

## USDA NRCS MONARCH BUTTERFLY WILDLIFE HABITAT EVALUATION GUIDE AND DECISION SUPPORT TOOL: *MIDWEST EDITION*

### EXECUTIVE SUMMARY

In response to the decline in the monarch butterfly population, USDA Natural Resources Conservation Service (NRCS) is providing technical and financial assistance to help producers establish and enhance monarch habitat. In the Midwest, the effort is primarily focused on improving monarch habitat on Crop, Farmsteads, and Associated Agricultural Land as defined by NRCS<sup>1</sup>.

When working with decision-makers on the nation's private agricultural lands, the NRCS uses a 9-step conservation planning process (USDA 2013).

When monarch butterfly (*Danaus plexippus*) habitat has been identified by the decision maker as a resource concern, NRCS staff will use an approved Wildlife Habitat Evaluation Guide (WHEG) (NRCS 2010) to evaluate benchmark conditions and limiting resources in order to develop a conservation plan. The *USDA NRCS Monarch Butterfly Wildlife Habitat Evaluation Guide (Monarch WHEG) and Decision Support Tool: Midwest Edition* is the planning support tool for staff located in portions of the Midwestern United States, and it will guide planners through implementation of all, or portions of all nine steps.

The NRCS National Planning Procedures Handbook (NPPH) explains that conservation planning by its nature “is both progressive and adaptive” (USDA 2013). This statement is particularly relevant to development of wildlife habitat on highly altered lands in the Midwest. Temporary and permanent changes to soils, the seed banks and the resulting plant community from past or current row-crop farming can complicate habitat restoration efforts in this region of the U.S. The development of targeted conditions for any perennial grassland habitat is seldom accomplished during a single year, and creating rich herbaceous communities can require more time and effort. Additionally, the results of habitat development efforts are seldom static, particularly when the objective is early successional or mid-successional (seral) conditions. Thus, the commitment of the land manager interested in optimizing habitats on grasslands, often requires multiple resource inventories (formal or informal), conducted during different seasons and over many years.

This guide is designed to assess current monarch habitat (benchmark condition), provide habitat development alternatives based on the findings, and predict/plan outcomes (planned score or future conditions). The guide provides a qualitative monarch butterfly habitat rating (*poor, fair, good or excellent*) at conservation practice implementation scale. The user of this WHEG will discover that it is constructed to be applied in a flexible approach depending on the objectives. This WHEG can be utilized:

- as the original decision support tool for the entire operation (e.g. WRP easement)
- to guide for progressive planning on a portion of the operation
- to plan habitat gains
- to measure the impacts of installed conservation practices
- to identify adaptive management decisions

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<sup>1</sup> Land use terms are from Conservation Delivery Streamlining Initiative

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## INTRODUCTION

### Monarch Butterfly and Habitat

The eastern U.S. population of the monarch butterfly (*Danaus plexippus plexippus*) has suffered significant declines over the past two decades. While this subspecies occurs in all states east of the Rocky Mountains, NRCS is targeting a habitat development effort within the core migration route and the primary breeding range. For general information on the monarch butterfly, staff are encouraged to read the document titled *NRCS Monarch Butterfly Habitat Development Project* (NRCS 2015)<sup>2</sup>. NRCS conservation practices installed to benefit the monarch will typically benefit other grassland wildlife species that occupy periodically disturbed mid-successional (seral plant community stage) habitats. In the absence of natural and free ranging herbivory and fire, periodic artificial disturbances (e.g. prescribed fire, prescribed grazing, and light disking) are typically required to obtain and/or sustain the target habitat condition of a seral grassland plant community.

Monarch butterflies rely on forbs for forage in all life stages. Any monarch butterfly habitat assessment must target the forb component.

The foundation to all wildlife habitats, and restoration of those habitats, are the soils. Some soils in the Midwestern U.S. developed under tall grasses that were maintained by free ranging wild herbivores and fire, whereas other soils derived under woodland vegetation or a combination of grasses and trees. The result were deep fertile soils, high in organic matter that were converted to cropland. Today, this region is dominated by highly mechanized row-crop farming operations supporting continuous cultivation. Natural (never cultivated) soils were a living substrate. Years of tillage reduced the organic matter, altered structure and minimized soil biota. These permanent changes (degradation) of the soils, seed banks and plant community complicate habitat restoration efforts, particularly efforts to re-construct a sustainable native forb component.

