a transect:**

- Transects should be between 300 meters and 2 kilometers (a transect of approximately 1-2 km will take around 45 minutes to 1 hour at a slow survey pace) and can be chosen by the surveyor. If the area surveyed is not on their own property, only follow designated public trails. Do not place your transect on a road, the shoulder of roads, or close to edges of water or cliffs.

- Transects should not be too far from the surveyor's residence for convenience of surveying.
- Placement of transects should consider habitats of odonates and butterflies. If the habitat type is available at your selected site and you are surveying for odonates consider placing a transect near a slow moving or still water source, such as a shoreline, or wetland ideally with some standing vegetation. If you are surveying for butterflies, or both consider placing a transect near a meadow, an unforested area (or savannah), or near an edge habitat (treeline, hedgerow, etc.). If possible, try to include both preferred habitat types for butterflies and odonates within the transect.
- Transects can be selected in person or mapped on My Maps by Google to determine length and printed off for use in the field. To see a tutorial on using My Maps, see the end of this document. Do not worry about being perfectly accurate with placement on the map and in the field. This map can be included on the data sheet by taking a screenshot and pasting onto the Site Map section before the data sheets are printed off. Otherwise, you can print the map straight from My Maps by clicking the drop-down menu next to the name of the map in the left-hand corner and attach it to your data sheet.
- Ideally sites will be visited for multiple years to determine population trends, so including a map is important in helping yourself or others find the exact location in future visits and years.
- Once selected, this transect is 'fixed', in other words the same route should be followed each visit and year, and the route should be easily relocatable.



**When to survey:**

- Butterflies are most active between 3.5 hours before and 3.5 hours after the sun is at its highest point. Ideal survey times are between 10:00 A.M. and 5 P.M. EST.
- Minimum air temperature must be 13°C and a maximum of 30°C. Between 13-17°C, cloud cover must be below 50%, and if 18°C and over, cloud cover can be marginally higher, but more sun is preferred.
- The wind should be 5 or lower on the Beaufort scale (called a fresh breeze), which is when the branches of a moderate size move and small trees in leaves begin to sway.

**Table 1.***When to survey based on temperature, cloud cover, wind and rain*

Temperature (°C)	Below 13°C	13-17°C	18-30°C	30°C and over
Cloud cover < 50%	No	Yes	Yes	No
Cloud cover > 50%	No	No	Yes	No
Wind is a strong breeze or higher	No	No	No	No
Rain	No	No	No	No

**What to bring:**

<ul style="list-style-type: none"> <li>• Water</li> <li>• Proper field clothing: boots if it rained earlier, long pants, hat</li> <li>• First Aid kit (if available)</li> <li>• Cell phone for GPS points (or portable GPS)</li> <li>• Data sheet and transect information sheet</li> <li>• Writing materials (pens, pencils)</li> </ul>	<ul style="list-style-type: none"> <li>• Map of transect (if one was prepared)</li> <li>• Binoculars (make sure you are looking within a 5m<sup>2</sup>cube)</li> <li>• Magnifying glass (optional)</li> <li>• Net (optional)</li> <li>• Containers for identification and release (optional)</li> </ul>
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**Where to look and establish a transect (if possible):**

- While you will find butterflies and odonates just about anywhere, sunny, exposed areas with flowering, herbaceous plants are the most likely of places. Odonates will be found in greater concentrations around water that is slow-moving or still and may be hiding in vegetation.
- Mud or wet sand patches.
- Near or on flowers.

## Safety considerations:



- Let someone you can trust know where you are going and when you expect to be back.
  - Make sure your transect is at least 5 meters away from a water or cliff edge.
- If possible, explore the area first before making your transect to be aware of any hazards and to avoid them.
- Do not survey during a heat wave, thunderstorm, or other severe weather events.
- Watch for any hazards as you walk. This can include animals, tree roots, recreational vehicles, or edges.
- When moving off the transect to identify a species, do not go off trail, and be aware of where you left the transect.
- Always check for ticks on your clothes before you leave the site, and on your person when you arrive home. Make sure to check warm areas, like your armpits, behind your ears, your hairline, and behind your knees. For an extra precaution, shake off your clothes outside and put them in a sealed bag until washing, then shower to ensure any ticks rinse off.

