

SOP 2: Counting Adult Monarchs and Documenting Behavior

Follow these instructions for counting adult monarch butterflies and documenting behaviors, especially adults' use of nectar plants. You will use a modified Pollard (1977) walk to **survey** adult monarch butterflies. The method entails walking a route (**segment**) and counting all monarch adults observed, along with their activity or behavior, within a set vertical and horizontal distance from the segment line. Counting adult monarchs using this three dimensional frame permits a fixed-area count and produces a time-specific index of adult monarch abundance (number/ha). Because monarch abundance varies with time at a given location, it is necessary to perform multiple surveys from spring to fall. Times for beginning and ending the survey and disturbances should also be recorded for each visit to a plot.

Attributes Measured

- Time required to conduct this SOP
- Number of adult monarch butterflies (number/ ha)
- Behavior (category)
- Plant species used by adults for nectaring
- Temperature (ambient °C)
- Sky condition and precipitation category

Equipment and Supplies

- GPS, smart-phone or iPad with locating functionality
- Data sheets, clipboard, pencil or pen
- Compass
- Field thermometer
- Black marker
- Plant identification materials (SM 3) and respective field guide
- 100-meter tape (optional, for establishing systematic -sampling layout and replacing missing flags)
- Pink wire flags and bamboo staffs (optional for marking systematic-sampling layout)
- Cord (7.0-m length and marks of 1.0, 2.5, and 5.0 m) for quickly measuring short distances (optional)
- Hand lens or magnifying glass (optional but useful to have)
- Monarch identification materials (Appendix A) and butterfly field guide
- Camera (optional if not already on smart-phone or iPad)

Data Entry (see also SOP 5, SM 4 and SM 5)

Record data for SOP 2 and disturbance noticed in the plot during the visit, using **SOP 2 Data Sheet 1** or iPad Survey123 form named *SOP2 Butterfly Walk*. Record any encounters of adult monarchs using nectar plants when not doing the butterfly walk (e.g., walking to or from a plot), on **SOP 3 Data Sheet 2** or iPad Survey123 form named *SOP3 - Datasheet 2 Miscellaneous Adult Monarch Observations*. Always reference the metadata sheets (SM 5) when trying to remember how different variables (data fields) are recorded.

Conducting the Survey—One person will conduct a slow walk to count adult monarchs at a site on a given day. Assistants can help with data recording, but should position themselves ~45 degrees off set and about 5 m behind the observer in a way that would avoid flushing adults not counted by the observer. Monarch identification is found in Appendix A and must be distinguished from other butterflies and mimics (reference a butterfly field guide for your regions).

Preferable conditions for the Pollard walk are:

- between the hours of 1000–1600,
- when adult butterflies are most active like on sunny, warm days between about 21–30 °C (70–87 °F), and
- during mild winds (less than 10 mph [15 km/hr]).

Cooler or warmer temperatures might cause the adults to stop flying. Do not survey if temperatures are below 16 °C (60 °F) or wind speeds are continuously above 50 km/hr (30 mph) or while raining. We realize that strong winds occur frequently in open midwestern prairies so our intent is to avoid surveys only in situations with very strong winds. So, while low wind speeds are preferable for spotting flying adults, even fairly strong wind conditions, up to 50 km/hr are allowable, if avoiding such strong winds is difficult at a location.

Be sure not to disturb the plot before conducting counts. When doing multiple activities at the same plot on the same day, always conduct adult butterfly counts first. Use SOP 1 to locate segment start points. Conduct the butterfly count by following these steps:

1. Slowly walk segments and count adult monarchs seen within 5 m of either side of the segment line, 5 m vertically, and 5 m in front of you as you walk. What is a “slow walk”? Some people liken the pace to that of the “wedding walk” down the aisle.
2. Only count adults within the **monarch adult counting frame**, which is a 5-m window projected in front of, and to each side of you (Figure SOP-2.1). Do not count butterflies behind you.
3. The monarchs you observed might be flying or not. Count all monarchs you observe within the 5-m distance. The adults seen may or may not be moving. They may be **flying, resting, ovipositing, mating, or nectaring** (Figure SOP-2.3). Regardless of their activity, if you see an adult in the 10-m wide (5 m on each side of the segment) by 5-m long area in front of you, count it, regardless of its height above the ground or its behavior.
4. As you count all adults observed within 5 m on each side of the segment line, also record the perpendicular (shortest) distance from the butterfly to the segment line using the following categories:
 - 1 for 0–2.5 m and
 - 2 for 2.5–5 m

In other words, if a butterfly was first seen within 0–2.5 m of the segment line, you would record its perpendicular distance as “1” (first bin, 0-2.5 m). If it was located between 2.5–5 m from the segment line when you first observed it, its perpendicular distance would be “2” (second bin, 2.5–5 m). The distance from the segment line to the monarch location is the perpendicular distance to the segment line, not the distance from you to the monarch

(See Figure SOP-2.2). The distances recorded are based on the location at which you first encountered the butterfly within the observation window.

