

Nationwide Candidate Conservation Agreement for Monarch Butterfly on Energy and Transportation Lands

July 2023

Adaptive Management Modification for Flowering Nectar Plants

Purpose

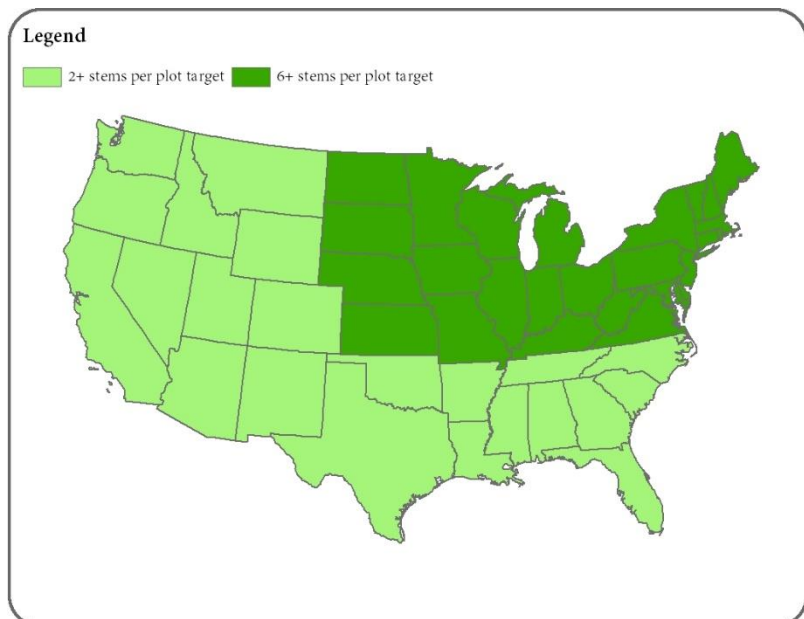
Findings from data collected informs whether Partners and the Program are meeting expectations for milkweed and nectar plant abundance on adopted acres as described in the CCAA’s Conference Opinion. As described in Section 14.2 of the CCAA, if results are below the targets for adaptive management, additional information is requested from Partners to consider why targets were not met, and what can be adapted to achieve those targets in the future.

The Program Administrator (UIC) and USFWS recognize that random selection of sample plots may not always be located within milkweed populations present on adopted acres. Recognizing this, and to encourage additional data collection of nectar plant cover, the Program Administrator and USFWS are modifying the adaptive management requirements in the Midwest and Eastern U.S. to consider nectar plant cover as conservation benefit on adopted acres. This document outlines the modified process to be used by the Partners, Program Administrator, and USFWS to consider nectar plant cover in monitoring results and adaptive management triggers starting in the 2023 growing season.

As part of this consideration, this document also summarizes what may constitute as “good” nectar plant cover for monarch butterflies. The importance of nectar plants for monarch butterflies is widely recognized yet remains an understudied topic. To date, there is little to no quantitative data prescribing what “good” nectar plant cover is, or how it might vary regionally. This document summarizes available literature on the essential functions of nectar plants in monarch habitat and the key characteristics of nectar plants important to monarch biology.

Background

Partners track adopted acres that they maintain as monarch habitat towards their annual commitments under the CCAA. In tracking, Partners are required to complete *effectiveness monitoring* on a random selection of plots on their adopted acres (see: [‘Monitoring’ in the CCAA Toolkit](#) or [Section 14 of the Monarch CCAA](#)). During CCAA monitoring, data collected informs two questions based on a Partner’s plot locations:



1. *Are numerous milkweed stems present within randomly selected portions of the adopted acres? Specifically, within sample plots:*
 - a. *In the Midwest or Eastern U.S., do sample plots contain at least six milkweed stems, or*
 - b. *In the Western and Southern U.S., do sample plots contain at least two milkweed stems?*

2. *Are potentially flowering nectar plants present across more than 10 percent of the sample plots in the Western and Southern U.S.?*

Data regarding nectar resource presence is only required for Partners in the Western and Southern U.S. However, many CCAA Partners collect nectar plant cover data as an “optional” data field in the Midwest and Eastern U.S.