## Capture and Handling:

When capturing an insect during the transect method, make sure to remember where you left the transect and to return after capture. Anything observed after leaving the transect cannot be counted. Handling odonates and butterflies is a delicate process that requires being as gentle as possible. When capturing with nets, swinging too fast may cause harm if the edge of the net hits the organism. Once caught, you can capture it for identification by placing it in a container or holding it by its wings. Outside of this study, you can try holding a butterfly or odonata by putting your finger in front of them and pushing gently, encouraging them to come onto your finger. This works best on a cooler day when they are more sluggish.

Most damselflies are very delicate and holding them with your hands is not recommended. Dragonflies which have recently emerged can be recognised by their shiny wings and lack of pigmentation and are also very fragile, so handling and netting is not recommended. In addition, these organisms should not be held too long in order to prevent long-term damage. Damselflies and butterflies are much easier to catch, but dragonflies require swinging the net up and from behind the insect. Once caught,

quickly flick the net so the mesh closes over the opening. Dragonflies must be held by all four wings, and butterflies by both wings. Never hold one in between the wings and on the body, as you could damage the legs. If any wings are left to move, they can easily crack or become damaged. Gently grasp the wings at the base (close to the body) from the outside and slowly close them between finger and thumb. Try not to rub or slide your fingers as this may cause scales to rub off. After identification or photos are taken, release it by setting it on a perch and letting go of the wings. The other method of capture is to lower a container (jar or clear bag with small air holes) over the insect and as it flies up, put a lid up to meet the jar. Using





this method requires more patience in order to have the individual calm and stay still for identification.

Check out this video for handling tips: [How to Hold a Butterfly Without Hurting Its Wings](#)

### Data Submission:

Data can be submitted by entering it manually into the adobe data sheets supplied. Once complete you can email them to us at [info@thelandbetween.ca](mailto:info@thelandbetween.ca)



### Identification:

While it may seem a daunting task to identify between all species of butterflies and odonates, many of them are very uncommon, and will not likely be seen. In the guide provided, the most common species of odonates and butterflies have been listed, as well as broad descriptions of the genus and family. The guide also includes species identification, typical flight periods, or months seen in Ontario, sizes and whether they are common or uncommon.

If you need help identifying a species, try to take a photo of the top and side views. Especially with butterflies, try taking a photo of their wings open from the top and closed from the side. For difficult to identify odonates, capture and take photos of the underside with a close-up of the tip of the abdomen (the appendages), vulvar laminae in females (located ventrally just above the tip or abdominal segment 9), and the hamules in males (located ventrally at the base of the abdomen or abdominal segment 2). Which parts to capture will be included with the more difficult species to identify in the guide provided. You can then post the photos to a naturalist site, such as [inaturalist.org](http://inaturalist.org) to get help with the identification. If you are unable to identify the species at the time of the survey, add a tally to the 'Unknown' section at the bottom of the data sheet.



### Butterfly identification clues:



While most butterflies can be identified by their wing patterns and colours, some species are difficult to tell apart, like the mimic Viceroy and the Monarch (Ritland & Brower, 1991). More information on how to identify each individual is included in the guide provided.

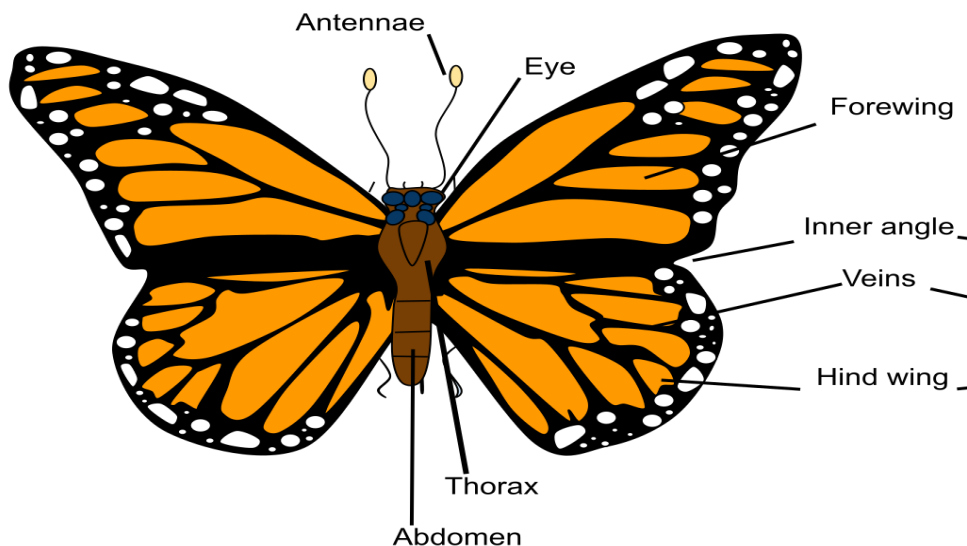
When identifying butterflies, some indicators to look out for include:

