

Western Monarch Count Methods and Protocols

When and how often to survey

Surveys should be conducted at least once per season, although twice or more is preferred. The most important time to count is during the annual **Western Monarch Thanksgiving Count**, which takes place over three weeks surrounding the Thanksgiving holiday. If you can complete one additional survey, the next priority date is the week of January first (a **New Year's** count). Feel free to establish weekly, bi-weekly, or monthly schedules throughout the monarch overwintering season (November through the first week of March). Even if you conduct surveys throughout the season, it is important to include counts at Thanksgiving and around New Year's so we can compare population sizes among the sites.

Surveys should be conducted by **at least two observers** in the early morning while temperatures are low (usually below 13 °C or 55 °F) and monarch butterflies are still clustered. *Note: Do not survey during heavy precipitation and/or strong winds because of poor visibility and increased chances of the butterflies being scattered and on the ground.*

Cluster Estimation Protocols

- I. Record each cluster on a separate row of the datasheet
 - a. Individually count small area of cluster and then extrapolate out to arrive at total for entire cluster; repeat count and take the average.
 - b. Record average of all observers' counts within 20% (only counts that are within a 20% margin should be considered. If counts are not within 20% discuss why and then start the count again)
 - c. Exclude sunners, loners, fliers, and grounders---these categories are tracked separately
 - d. Sum all clustered monarchs + sunners, loners, fliers, and grounders for a grand total of all monarchs observed at the site

Definitions

Cluster: more than two adjacent butterflies with closed wings (likely that the cluster formed the previous day)

Sunners: wings are open and temperatures exceed 55° F (likely that the sunning butterflies flew from their cluster to the sunning location)

Loners: two (adjacent) or fewer butterflies with closed wings not associated with a cluster

Fliers: estimated number of butterflies in flight

Grounders: estimated number of live butterflies on ground (NOTE: if you have time, you can count dead monarchs too; make a separate line on the data sheet)

Weather Protocols

- I. Record at beginning of count and at same location in the grove each visit

II. Wind direction = where the wind is coming FROM

Equipment list

Data sheets	GPS unit or smart phone w/ GPS capability
Clipboard (helpful but not required)	(optional)
Pen or pencil	Plant Identification/Field Guide Book
Binoculars (to monitor monarchs)	(optional)
Kestrel pocket weather meter or outdoor	Camera (optional)
weather thermometer	Compass (optional)