Nectar Plant Contributions to Monarch Habitat

Nectar plants are identified as an important habitat requirement for the monarch butterfly (USFWS 2020). Severe declines in monarch butterfly populations over the last 20 years (Brower et al. 2006, Rudolph et al. 2006, Semmens et al. 2016) have been partially attributed to landscape-scale declines in nectar plant abundance (Inamine et al. 2015, Saunders et al. 2019) including the Midwest and Eastern U.S. (Brower et al. 2006, Xerces Society 2023).

“Good” nectar plant cover for monarchs can be described by metrics of nectar plant **diversity**, **flower phenology**, and **abundance**.

Diversity

Lands with a diversity of nectar plant species are the most supportive to the monarch butterfly. Studies have supported that adult monarch abundance is positively correlated with nectar plant species richness (Bruce et al., 2021). Nectar plant diversity provides multiple resource options for butterflies, as different species have different nectar chemistries: some offer higher quantities of sugar, while other offer higher quantities of amino acids (Arnold et al. 2017). Different combinations of these nutritional components may support monarch life stages at different times when needed. For example, high amino acid content has been suggested to support monarch egg production (Arnold et al. 2016), while higher levels of sugars may provide necessary energy reserves for long-distance migration.

Flower Phenology

Flower phenology, or the timing of flower blooming, is another important component for establishing suitable nectar cover for habitat as monarchs may rely more on nectar plant resources at different periods in their life history. For example, consuming large amounts of nectar resources in the fall is important for monarchs to complete their annual migration and overwintering (Alonso-Mejia et al. 1997). For conservation planning, it is important when planning vegetation to include species that will provide nectar resources throughout the year for adult monarch butterflies as they migrate and reproduce (Xerces Society 2023).

Abundance

No studies have attempted to quantify an abundance of nectar plants needed. Thus, no literature is currently available to inform either a minimal expectation or an optimal target for nectar plant abundance for monarchs. In considering the benefits of diversity and phenology discussed, a “more is better” approach to nectar plants is broadly consistent with goals for monarch butterflies and habitat conservation. By opting for more abundance of flowering plants where possible, the known benefits of nectar plants can be more readily available at times when monarchs need them the most.

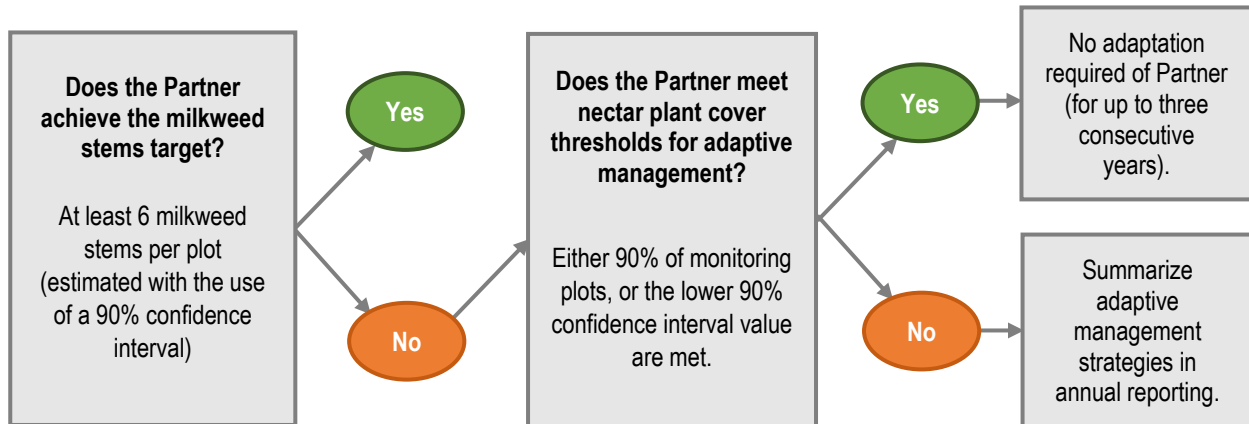
Modified Process to Recognize Nectar Plant Contributions from Midwest and Eastern U.S. Partners

The Program Administrator and USFWS recognize that nectar plants are an important resource for monarch butterflies. The Program Administrator and USFWS are modifying the strategy for determining adaptive management thresholds for Partners in the Midwest and Eastern U.S. originally described under Section 14.2 of the CCAA.