- **Size:** Most families have similarly sized species, like the large Swallowtails or the small Gossamer-winged Butterflies.

- **Wings:** Look at the shape of the wings, patterns on either side (top or bottom), and any markings like 'eyes'. Some species within the Brush-footed Butterflies can be distinguished by the size and position of dots on their wings, while silver markings in the form of shapes on the ventral hindwing distinguishes between species of the genus *Polygonia*, including the common Question Mark (*Polygonia interrogationis*) and Eastern Comma (*Polygonia comma*) species. Many species can be distinguished by the presence, absence (only on the hind or forewings, or on both), or the depth of a wings border. In addition, make note of the shape and alignment of the patterning, such as the tiger stripes on the Tiger Swallowtail, or the zigzag lines on the fritillaries.
- **Colour:** The colours of all species, as well as the sheen of some species in the Gossamer-winged Butterflies, is important to note, as well as the colour of any markings. Many species in the Skippers family can only be distinguished by the differences in how light or dark the colours are.
- **Sex:** Males and females are only different in appearance for certain species, but especially between the Skippers. When determining species within the Skipper family, viewing the top of the wings can be unreliable, so it is important to determine the species by the bottom of the wings. In addition, females of some species have dark or white forms, along with their normal colours.
- **Tails:** Within the Gossamer-winged Butterflies, most of the Hairstreak species have tails, while some do not. To identify between these species, closer inspection is necessary. The Swallowtails also have hindwings with a forked, tail-like appearance that distinguishes this family.
- **Season:** Flight season, or what months the butterflies are active, may help distinguish some species depending on what month you are surveying. In addition, the Mustard White (*Pieris oleracea*) has a spring form, which has dark-lined veins on its wings, and a summer form which is almost completely white.

**Figure 3.**

*Butterfly morphology to show upper surface of the fore and hindwing.*





## Dragonfly and Damselfly identification clues:

When identifying dragonflies and damselflies, some indicators to look out for include:

