

# INSTRUCTIONS FOR MONARCH WILDLIFE HABITAT EVALUATION GUIDE (WHEG)

Northern Great Plains Edition  
Version 1.0 (2020-08-13)

## INTRODUCTION

### Monarch Butterfly and Habitat

The eastern U.S. population of the monarch butterfly (*Danaus plexippus*) has suffered significant declines over the past two decades. NRCS is targeting a habitat development effort within known migration routes and the primary breeding range. For general information on the monarch butterfly biology, staff are encouraged to read the document titled *NRCS Monarch Butterfly Habitat Development Project* ([USDA 2015](#)). For specific details on the status of the eastern monarch butterfly, consider reading the Monarch Butterfly Conference Report (USDA and USFWS 2016). NRCS conservation practices installed to benefit the monarch will typically benefit other wildlife species that occupy periodically disturbed mid-successional (seral plant community stage) habitats.

Monarch butterflies rely on nectar-rich forbs for forage for adult butterflies, and milkweed species for successful reproduction. Any monarch butterfly habitat assessment must target the milkweed and forb plant community component, as well as pesticide risks.

### Evaluating Monarch Habitat

Most NRCS species-specific wildlife habitat evaluation guides (WHEGs) determine the quality of habitat for a wildlife species at the farm/ranch scale (cumulative score for entire project area) where the objective is a resource management system (USDA 2013). The objective of those WHEGs is to identify the most limiting factor for the species while taking into account the proximity and interrelationships to adjacent habitats (on and off the farm or ranch). This approach is particularly appropriate for resident species with limited mobility, distribution and home ranges. The monarch butterfly, however, is a migratory species that uses habitat resources across a wide area in a single season. When not migrating, the movement of individual monarchs is not well understood; however, they still appear to move long distances to acquire life requirements (Brower 1995, Brower et al. 2011). Addressing the declines in the monarch butterfly population mandates a different approach.

Little is known about the importance of the spatial connectivity of habitats during the migratory or non-migratory periods of the monarch's life cycle. Accordingly, rather than attempting to evaluate habitat spatially at the landscape or regional levels, this guide is narrowly applied to only those portion(s) of the agricultural operation under consideration for monarch habitat improvement, and does not consider connectivity to, or interactions with other habitats. This guide is applied to each individual assessment area separately (each assessment area receives a score). Based on the best available science (Brower et al. 2011; Pleasants and Oberhauser 2012) the most limiting factors for monarchs are the availability of reproductive habitats (i.e., the abundance and distribution of the monarch caterpillar's hostplants: milkweed) and availability of

nectar plants to fuel adult flight (Inamine et al. 2016). This WHEG requires the user to measure abundance and species richness of milkweeds and nectar sources, while also assessing the risk to the habitat posed by pesticide use on or adjacent to the assessment area.

Scoring Monarch Habitat

The scores derived from this WHEG are not designed to be used as a ranking mechanism for Farm Bill conservation programs. Maintaining the integrity of this WHEG as a planning tool and not a Farm Bill program ranking tool allows the conservation planner some flexibility in applying the WHEG. Staff are encouraged to incorporate professional judgments deemed necessary for unique site conditions, varying financial resources, and varying client objectives.

Reference Domain

Figure 1 provides the reference domain (area of applicability) for the Northern Great Plains edition of the NRCS Monarch WHEG. The reference domain is based on multiple Major Land Resource Areas (MLRAs) within two Land Resource Regions (LRRs) (USDA 2006):

- F: *Northern Great Plains Spring Wheat Region* (All MLRAs are included except where 55C [Southern Black Glaciated Plains] occurs within MN.).
- G: *Western Great Plains Range and Irrigated Region* (Includes portions of LRR G in MT, ND, SD or NE.)
- H: *Central Great Plains Winter Wheat and Range Region* (Includes portions of from LRR H in NE.)
- M: *Central Feed Grains and Livestock Region* (Includes portions of LRR portions in ND, SD or NE.)

Application of this WHEG on lands located in LRRs immediately adjacent to the reference domain, may be appropriate if approved by the NRCS State Conservationist.