### Evaluating Monarch Habitat

Many NRCS wildlife evaluation guides determine the quality of habitat at the farm/ranch scale (cumulative score for entire project area) where the objective is a resource management system (NRCS 2013). The objective of these WHEGs is to identify the most limiting factor and consider the proximity and interrelationships to adjacent habitats. This approach is particularly appropriate for resident species with limited mobility, distribution and home ranges. The challenges with addressing the declines in the highly mobile monarch butterfly, however, mandate a different approach. When not migrating, the movement of individual monarchs is not well understood; however, they appear to move long distances to acquire life requirements (Brower 1995, Brower et. al 2011). 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 evaluate habitat spatially within the context of home range of a population of a species of concern, this guide is narrowly applied to only those portion(s) of the agricultural operation

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<sup>2</sup> <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/plantsanimals/pollinate/?cid=nrcseprd402207>. For more detailed information on the biology of the monarch and its habitat, staff can access monarch webpages sponsored by Monarch conservation organizations, such as the Monarch Joint Venture <http://www.monarchjointventure.org/>, Monarch Watch <http://www.monarchwatch.org/>, Xerces Society <http://www.xerces.org/monarchs>. To gain an appreciation of the monarch migration and to determine when monarchs are migrating or reproducing in any particular region, staff are encouraged to visit Journey North's citizen observational data. <https://www.learner.org/jnorth/>.

under consideration for monarch habitat improvement, and does not consider connectivity to, or interactions with other habitats. Based on best available science (Pleasants and Oberhauser 2012; Brower et. al 2011), the limiting factor for monarchs in the Midwest is the availability of reproductive habitats (milkweed abundance and distribution). Accordingly, the target habitat conditions identify and consider milkweed as the most significant critical component.

### **Rating Monarch Habitat**

The first step in evaluating a project for monarch habitat is to subdivide the project (e.g. tract, farm, Planning Land Unit – PLU, WRP easement) into smaller areas for an assessment of habitat quality. These smaller areas are referred to as “assessment areas.” Assessment area (AA) boundaries are based on the similarity of the site characteristics (e.g. soils, slope, vegetation and management) to one another. This approach allows for monarch habitat assessment and development to occur at the conservation practice implementation scale (e.g. catch-pens, farm road rights-of-way, 2-acre wildlife foot plot, or 200 acre WRP easement), and provides for increased efficiencies during the conservation planning process.

The final product of this evaluation is a monarch butterfly habitat *base map* that identifies the project boundary, different AA’s within the project boundary, and the qualitative monarch habitat benchmark condition rating of *poor*, *fair*, *good* or *excellent* for each AA. Benchmark condition ratings are based on current conditions. If the rating for an AA is *poor*, *fair* or *good*, habitat alternatives (NRCS conservation practice standards) are then developed for that AA. Each habitat alternative receives a planned monarch habitat condition rating, and decisions are then made for each AA based on these ratings. Following implementation of selected conservation practices<sup>3</sup>, the assessment can be applied once again to determine a resultive (applied) habitat condition rating. At no time in the evaluation of the project area is a cumulative score or rating provided for the entire project. Rather, multiple evaluations are made (one for each AA), with an eventual decision being rendered at the assessment area scale.

The ratings 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 the opportunity to apply the WHEG in a flexible approach, incorporating professional judgments deemed necessary for unique site conditions, varying financial resources and objectives. With the decision to limit the WHEG as a planning tool, the scoring process is not encumbered with concern of consequences of the rating related to Farm Bill program eligibility.