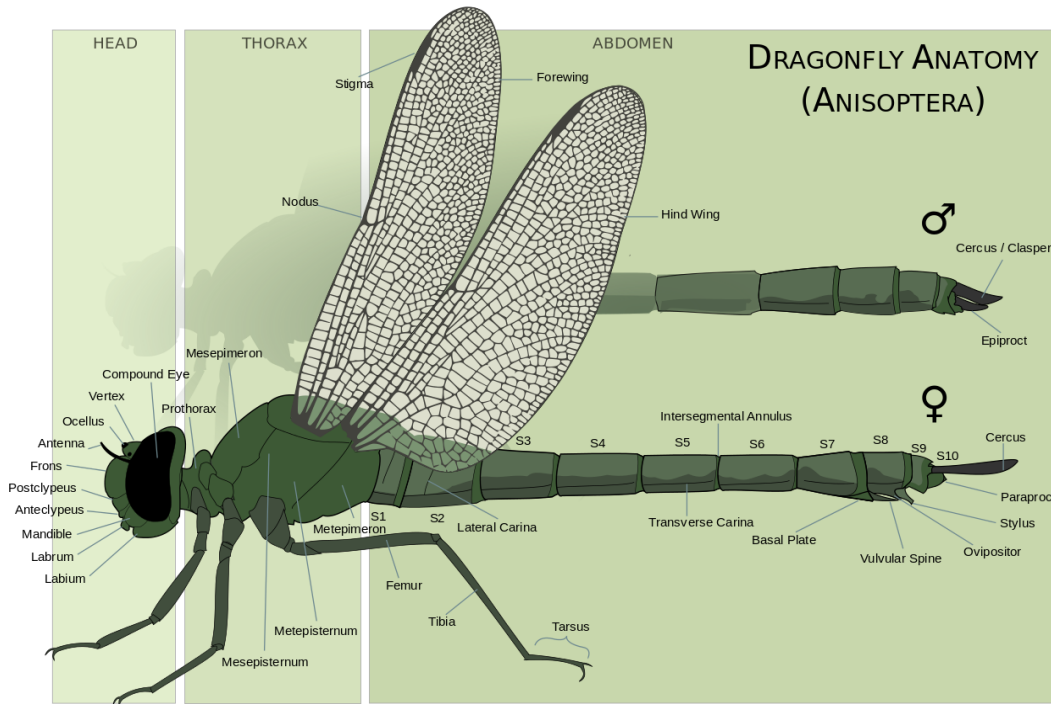
- **Size:** Certain families are larger than others, such as the large Darners, while species within families can have noticeable differences in sizes.
- **Thorax:** Does the thorax have stripes or spots? Is it a solid colour or is it multi-coloured?
- **Abdomen:** Does the abdomen have patterns? What shapes are they? What is the colour scheme?
- **Appendages:** For some species, like those in the family Pond or Narrow-winged Damselflies, the only way to identify between species is to compare the upper and lower appendages at the end of the abdomen. For others, the claspers (appendages the males use to clasp onto the females) are a distinct colour or shape.
- **Wings:** Are they clear or do they have patterns or a tint, either on the edge (costal) or the base (close to the body)? Are pterostigmata (cells on the edge of the wing that are often coloured) present?

**Damselfly wings:** The three damselfly families in Ontario can be distinguished by the position in which they hold their wings when perched and the size of their wings.

- Family *Calopterygidae* (Broad-winged Damselflies): These damselflies have wide, heavily veined wings that are held together over the top of their bodies (Schneider & Paulter, 2013).
- Family *Lestidae* (Spread-winged Damselflies): These damselflies have slim, clear wings that are held out and spread slightly to the side (Schneider & Paulter, 2013).
- Family *Coenagrionidae* (Pond or Narrow-winged Damselflies): These damselflies have slim wings that are held together over the bodies (Schneider & Paulter, 2013).
- **Eyes:** Some families of dragonflies can be distinguished by the position of their eyes.
  - Family *Aeshnidae* (Darners): Very large, compound eyes that meet on top of the head and are closely touching (Schneider & Paulter, 2013). All families other than Clubtails meet only at a point.
  - Family *Gomphidae* (Clubtails): Eyes are widely separated on the top of the head (Duncan, 2005).
- **Age:** For some species, immature and mature individuals will have different colouring and patterns. Additionally, some patterns fade as the individual ages. While it may be difficult to tell the age, try not to rely entirely on colour for identification.
- **Sex:** For some species the female and male have different colour patterns. Also note if a female or male are mating, so you can cross-check both the male and the female against identification.
- **Habitat:** While most are found by slow moving or still water, some species prefer hiding in the vegetation, or will only be found in a specific habitat type, such as the Ebony Boghaunter (*Williamsonia fletcheri*) which prefers sphagnum bogs and fens (n.a., n.d.).
- **Season:** Flight season, or what months the odonates are active, may help distinguish some species depending on what month you are surveying.

**Figure 4.**

*Dragonfly morphology with female and male abdominal appendages.*



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For more information on specific species behaviours, habitats, descriptions and active months, see the [Ontario Dragonfly and Damselfly Guide](#) or the [Butterflies of Ontario](#).