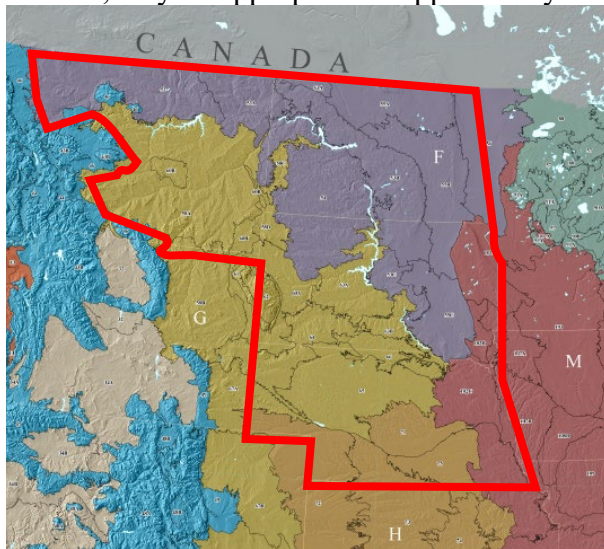


Figure 1: Applicability region for the NRCS Monarch WHEG; Northern Great Plains Edition.

## Exclusions

This WHEG is designed for use on croplands, grasslands (range, pasture, haylands), shrublands, savannahs or areas supporting brush or trees that were historically grasslands, shrublands or savannahs within the reference domain (see Figure 1). This WHEG shall not be applied to forested areas (forested swamps, riparian forested areas or forested uplands that were historically forested) that are providing other important ecosystem services. Historic grasslands that have been invaded by woody species do not fall under this exemption.

## Timing of the Evaluation

Conduct the evaluation during the growing season in order to determine the number and species richness of nectaring plants and milkweeds present on the assessment area.

## **Equipment Needed<sup>1</sup>**

- 100 ft. tape
- 12 wire flags
- Yard or Range stick
- Clipboard
- Pens/pencils
- Compass
- Camera
- Aerial photos / maps of assessment area
- GPS for Lat/Long
- Resources for estimating cover (6' x 6' frame recommended)
- NRCS document "Important Plants of the Monarch Butterfly—Northern Great Plains Staff Guide" (USDA 2018)

## **INSTRUCTIONS**

### **STEP 1: Develop a project base map.**

- a. Delineate the area to be evaluated on an aerial photograph or other mapping resource. The area to be considered for monarch habitat improvements is referred as the "*project area.*" *Note: The project area may be the USDA Tract boundaries, but not always. In some situations, it may be a single field or portion of field. The decision of the project area boundaries is left to the discretion of the conservation planner and decision-maker for the land under consideration.*
- b. Delineate unique assessment areas within the project area. As appropriate, subdivide the project area into smaller, unique areas to be assessed based on consistent land type (i.e. similar ecological sites, vegetation, soils, slope, and land use/management). These unique areas are referred to as *assessment areas* (AA). Identify each assessment area on the base map. To not conflict with Common Land Units (CLU) and USDA field numbering, choose an alphabetical notation (A, B, and C). An assessment area need not be fully contained in a single contiguous polygon. For example, if more than one portion of the project area supports similar habitat characteristics (i.e. dense stands of *juniper* on steep slopes) then each polygon supporting these conditions will be assigned the same assessment area label. For these situations, follow a sequential numeric notation (A1, A2, A3, etc.) to denote that a group of non-contiguous areas ("sub-assessment areas" or

---

<sup>1</sup> The requirement for most of this equipment is limited to sampling the plant community. In many situations, the "rapid screening approach" will be used and sampling will not be required.

“subareas”) have similar characteristics and will be considered as one assessment area. See Figure 2 for an example. A Northern Great Plains Monarch WHEG datasheet will be completed for each assessment area.

- c. Determine size of each area. Determine and denote the acres in each assessment area (including each subarea) on the base map and the WHEG datasheet.

USER NOTE: This WHEG allows the planner to rapidly screen out AAs that will not require the completion of a vegetation survey based on the plant community. For example, vegetative sampling to determine the density of milkweed and/or nectaring species has limited value in a cropland field or areas dominated by invasive species or brush.

