

Monarch Count Survey Instructions

Protocol for the Xerces Society's Western Monarch Count

Equipment List

- Monarch Count Survey Instructions
- Monarch Count Datasheet (hardcopies, or set up on the Survey123 app)
- Binoculars
- Pen or pencil (if using hardcopy datasheets)
- Clipboard (if using hardcopy datasheets)
- Smartphone w/ GPS capability or GPS unit (helpful but not required)
- Smartphone w/ Compass app or handheld compass (helpful but not required)
- Backup portable phone charger & cord (if using Survey123 app)
- Kestrel pocket weather meter or outdoor weather thermometer (helpful, but not required)
- Plant identification field guide or the Seek by iNaturalist app (helpful but not required)
- Camera (helpful but not required)

When and How Often to Count

Monarch Count surveys should be conducted at least once per monitoring period (e.g., once during the Thanksgiving Count and once during the New Year's Count), although twice or more is preferred. Ideally, volunteers will conduct a Monarch Count during both monitoring periods, but *if necessary*, the Thanksgiving Count should be prioritized. Volunteers are welcome to establish weekly, bi-weekly, or monthly schedules throughout the entire monarch overwintering season (late October through early March) if their capacity allows – all monarch overwintering data will be included in the Xerces Society's Western Monarch Overwintering Sites Database, even if collected outside of the two official monitoring periods. However, it is important to conduct Monarch Counts during the Thanksgiving Count and New Year's Count in order to compare cluster sizes in a standardized way across sites and years.

Surveys should be conducted by **at least two observers** in the **early morning** while temperatures are low enough that monarch butterflies remain clustered from the evening before (usually below 13 °C or 55 °F). Weather measurements should be taken and recorded in the datasheet before beginning to count; measurements should be taken from the same location in the grove each visit (note that "wind direction" is the direction that the wind is coming FROM). **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. Additionally, if a considerable number of fliers are observed, please complete your survey as usual, but plan to return another morning when conditions are more favorable for an accurate count.

Cluster Estimation Protocol

Record each cluster on a separate row/field of the datasheet:

1. Identify a cluster to estimate with your monitoring partner. It's important that you are both counting the same butterflies since you'll compare counts for accuracy at the end.
2. Individually count the number of monarchs in a small section or area of the cluster, then extrapolate that number out to arrive at count estimate for the entire cluster. Repeat this process one or two more times from different angles, then take the average.
3. Compare your estimate with that of your monitoring partner's; if both counts are within a 20% margin, record the average of the two counts (yours and your partner's) on the datasheet. If counts are *not* within 20%, discuss why and then start the count again.

4. Repeat this process until you and your monitoring partner have agreed upon estimates for each cluster present at the site. Sum your estimates and note the total number of clustered monarchs on your datasheet.
5. Sunners, loners, fliers, and grounders are tracked separately on the datasheet; tally these observations as you move around the site.
6. Sum all clustered monarchs + sunners + fliers + loners + grounders to produce the grand total monarch count.
 - *Note: dead monarchs or monarchs missing an abdomen (e.g., due to predation) should NOT contribute to the grand total. Instead, record number of dead monarchs in a separate field on the datasheet.*

Submitting Data

Monarch Count and Habitat Assessment data should be submitted as soon as possible through the Survey123 mobile app or online forms available at WesternMonarchCount.org. Monitoring partners will need to decide who is responsible for submitting their joint datasheet and plan accordingly to avoid submitting multiple reports of the same data. If inconsistencies, missing data or protocol concerns are noted, a Xerces staff person or regional coordinator will attempt to contact the individual(s) for clarification, using the email provided in their datasheet.

Monitoring Definitions

Monarch butterfly categories:

- **Cluster:** three or more adjacent butterflies with closed wings (likely that the cluster formed the previous day)
- **Sunners:** butterflies with open wings and temperatures usually exceed 55° F (likely that the sunning butterflies flew from their cluster to the sunning location)
- **Loners:** two or fewer butterflies with closed wings not associated with a cluster
- **Fliers:** any number of butterflies in flight
- **Grounders:** any number of live butterflies on ground (living monarchs missing an abdomen due to predation should be categorized as “dead”)
- **Dead:** butterflies presumed dead or death is imminent (e.g., missing abdomen)
- **Mating:** individual butterflies engaged in mating activities
- **Tagged:** butterflies with a unique applied marking (usually a sticker) on hindwing

Site access categories:

- **Open Access:** Unrestricted direct access to the site/cluster trees (e.g., public parks or open spaces that remain open all/most hours, public walkways, roadways, or parking lots, etc.)
- **Limited Access:** Complete or partial access to the site/cluster trees *with* limitations or restrictions (e.g., fees, limited operating hours, requires site access coordination or special permissions, environmental obstacles, etc.)
- **No Access:** No direct access at this time; however, the site may or may not be visible from a nearby location, such as a public road (e.g., private property, restricted access area, environmental barriers, etc.)

Thank you for participating in the Western Monarch Count!

Please refer to the resources available at WesternMonarchCount.org for more information.