### Technical Guides & Resources:

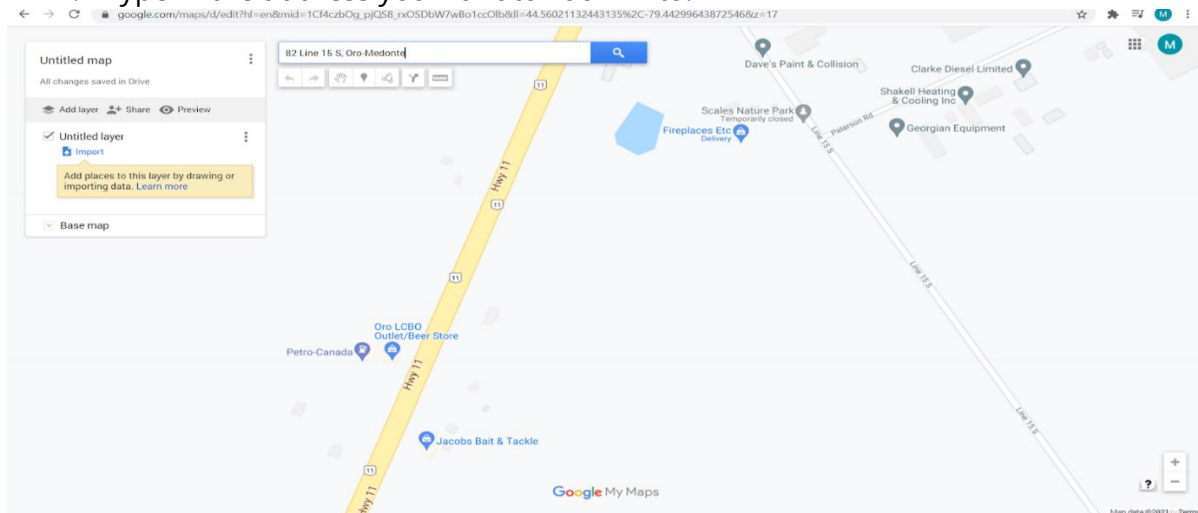
- [Somatochlora of Southern Ontario](#)
- [Ontario Dragonfly and Damselfly Guide](#) - Species descriptions, habitats, and time of year to find them.
- [Manitoba Dragonfly Survey - Citizen's Monitoring Guide](#). - A helpful guide with a picture guide on how to identify between families, and a guide on how to construct a net.



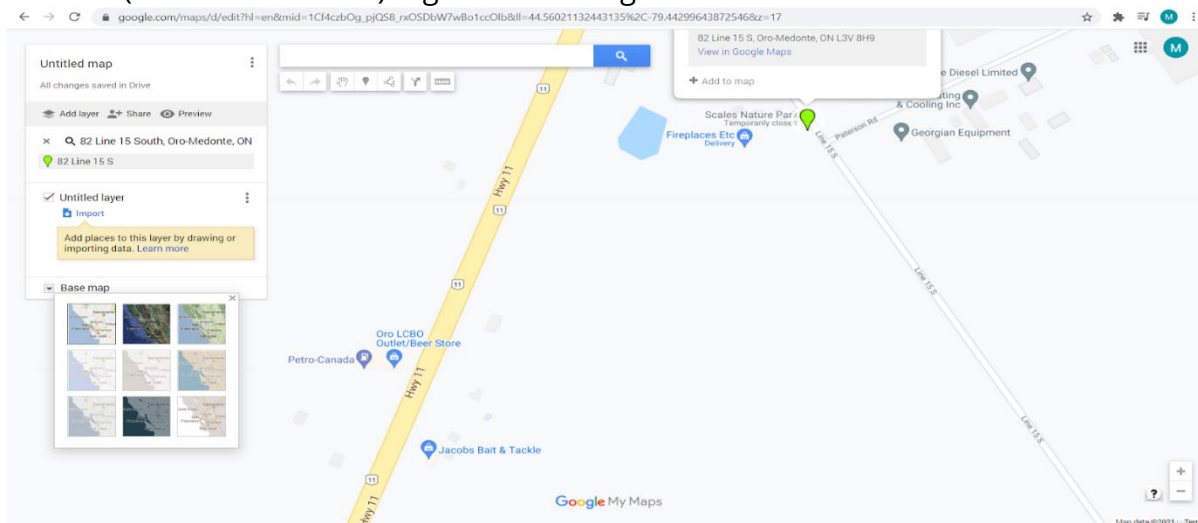
- [Butterflies of Ontario](#)
- [Canadian Biodiversity Information Facility - Butterflies of Canada](#)
- [Butterflies of Toronto](#) - Excellent information on butterfly host plants, species profiles, and general information on butterflies.
- [Odes for Beginners](#)
- [Wisconsin Odonata Survey](#) - An extensive and detailed species catalogue.