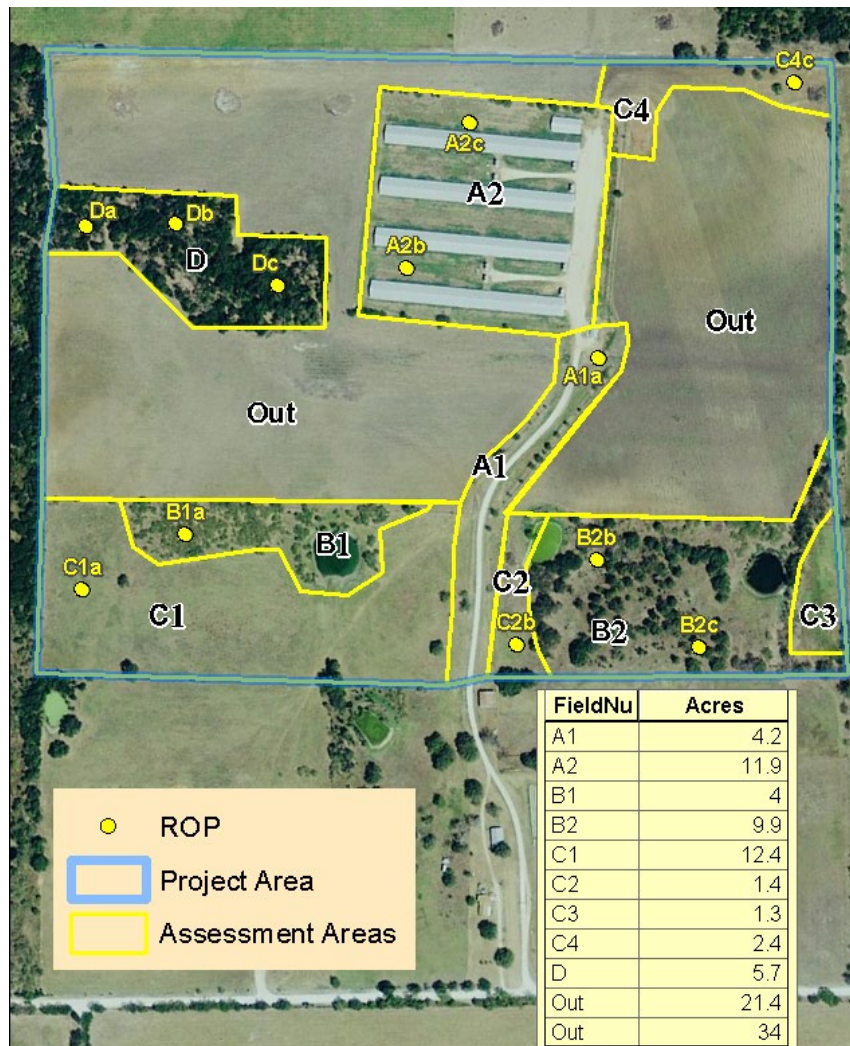


Figure 2: Example of a monarch habitat development base map. Note the concept that an assessment area need not be contiguous. As an example, the open herbaceous assessment area C has four subareas (C1, C2, C3, and C4). ROP denotes Representative Observation Point where vegetation surveys occur. Also, note that assessments need not be performed on areas where the decision-maker is not interested in providing monarch habitat (e.g. Out).

## **STEP 2: Rapid Screening of Monarch WHEG Plant Community Types<sup>2</sup>.**

Determine the Monarch WHEG plant community type and document the decision on the data sheet for the assessment area. If an assessment area is cropland, intensively managed hayland or pasture, or dominated by invasive species or brush, then it is of low value to monarchs and can be rapidly screened as poor value habitat (see WHEG datasheet page 1). No data on milkweeds or nectar plants needs to be collected for that assessment area. Continue with Steps 3, 6 and 7 (skipping Steps 4 and 5). If habitat is “other herbaceous community” (and thus might have significant milkweed or nectar plant populations), carry out Steps 3 through 7.

- i. *CROPLAND* – Any area that is being annually planted for harvest of a product.
  - A. Document a benchmark rating of *poor* on page 1 of the datasheet.**
  - B.** If any of the planning considerations below are an objective of the decision maker, continue to Step 3.
    - Alternatives and Planning Considerations:
      - Habitat establishment using conservation practice(s) Conservation Cover (327), Wildlife Habitat Planting (420), Field Border (386), Riparian Herbaceous Cover (390) and/or Range Planting (550) with additional criteria to “enhance wildlife, pollinator and beneficial organism habitat,” with the monarch as the target wildlife species.
- ii. *INTENSIVELY MANAGED – LOW DIVERSITY HERBACEOUS COMMUNITIES (includes farmsteads, pastures, hayland and other frequently-managed OR low diversity grass stands)* - These areas are primarily monotypic or low diversity grass stands that commonly receive intensive management through fertilization, mowing and/or herbicide applications. Vegetation is generally non-native species. Native haylands with high forb richness should be classified as “*OTHER HERBACEOUS COMMUNITY*” (see iv below).
  - A. Document a benchmark condition rating of *poor* on page 1 of the datasheet.**
  - B.** If any of the planning considerations below are an objective of the decision maker, continue to Step 3.
    - Alternatives and Planning Considerations:
      - Habitat establishment using conservation practice(s) Conservation Cover (327), Wildlife Habitat Planting (420), Field Border (386), Riparian Herbaceous Cover (390) and/or Range Planting (550) with additional criteria to “enhance wildlife, pollinator and beneficial organism habitat”, with the monarch as the target wildlife species.
      - Habitat management through Forage Harvest Management (511), Prescribed Burning (338), Prescribed Grazing (528) and/or Early Successional Habitat Development / Management (647), if planner deems such activities will improve monarch habitat by increasing the richness