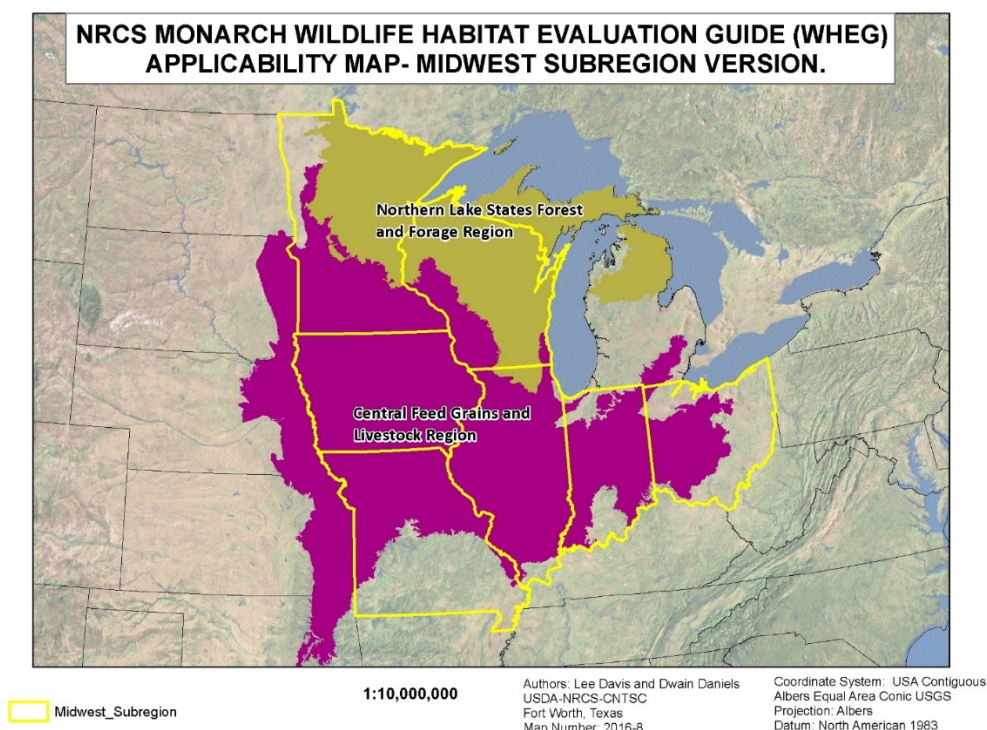
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<sup>3</sup> Habitat objectives should consider the period of year when monarch butterflies are frequenting the area of interest. To gain an appreciation of the monarch migration and to determine when monarchs are migrating or reproducing in any particular area, staff are encouraged to visit Journey North’s citizen-observational data <https://www.learner.org/jnorth/>.

## REFERENCE DOMAIN

Figure 1 provides the reference domain (area of applicability) for the NRCS Monarch WHEG; Midwest edition. The reference domain is based on two Land Resource Regions (LRR) (USDA 2006).

*M: Central Feed Grains and Livestock Region,*  
*K: Northern Lake States Forest Region*



*Figure 1: Applicability region for the NRCS Monarch WHEG; Midwest Edition.*

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

## EXCLUSIONS

This WHEG is designed for use on converted lands that were once grasslands, savannas, or woodland within the reference domain. The WHEG will not be applied to current forested areas (forested swamps, riparian forested areas or forested uplands) or other rare and declining habitats that are currently providing other important ecosystem services. Such areas contained within the project area will be rated as “N/A”.

## MONARCH HABITAT IN THE MIDWEST

Most key wildlife species in North America have been studied extensively for centuries. Life and habitat requirements of these species are well understood and well documented. This is not true for the monarch butterfly. There remain many data gaps and mysteries regarding the monarch and its habitat requirements while in the central portions of North America.

The following are well understood:

- The spring migration pattern (primarily based on observational data, rather than tagging) in the central U.S. is less concentrated than during the fall migration, but is generally more easterly than the fall migration pattern.
- Gravid females lay eggs almost exclusively on plants in the genus *Asclepias*.
- The most important plant family for nectaring is the Composite family (Asteraceae).
- Summer reproductive habitat in the Midwest is a limiting factor (Pleasants and Oberhauser 2012; Brower et al. 2011).
- Monarchs with a natal origin of the Midwest provide the majority of the individuals overwintering in Mexico (Wassenaar, L.I. and K.A. Hobson 1998; Flockhart et. al 2016).

The following are not well understood:

- individual monarch movements of gravid females, particularly during egg laying
- the movements (distance traveled) of wild gravid females during egg laying<sup>4</sup>
- preference or importance of spatial scale and/or configuration of monarch butterfly habitats for either migration or reproduction
- nectaring habits of adults

With consideration of what is and is not well understood regarding monarch biology and habitats, NRCS elected to design this WHEG to capture inputs and provide outputs to only those portion(s) of the agricultural operation under consideration for monarch habitat improvement. This WHEG does not consider connectivity to, or interactions with adjacent habitats, nor does it attempt to identify a single limiting factor. Rather it is designed to assist the client with habitat improvement decisions for portions of the agricultural operation, irrespective of habitat condition, size or location of other areas. In keeping with this approach, the results of this WHEG are not cumulative for the project area (e.g. farm, easement area), but rather provides a monarch habitat condition rating (*poor, fair, good or excellent*) for each assessment area<sup>5</sup>. The WHEG is based on the best available science, with the anticipation of future modifications.