# My Maps by Google Tutorial

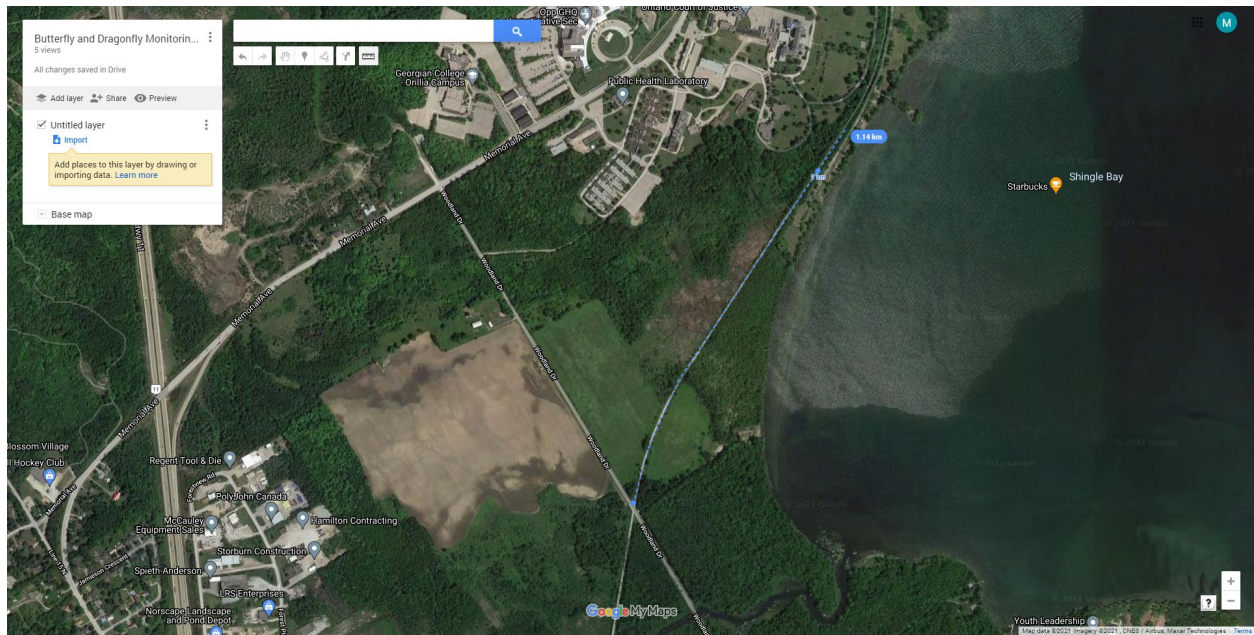
1. Type in the address you want to zoom into.



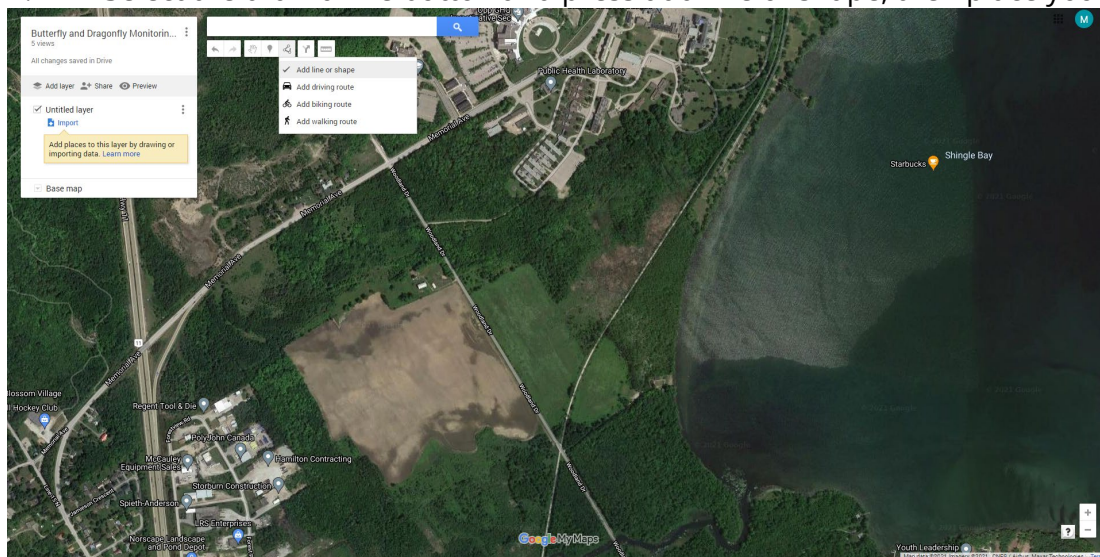
2. Click Base map at the bottom of the left-hand box and select the base layer you'd like. Satellite (the second choice) is good for seeing terrain and trail features.