---

<sup>2</sup> Monarch WHEG plant community types are related specifically to this WHEG and should not be confused with the term “landuse” in the NRCS National Conservation Planning Manual or program guidance.

and cover of the forb component.

- iii. *BRUSH and/or INVASIVES SPECIES DOMINATE* – These areas contain woody vegetation (shrubs and trees) or invasive species at densities such that monarch habitat is by and large absent. Shrublands or savannahs that support a diverse herbaceous plant community should be classified as “*OTHER HERBACEOUS COMMUNITY*” (see iv below).
  - A. Document a benchmark condition rating of *poor* on page 1 of the datasheet.**
  - B.** If any of the planning considerations below are an objective of the decision maker, continue to Step 3.
    - Alternatives and Planning Considerations:
      - Monarch habitat management requires the implementation of Brush Management (314) and/or Herbaceous Weed Treatment (315).
      - In addition, Prescribed Burning (338), Early Successional Habitat Development / Management (647) and/or Prescribed Grazing (528) may be applied to improve monarch habitat by increasing the richness and cover of the forb component.
      - Following effective control of brush and non-native species, the planting of preferred monarch butterfly forage species may be needed. If needed, use Conservation Cover (327), Wildlife Habitat Planting (420), Field Border (386), Riparian Herbaceous Cover (390) and/or Range Planting (550) with additional criteria to “enhance wildlife, pollinator and beneficial organism habitat”, with the monarch as the target wildlife species.
- iv. *OTHER HERBACEOUS COMMUNITY*– *These areas support native and non-native grasses, and a significant forb component worthy of inventory. They may have past cropping or grazing history. Past cultural practices (e.g. cropping) may have changed the soil (structure, organic matter, biology) and microtopography such that the site’s potential to support a rich mix of native herbaceous species is reduced, but is not eliminated. There may be some woody plant cover and/or invasive plants, but not to the level to warrant designating the area as “BRUSH and/or INVASIVES SPECIES DOMINATE”.*
  - A.** If your assessment area qualifies as “other herbaceous community”, continue to Step 3.

### **STEP 3: Pesticide Threat Assessment**

Collect information on use of insecticides and herbicides by interviewing the client. If decision-maker is not agreeable to avoiding direct pesticide treatments to the area once habitat is established, then stop the planning process as planning criteria will not be met.

Herbicides and insecticide drift can impact the value of monarch habitat. Insecticide drift from spray and seed treatments, including dust when planting treated seed, and impact monarchs using adjacent habitats. Record notes on the WHEG datasheet (see page 2) and assign benchmark scores for insecticide risk ( $V^{IR}$ ) and herbicide risk ( $V^{HR}$ ).

- Alternatives and Planning Considerations:
  - If the decision-maker will avoid direct application and is interested in reducing the threat of pesticides from drift to the proposed monarch habitat, consider implementing an Integrated Pest Management Plan (595)<sup>3</sup> or utilizing drift mitigation techniques as described in Table 3 of Technical Note 190-Agr-9 (USDA 2014).
  - The decision maker may opt to implement a *100-foot pesticide-free buffer* around the entire AA or area encompassing all implemented practices. *Note: These restrictions do not apply to strategic herbicide applications intended to (1) help establish monarch habitat (e.g. using herbicide to eliminate invasive plants before seeding), or (2) maintain the AA as productive monarch breeding habitat (e.g. spot-spraying of herbicide to keep invasive plants from outcompeting milkweeds and native nectar sources).*
  - The decision maker may not be able to provide for a 100-foot pesticide free buffer or implement the drift mitigation practices in Technical Note 190-Agr-9. In these situations, less effective drift mitigation measures, as provided in the monarch WHEG data sheet should be considered.