### **TIMING OF THE EVALUATION**

For many situations, this WHEG can be applied during any time of the year with the use of remote sensing and/or a field visit without herbaceous vegetative data collection. However, for some situations, an inventory of nectaring forbs and milkweed (*Asclepias* spp.) is required. Ideally, this inventory is applied when species richness of the forb component is at its highest level and when plant identification is possible (middle to late growing season).

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<sup>4</sup> Female monarchs lay 400+/- eggs over many weeks, but the vast majority of the eggs are laid within a week (Edson 2007).

<sup>5</sup> The concept of an assessment area is provide in detail in Instructions; Step 1(c) on page 8.

## RECOMMENDED SUPPLIES AND EQUIPMENT

If the assessment area supports enough *Asclepias* and other forbs to warrant vegetative sampling of the herbaceous community (as explained in the Instructions section), the following may be needed to conduct this assessment.

- Backpack
- GPS
- 100-foot measuring tape
- Pin flags or stakes
- Compass
- Clipboard
- WHEG, supporting documents and datasheets
- Plant ID field guide (optional)

## INSTRUCTIONS

**STEP 1:** Develop a Project Base Map (Figures 2 and 3):

- a. Delineate the area to be evaluated on an aerial photograph. The area to be considered for monarch habitat improvements is referred as the “*project area.*” *Note: The project area will commonly 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.*
- b. Identify areas within the project area that will not be evaluated. Within the project area, identify and delineate those areas where the decision-maker has no interest in development of monarch habitat. For example, monarch habitat may not be identified as an objective on a cropland or hayland field, or an old field with woody vegetation being used to provide wildlife habitat, where the decision maker is not interested in opening the canopy for the monarch. Identify such areas by placing the word “OUT” on the base map (for example, see Figure 3).
- c. Identify all assessment areas with the plant community type of *Forested.* Within the reference domain of this WHEG, these areas include narrow zones of woody vegetation and blocks of woody species such as elm (*Ulmus* spp.), green ash (*Fraxinus pennsylvanica*), pecan (*Carya illinoensis*), or oaks (*Quercus* spp.). These areas were historically and currently forested and do not include sites that were grasslands or savannahs. These assessment areas are excluded from the application of this WHEG. If determined to be the *forested* plant community type, document a rating of “N/A” (monarch habitat development not recommended) and end the assessment.