3. Select the ruler under the search bar to pre-measure the transect and eyeball where to draw your line.



4. Select the draw a line button and press add line or shape, then place your line.

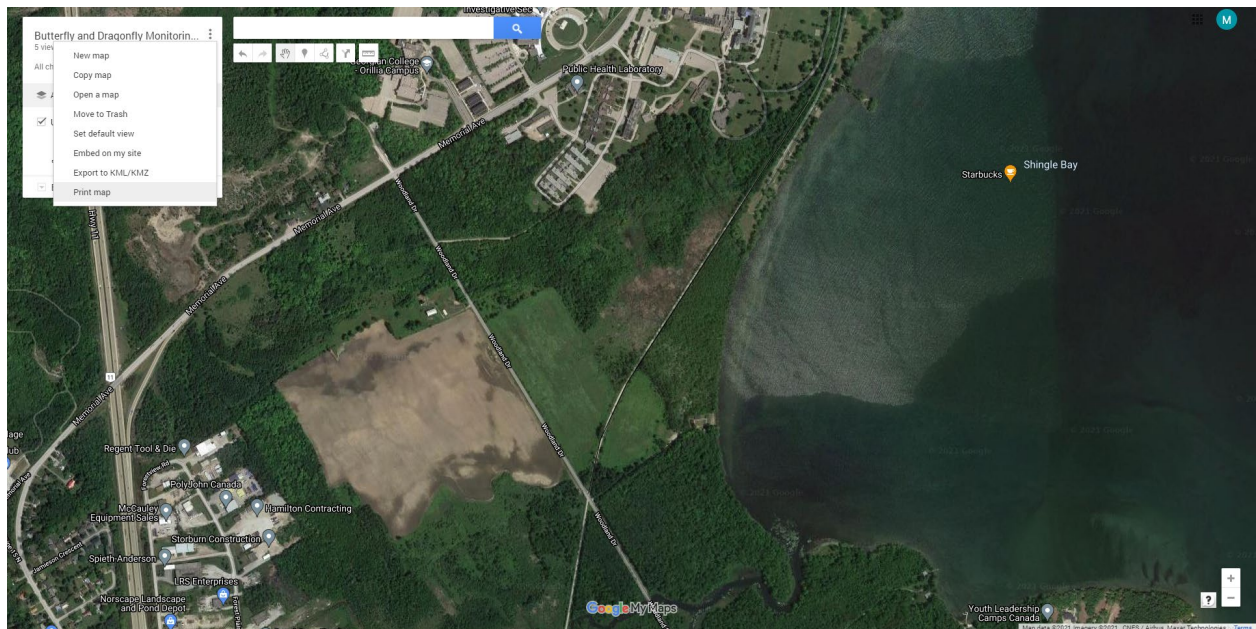


5. Once you've made it to the end of your transect, double click the end mark. It should tell you the kilometer distance at the bottom of the pop-up screen. Make sure to record this distance on your data sheet.





6. Edit and add the site name, then click the drop-down button next to the title and press print at the bottom of the menu. As an alternative, take a print screen capture by holding ctrl + alt + prt sc (this should be at the top of the keyboard), and pasting it into the data sheet document or into a word document.



## References

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<https://www.geobon.org/downloads/biodiversity-monitoring/technical-reports/GEOBON/2015/Global-Butterfly-Monitoring-Print.pdf>.

On behalf of The Land Between charity staff and volunteers, thank you for being a caring wildlife custodian!