As described in the CCAA, thresholds for adaptive management in the Midwest and Eastern U.S. region are determined solely by milkweed presence. Partners in the Midwest and Eastern U.S. region have the *option* of collecting percent cover estimates of nectar plant cover as well. Starting in the 2023 monitoring season, the Program Administrator will evaluate adaptive management requirements for Midwest and Eastern U.S. Partners as a two-stage approach (Figure 1):

- First, the Program Administrator will consider the Midwest and Eastern U.S. Partner’s milkweed presence (consistent with Section 14 of the Monarch CCAA), and
- If milkweed statistics meet or exceed the adaptive management target of 6 milkweed stems per plot, then Partners are already achieving targets. No other work is required.
- If milkweed statistics do not meet the adaptive management target of 6 milkweed stems per plot, then the Program Administrator will consider nectar plant cover. If the optional target (more than 10% nectar cover in a plot) is present on 90% or more of the Partner’s plots, then Partners in the Midwest and Eastern U.S. may forego considerations for adaptive management in that year. Partners may use either the percentage of monitoring plots, or the lower 90% confidence interval value, in accordance with their data collection approach (see Section 14.2.2 for more details).
- If neither the milkweed target nor the optional nectar plant target is met (or collected) in a single year, then adaptive management prioritizing milkweed enhancement is required in annual reporting per CCAA requirements.
- Partners would be able to use nectar plant cover in this way to satisfy adaptive management thresholds for up to three (3) consecutive years. If milkweed targets are still not achieved after three consecutive years, Midwest and Eastern U.S. Partners must then consider adaptive management strategies.

Figure 1. Modified approach for evaluating adaptive management thresholds for Midwest and Eastern Partners.



References

- Alonso-Mejia A, Rendon-Salinas E, Montesinos-Patino E, Brower LP. 1997. Use of lipid reserves by monarch butterflies overwintering in Mexico: implications for conservation. *Ecological Applications*. 7. 934-947.
- Arnold PM. 2016. Variation in nectar composition: the influence of nectar quality on monarch success, Chapter II: Effects of nectar amino acids on monarch. Master's Thesis, Bowling Green State University. https://etd.ohiolink.edu/apexprod/rws_etd/send_file/send?accession=bgsu1467568732&disposition=inline
- Arnold PM, Michaels HJ. 2017. Nectar Sampling for Prairie and Oak Savanna Butterfly Restoration. *Applications in Plant Sciences*. 5(6). doi:10.3732/apps.1600148
- Brower, L. P., Fink, L. S., & Walford, P. (2006). Fueling the Fall Migration of the Monarch Butterfly. *Integrative and Comparative Biology*, 46(6), 1123-1142.
- Bruce AS, Thogmartin WE, Trosen C, Oberhauser K, & Gratton C. 2021. Landscape- and local-level variables affect monarchs in Midwest grasslands. *Landscape Ecology*, 37, 93-108. <https://doi.org/10.1007/s10980-021-01341-4>
- Inamine H., Ellner S., Springer J., & Agrawal A. (2015). Linking the Continental Migratory Cycle of the Monarch Butterfly to Understand its Population Decline. 100th Annual Meeting of the Ecological Society of America, 2015.
- Saunders SP, Ries L, Neupane N, Ramirez MI, Garcia-Serrano E, Rendon-Salinas E, and Zipkin EF. 2019. Multiscale seasonal factors drive the size of winter monarch colonies.
- Semmens B, Semmens D, Thogmartin WE, Wiederholt R, López-Hoffman L, Diffendorfer JE, Pleasants J, Oberhauser K and Taylor O. 2016. Extinction risk and population targets for the Eastern, migratory population of monarch butterflies (*Danaus plexippus*) *Sci. Rep.* 6. 23265
- Rudolph, D. C., Ely, C. A., Schaefer, R. R., Williamson, J. H., & Thill, R. E. (2006). Monarch (*Danaus plexippus* L. Nymphalidae) Migration, Nectar Resources and Fire Regimes in the Ouachita Mountains of Arkansas. *Journal of the Lepidopterists' Society*, 60(3), 165-170.
- U.S. Fish and Wildlife Service. 2020. Monarch (*Danaus plexippus*) Species Status Assessment Report. V2.1 96 pp + appendices. <https://ecos.fws.gov/ServCat/DownloadFile/191345>
- Xerces Society. Accessed May 2023. Monarch Nectar Plant Guides. <https://xerces.org/monarchs/monarch-nectar-plant-guides>