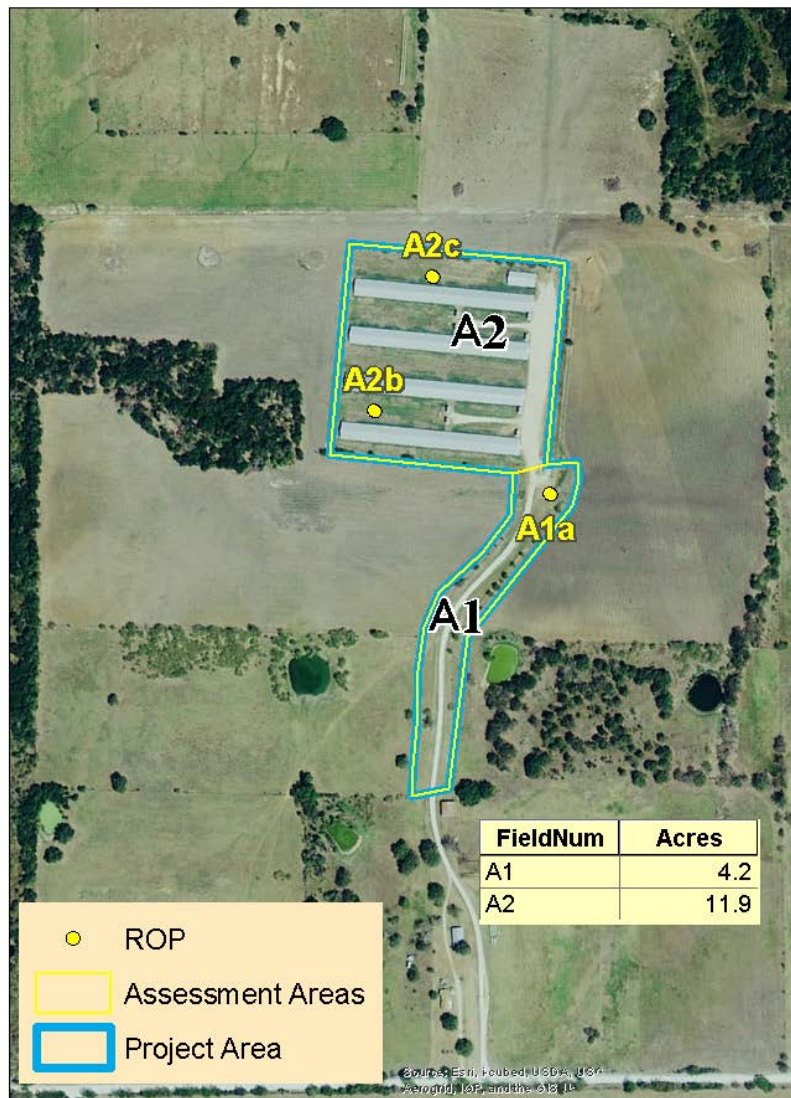
*Monarch Fact: Narrow forested riparian areas and edges of larger blocks of land supporting trees often provide important resting cover (micro-climates) for migrating monarchs, particularly during the fall migration. Many have observed monarchs feeding on “aphid honey-dew” on pecans during fall migration.*

- d. Subdivide the remainder of the project area into unique assessment areas. As appropriate, subdivide the remainder of the project area into smaller areas to be assessed. These unique areas are referred to as *assessment areas* (AA). Each AA will have consistent ecological sites, vegetation, soils, slope, and management. 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 contiguous polygon. For example, if more than one portion of the project area supports similar characteristics (i.e. - dense stands of *cedar* on steep slopes) then each polygon supporting these conditions will be

assigned the same 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 “subareas”) have similar characteristics and will be considered as one assessment area.