5. **Do not count adults observed more than 5 m from the segment line.**
6. Avoid double-counting monarchs.
7. You may have to pause to record data. Pause facing the direction you will continue walking towards, record your observations, and then continue the survey at a slow pace.

Estimating Distance—How can you estimate distances up to 5 m accurately so you can put the observations into their correct bin (0–2.5, 2.5–5 m)? First, we suggest a little bit of practice. Using a yard stick or tape measure, measure off 2.5 and 5 meters and see how many paces those distances correspond to. We also suggest taking a 5-m length of small-diameter rope or tie-line with you into the field. Mark its halfway point by doubling it over and tying a knot there. Before you start your survey, lay out the string to get a picture of 2.5 and 5 m in front and to the side of you.

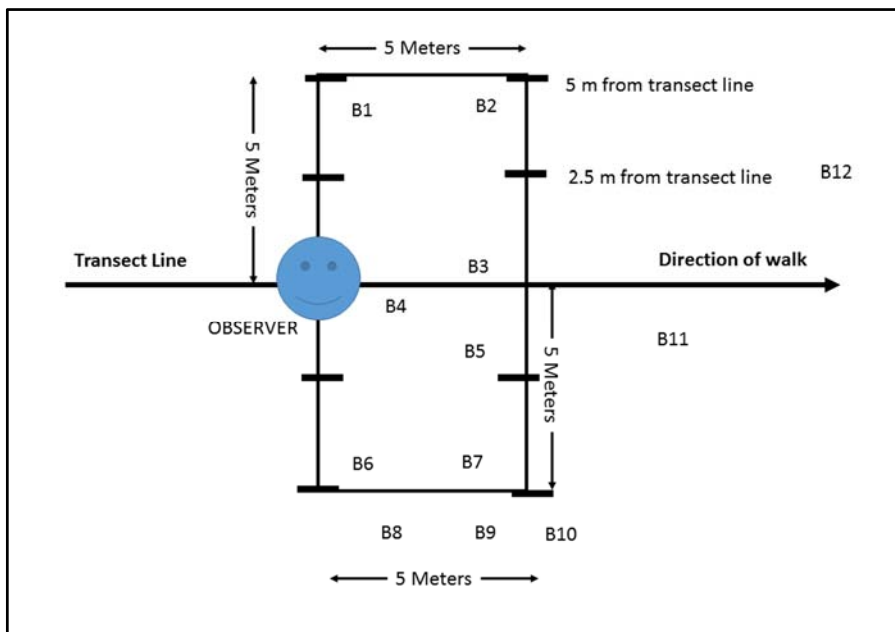


Figure SOP-2.1. The monarch adult counting frame. In this example, if B_x is a monarch adult, there are 7 monarchs (B₁-B₇) counted within the 5-m counting frame, at this moment. B₈-B₁₂ are outside of the counting frame and are not counted. B₃-B₅ are seen within 2.5 m of the segment (transect) line. B₁, B₂, B₆, and B₇ are seen between 2.5-5 m from the segment line. The observer in this example is moving along the segment line from left to right. As the observer walks down the segment, the counting frame moves forwards and some of the butterflies, such as B₁₁ and B₁₂, may move into the frame and be counted. The counting box extends 5 m vertically so monarchs flying within 5 m of the ground within the 5 x 5 m horizontal counting area are included in the count.