If assessment area is plant community type identified as poor in Step 2 (Rapid Screening), skip to Step 6. Otherwise, proceed to Step 4.

#### **STEP 4: Field Assessment**

The field assessment involves conducting vegetative surveys at three Representative Observation Points (ROPs) per AA. Planners should locate ROPs that represents the average condition of the AA. At each ROP, stretch a tape 72.6 feet noting the geographic coordinates of the starting point and the direction the tape is stretched. This will serve as the transect from which vegetation measures are taken (see WHEG datasheet top of page 3 for detailed instructions).

Milkweed species that are regionally important in the NGP display significant variability in the number of stems per plant. As such, breeding habitat is based in part on the numbers of milkweed stems present. Each milkweed stem rooted within 3-feet of the tape along both sides (6' x 72.6') should be recorded on the datasheet. If no milkweeds were rooted within any of the three survey transects but were observed within the AA, the appropriate box should be checked on page 3 of the datasheet.

---

<sup>3</sup> NRCS CPS 595 – IPM provides for different levels of consideration. For monarch habitat, considerations are limited to drift and application to the habitat itself. Consideration of movement of pesticides via water is not required for evaluation of monarch habitat.

The planner should then estimate the percent cover and number of species of monarch nectar plants within three 6' x 6' quadrats starting at the 10, 40 and 60-foot marks on the tape (Figure 3).

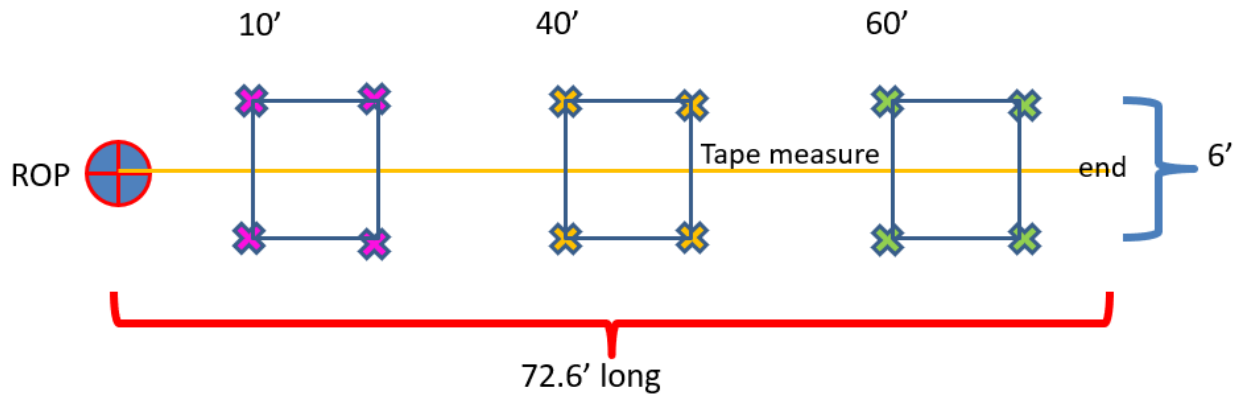


Figure 3: Diagram showing the layout of a vegetation survey starting from a Representative Observation Point (ROP).

To identify monarch nectar plants in your area, use the Monarch WHEG Habitat Inventory List from the “Important Plants of the Monarch Butterfly: Northern Great Plains Staff Guide” located on the NRCS Monarch Butterfly webpage <https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/plantsanimals/pollinate/?cid=nrcseprd402207>.

[Note: Line-point intercept can be used to measure nectar plant cover and diversity (richness) if that is desirable. See USDA (2009) ARS Jornada Experimental Range Monitoring Manual for detailed instruction on conducting line-point intercept.]

**STEP 5:** Enter data into the WHEG datasheet page 3, which is designed to automatically calculate averages and benchmark scores for breeding habitat and nectaring habitat. Data are used to assign average values for milkweed density ( $V^{MD}$ ), percent cover of monarch nectaring plants ( $V^{FC}$ ), and richness of monarch nectaring plants ( $V^{FR}$ ). The assigned values of habitat and pesticide variables are then used to calculate habitat scores based on the following equations;

$$\text{Breeding Habitat Score} = ((VIR) + (VHR) + 6(VMD))/8$$

$$\text{Nectaring Habitat Score} = ((VIR) + (VHR) + 5(VFC) + (VFR))/8$$

Habitat scores are then used to establish habitat Ratings as follows:

Poor = <0.25      Fair = 0.25-0.49      Good = 0.50-0.74      Excellent =  $\geq$  0.75

An Overall Habitat Score of “Poor” or “Fair” means there is a resource concern for monarch habitat within the AA.