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

Monarch Butterfly Habitat Base Map



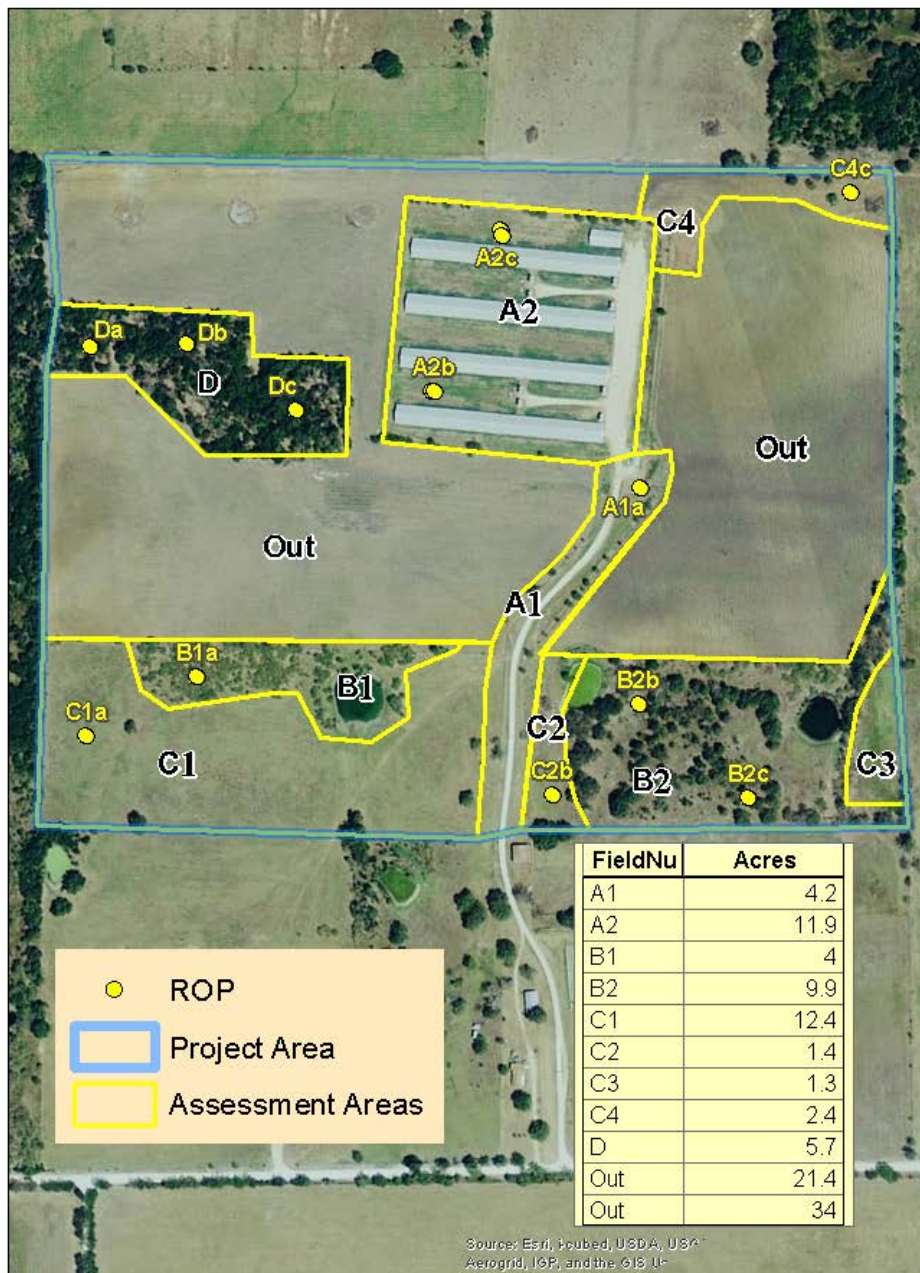
1:4,800

Map created: February 25, 2016  
 Central National Technology Support Center  
 USDA-NRCS, Fort Worth, Texas  
 Map No. 2016-27

Figure 2: Example of a monarch habitat development base map for a less complex project. Note that an assessment area need not be contiguous. This assessment area (A) is divided into two subareas (A1 and A2). ROP denotes Representative Observation Point.



### Monarch Butterfly Habitat Base Map



1:4,800

Map created: February 25, 2016  
 Central National Technology Support Center  
 USDA-NRCS, Fort Worth, Texas  
 Map No. 2016-26

Figure 3: Example of a monarch habitat development base map for a complex project. Note 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.

***USER NOTE:** This WHEG allows the planner to screen AAs that will not require the completion of the WHEG 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 that will not be converted to wildlife habitat. This screening process and the presentation of conservation planning alternatives unique to the plant community type are based on four monarch WHEG plant community types<sup>6</sup>. Each type is defined in steps 2 and 3. To support the screening concept, no vegetative sampling or numeric scoring will occur in Step 2.*

## **STEP 2:** Rapid Screening of Low-Value Plant Communities

- a. Determine the Monarch WHEG plant community type and document the decision on the datasheet(s) for the assessment area.
  - i. *CROP* – Any area that is being annually planted for harvest of a product.
    - A. **Document a benchmark condition rating of *poor* and end the assessment of benchmark habitat conditions on the datasheet.**
    - B. If any of the planning considerations below are an objective of the decision maker, continue to Step 4; otherwise, identify the AA as “OUT” on the base map per step 1b and end the assessment.

### Alternatives and Planning Considerations:

- Conservation Cover (327), Field Border (386) or Riparian Herbaceous Cover (390), with an additional criteria to “enhance wildlife, pollinator and beneficial organism habitat”, with the monarch as the target wildlife species.
- In addition, the decision maker will implement a *125-foot wide, pesticide-free buffer* around the entire AA or area encompassing all implemented practices. Alternatively, the decision maker may opt to implement Integrated Pest Management (595), with the purposes of:
  - Prevent or mitigate offsite pesticide risks to soil, water, air, plants, animals and humans from drift and volatilization losses, with the monarch being the target animal and monarch larval and/or nectaring forbs being the target plants. Consider drift/movement of insecticides (spray or planter dust with seed treatments).
  - Prevent or mitigate on-site pesticide risks to pollinators and other beneficial species through direct contact, with monarchs being the target species.