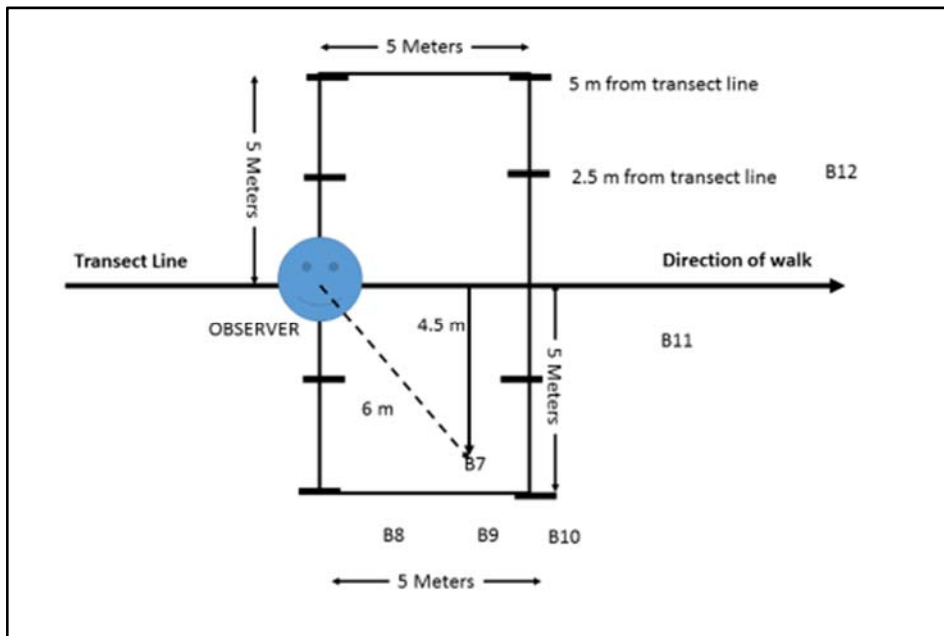


Figure SOP-2.2. Perpendicular distance from segment (transect) line to observed butterfly. Perpendicular distance: In this example, Butterfly B7 is 4.5 m from the transect line but 6 m from the observer. The distance from the segment line (4.5 m) is the shortest (perpendicular) distance to the segment line from the butterfly. It is the distance you need to estimate when recording numbers of adults by distance category (0-2.5 m, 2.5-5 m) and behavior on the data sheet.

Seasons and Frequency of Survey

Monarchs may move northward into a given area to breed, emerge as adults within that area, move from patch to patch, or pass through that area as a southward migrant. Within a brood, adults may emerge over a span of weeks. Thus, it is desirable to count adults many times during a year to get a good picture of their abundance. At minimum, we recommend an adult survey with every plant survey, which occur every three weeks. If time permits, conduct adult counts more frequently. A survey every one to two weeks during the times of the year when monarchs occur in an area is best. Counts and observations of monarchs conducted every three weeks should be done in conjunction with vegetation measurements (SOP 3), preferably on the same day.

A good way to figure out when to start counting adult monarchs is to consult the Journey North website and watch the maps for first sightings of monarchs in your area

(<https://www.learner.org/jnorth/maps/monarch.html>) and to keep an eye open for arriving monarchs in your area.

For Iowa, the following is an approximate schedule of ten biweekly counts:

1. May 16,
2. May 30,
3. June 13,
4. June 27,
5. July 11,

6. July 25,
7. August 8,
8. August 22,
9. September 5,
10. September 19.

Further north, the schedule might start a week later and end a week earlier. Further south (north of Texas), this average schedule might start one to two weeks earlier and end one to three weeks later. These northbound or southbound arrival dates can be shifted earlier or later depending on weather events so watching for monarch arrivals, either live or online for the initial arrivals is important. Nonetheless, the calendar above, from mid-May to Mid-September should be adequate for latitudes north of Iowa. South of Iowa, arrivals in the spring will be earlier and migration south later so, outside of Texas, anticipate starting about two weeks earlier and ending about two weeks later, i.e. adding a count before and after the calendar listed above.

In Texas (except Panhandle region) start counting at the beginning of March and count every two weeks through the end of April and then every four weeks until about the beginning of October, when count frequencies should return to every two weeks. That would result in the following approximate calendar of counts:

1. March 1,
2. March 15,
3. March 29,
4. April 12,
5. April 26,
6. May 24,
7. June 21,
8. July 19,
9. August 16,
10. September 20,
11. October 4,
12. October 18,
13. November 1

For the migration south, consult <http://monarchwatch.org/tagmig/peak.html> for average dates for the peak of the southward migration. As a rough guide, southward migration peaks have historically occurred around September 6 for the latitude of Minneapolis, September 15 for the latitude of Iowa City, and about October 15 for Austin, Texas. Of course, timing of the migration north or south can differ from year to year by several weeks.