**STEP 6:** Help decision maker select planned conservation practices (see WHEG datasheet page 4). Assuming that planned conservation practices will be applied successfully, predict future (planned) values of milkweed abundance and nectar plant species richness and abundance, enter planned values into page 3 of spreadsheet and allow its formulae to calculate the planned habitat scores. To meet minimum planning criteria (PC), planned ratings must be “Good” or “Excellent” (score  $\geq 0.5$ ).

**STEP 7:** POST-IMPLEMENTATION. After full implementation of planned conservation practices, the success of the project may be measured by applying the WHEG once again. If the results fail to meet expectations (planned scores), consider maintenance actions or modification of the plan (adaptive management).

## RESOURCES

- Agrawal, A. 2017. *Monarchs and Milkweed: A Migrating Butterfly, a Poisonous Plant, and Their Remarkable Story of Coevolution*. Princeton University Press. 283 p.
- Singhurst, J. and B. Hutchins. Identification of Milkweeds (*Asclepias*, Family *Apocynaceae*) in Texas. 2015. Texas Parks and Wildlife Department PWD RP W7000-1803 (06/15). [https://tpwd.texas.gov/publications/pwdpubs/media/pwd\\_rp\\_w7000\\_1803.pdf](https://tpwd.texas.gov/publications/pwdpubs/media/pwd_rp_w7000_1803.pdf)
- Jepsen, S., D.F. Schweitzer, B. Young, N. Sears, M. Ormes, and S.H. Black. 2015. *Conservation Status and Ecology of the Monarch Butterfly in the United States*. [http://www.xerces.org/wp-content/uploads/2015/03/NatureServe-Xerces\\_monarchs\\_USFS-final.pdf](http://www.xerces.org/wp-content/uploads/2015/03/NatureServe-Xerces_monarchs_USFS-final.pdf)
- USDA. 2010. USDA NRCS Practice Standards in NRCS National Handbook of Conservation Practices. September 2010.
- USDA, NRCS. 2017. The PLANTS Database (<http://plants.usda.gov>, 19 September 2017). National Plant Data Team, Greensboro, NC 27401-4901 USA.

## REFERENCES

- Brower, L. P. 1995. "Understanding and misunderstanding the migration of the monarch butterfly (*Nymphalidae*) in North America: 1857-1995." *Journal of the Lepidopterists Society* 49.4 (1995): 304-385.
- Brower, L.P., O.R. Taylor, E.H. Williams, D.A. Slayback, Raul R. Zubieta and Mi. I. Ramirez. 2011. Decline of monarch butterflies overwintering in Mexico: Is the migratory phenomenon at risk? *Insect Conservation and Diversity* Vol. 5(2), pp. 95-100.
- Inamine, H., S.P. Ellner, J.P. Springer, and A.A. Agrawal. 2016. Linking the continental migratory cycle of the monarch butterfly to understand its population decline. *Oikos*: 125(8). 1081-1091.

- Pleasants, J.M., and K.S. Oberhauser. 2012. Milkweed loss in agricultural fields because of herbicide use: effect on the monarch butterfly population.
- USDA. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. United States Department of Agriculture Natural Resources Conservation Service. United States Department of Agriculture Handbook 296.
- USDA. 2009. USDA ARS Monitoring Manual. <http://jornada.nmsu.edu/monitor-assess/manuals/monitoring>
- USDA. 2013. USDA NRCS National Planning Procedures Handbook. Handbooks, Title 180 – Conservation Planning and Application; Part 600. On-line version.
- USDA. 2014. Preventing or Mitigating Potential Negative Impacts of Pesticides on Pollinators Using Integrated Pest Management and Other Conservation Practices. USDA Technical Note 190-AGR-9.
- USDA. 2015. USDA NRCS Monarch Butterfly Habitat Development Project. On-line Edition <http://www.nrcs.usda.gov/monarchs>
- USDA. 2018. Important Plants of the Monarch Butterfly—Northern Great Plains Staff Guide. On-line Edition <https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/plantsanimals/pollinate/?cid=nrcseprd402207>
- USDA and USFWS. 2016. Monarch Butterfly Conference Report 2016. <https://www.fws.gov/savethemonarch/pdfs/MonarchConferenceReport2016.pdf>