*Note: These pesticide risk prevention restrictions do not apply to activities intended to establish or maintain the AA as productive monarch breeding habitat such as Herbaceous Weed Control (315), or use of herbicide spot-treatments to remove weeds post-planting.*

- ii. *MONOTYPIC GRASSES* – These areas support primarily monotypic non-native or native grass species and may include pasture, managed hay, farmsteads, and other frequently-managed or grass-dominated native grasslands. Plant species richness is low. Examples include areas dominated by reed canary grass (*Phalaris arundinacea*), Kentucky bluegrass (*Poa pratensis*), smooth brome (*Bromus inermis*), fescue (*Schedonorus* spp.), bluestems

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<sup>6</sup> Monarch WHEG plant community types are related specifically to this WHEG and should not be confused with the term “land use” in the NRCS National Conservation Planning Manual or program guidance.

(*Andropogon* spp.), switch grass (*Panicum virgatum*), and other non-native pastures, hayland, and grass fields. There may be some woody encroachment, but not to such a level to warrant a monarch WHEG plant community type of *Brush*.

- A. Document a benchmark condition rating of *poor* and end the assessment of benchmark habitat conditions on the datasheet.**
- B.** If any of the planning considerations below are an objective of the decision maker, continue to Step 4; otherwise, identify the AA as “OUT” on the base map per step 1b and end the assessment.

Alternatives and Planning Considerations:

- Implement Conservation Cover (327) or Field Border (386) or Riparian Herbaceous Cover (390) with an additional criteria to “enhance wildlife, pollinator and beneficial organism habitat,” with the monarch as the target wildlife species.
- In addition, implement Herbaceous Weed Control (315) or Prescribed Burning (338) or Early Successional Habitat Development / Management (647), if needed, with “improve wildlife habitat” as at least one of the purposes and the target habitat conditions of “increase in the forb component.”
- In addition, the decision maker will implement a 125-foot wide, pesticide-free buffer around the entire AA or area encompassing all implemented practices. Alternatively, the decision maker may opt to implement Integrated Pest Management (595) or selected elements thereof to:
  - Prevent or mitigate offsite pesticide risks to soil, water, air, plants, animals and humans from drift and volatilization losses, with the monarch being the target animal and monarch larval and/or nectaring forbs being the target plants. Consider drift/movement of insecticides (spray or planter dust with seed treatments).
  - Prevent or mitigate on-site pesticide risks to pollinators and other beneficial species through direct contact, with monarchs being the target species.

*Note: These pesticide risk prevention restrictions do not apply to activities intended to establish or maintain the AA as productive monarch breeding habitat such as Herbaceous Weed Control (315), or use of herbicide spot-treatments to remove weeds post-planting.*

- iii. **BRUSH** – These areas support woody vegetation (brush) at a density that prohibits implementation of other management options (e.g. herbaceous vegetation is minimized due to shading). The planner and decision-maker agree that the brush must be addressed prior to implementation of any other monarch habitat efforts. This monarch WHEG plant community type should not be used if the AA is forested. Rather, it is used for historic grasslands invaded and dominated by woody plants (e.g. cedar, boxelder, green ash).
  - A. Document a benchmark condition rating of *poor* and end the assessment of benchmark habitat conditions on the datasheet.**
  - B.** If any of the planning considerations below are an objective of the decision maker, continue to Step 4; otherwise, identify the AA as “OUT” on the base map per step 1b and end the assessment.

Alternatives and Planning Considerations:

- Brush Management (314), and convert all or a substantial portion of AA to productive monarch breeding habitat using Conservation Cover (327), Field Border (386) or Riparian Herbaceous Cover (390) with an additional criteria to “enhance wildlife, pollinator and beneficial organism habitat,” with the monarch as the target wildlife species.
- In addition, the decision maker will implement a 125-foot wide, pesticide-free buffer around the entire AA or area encompassing all implemented practices. Alternatively, the decision maker may opt to implement Integrated Pest Management (595) or selected elements thereof to:
  - Prevent or mitigate offsite pesticide risks to soil, water, air, plants, animals and humans from drift and volatilization losses, with the monarch being the target animal and monarch larval and/or nectaring forbs being the target plants. Consider drift/movement of insecticides (spray or planter dust with seed treatments).
  - Prevent or mitigate on-site pesticide risks to pollinators and other beneficial species through direct contact, with monarchs being the target species.