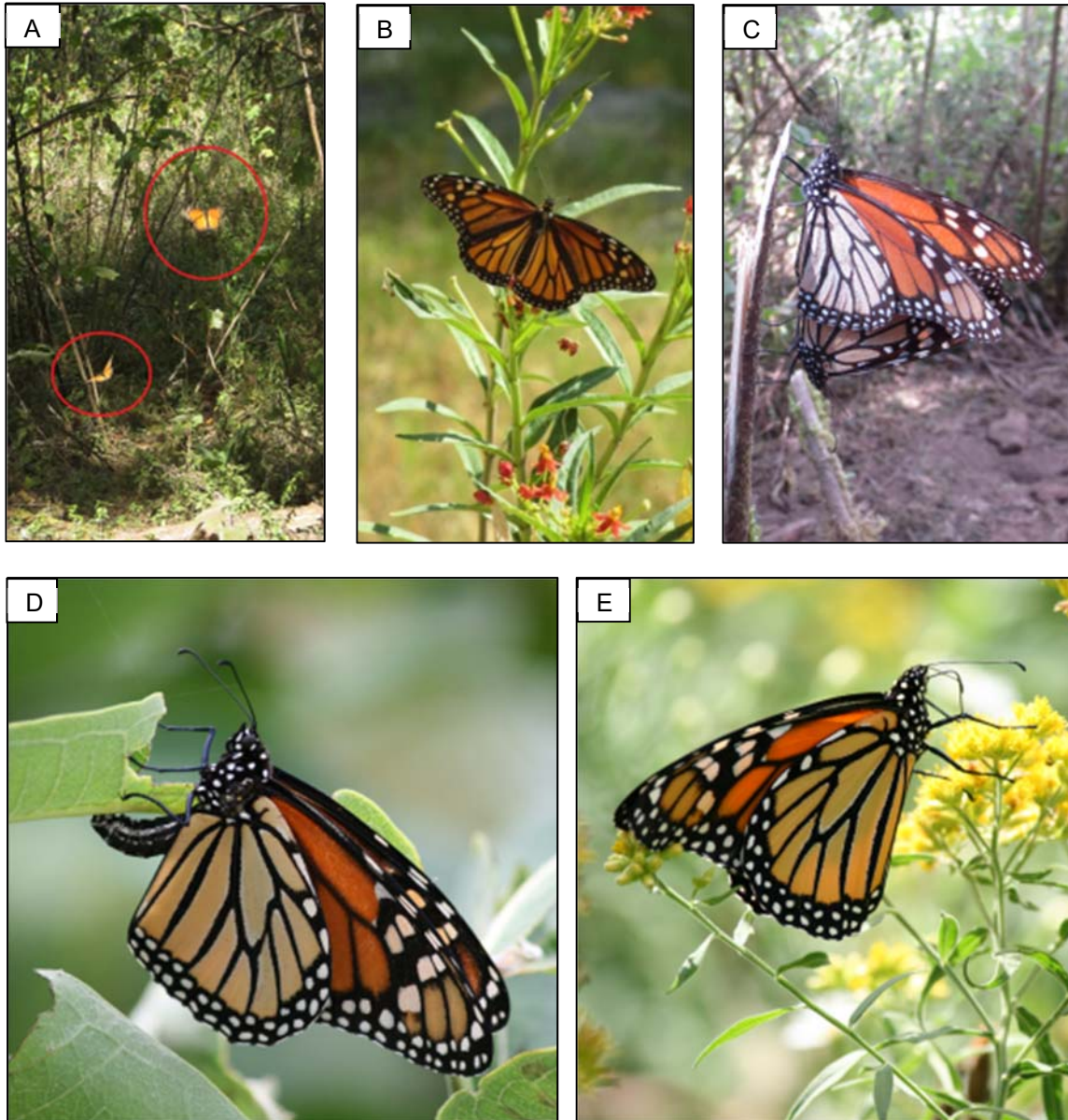


Figure SOP-2.3. Monarch behavior: (A) Two monarchs flying, (circled in red; photo courtesy of Holly Holt), (B) Resting (photo courtesy of Chuck Patterson), (C) Mating (photo courtesy of Holly Holt), (D) Ovipositing (photo courtesy of Candy Sarikonda), and (E) Nectaring (note that monarch's proboscis is extended into flower; photo courtesy of Candy Sarikonda).

References

Pollard E. 1977. A method for assessing changes in the abundance of butterflies. *Biological Conservation* 12: 115–134.