*Note: These pesticide risk prevention restrictions do not apply to activities intended to establish or maintain the AA as productive monarch breeding habitat such as Herbaceous Weed Control (315), or use of herbicide spot-treatments to remove weeds post-planting.*

**STEP 3:** Determine benchmark conditions for other plant communities (primarily herbaceous plant communities)

- a. If the plant community in an Assessment Area does not meet any of the conditions in Step 2, and may be suitable monarch butterfly habitat enhancement or restoration, then assess its current benchmark condition.
  - i. *OTHER PRIMARILY HERBACEOUS COMMUNITIES* – These areas support native grasses and some non-natives and may have a significant forb component. This habitat type may include glades, prairies, savanna, conservation areas, old fields, and odd areas. They may have past cropping history. Past cultural practices (e.g. cropping) may have changed the soil (structure, organic matter, biology) and micro-topography such that the site’s potential to support a rich mix of native herbaceous species is reduced. There may be some woody encroachment, but not to the level to warrant a monarch WHEG plant community type of *Brush*.
    - A. Document the benchmark habitat conditions on the datasheet.**
    - B.** If any of the planning considerations below are an objective of the decision maker, continue to Step 4; otherwise, identify the AA as “OUT” on the base map per step 1b and end the assessment.

Determine the monarch habitat scores. If more than one apply, choose the condition with the lowest score.

V <sup>IR</sup> : Insecticide Risk condition <sup>7</sup>	Benchmark Score	Planned Score	Applied Score
AA is treated with insecticides.	0.0	0.0	0.0
(End assessment and provide a rating of <i>poor</i> )			
A portion of the AA is located within 125 feet of areas treated with insecticides.	0.3	0.3	0.3
Neither of the above.	1.0	1.0	1.0
V <sup>WMR</sup> : Weed Management Risk Condition	Benchmark Score	Planned Score	Applied Score
AA is treated with herbicides.	0.1	0.1	0.1
A portion of the AA is located within 125 feet of areas treated with herbicides.	0.3	0.3	0.3
Neither of the above; however, AA is mowed inconsistent with the Monarch Habitat Management Guidelines	0.3	0.3	0.3
None of the above.	1.0	1.0	1.0
<p><i>Do not consider Individual Plant Treatments (IPT) for plants deemed undesirable such as spot treatments of brush, noxious weeds, invasive plants, and other undesirable plant species.</i></p> <p><i>Do not consider treatments, such as NCP 314 – Brush Management or 315 - Herbaceous Weed Control, when required for establishment of milkweed or nectaring habitat.</i></p>			

Alternatives and Planning Considerations:

- The decision maker will implement a 125-foot wide, pesticide-free buffer around the entire AA or area encompassing all implemented practices. Alternatively, the decision maker may opt to implement Integrated Pest Management (595) or selected elements thereof:
  - Prevent or mitigate offsite pesticide risks to soil, water, air, plants, animals and humans from drift and volatilization losses, with the monarch being the target animal and monarch larval and/or nectaring forbs being the target plants. Consider drift/movement of insecticides (spray or planter dust with seed treatments).
  - Prevent or mitigate on-site pesticide risks to pollinators and other beneficial species through direct contact, with monarchs being the target species.

*Note: These pesticide risk prevention restrictions do not apply to activities intended to establish or maintain the AA as productive monarch breeding habitat such as Herbaceous Weed Control (315), or use of herbicide spot-treatments to remove weeds post-planting.*

<sup>7</sup> V is used for the term “variable”. These are variables used to calculate the final score for the assessment area.

**SAMPLE VEGETATION:** Use the following process for variable factors  $V^{MWD}$ ,  $V^{FC}$ , and  $V^{FR}$ .

- Locate *Representative Observation Points* (ROPs): Within the assessment area, locate at least three ROPs that best represent the vegetative conditions (e.g. species, density, richness) that occur in the AA. If the assessment area supports subareas (noncontiguous areas with similar vegetation, soils, slopes, etc.) the determination of the location of the ROPs will be based on locations that best represent the assessment area, without the need in having a ROP in each subarea. *Note: If the AA is small, the community is ecologically diverse, or species are evenly distributed within the AA, then selection of a single ROP, or inventorying the entire AA (i.e., meandering search vs. belt transect) is suitable.*
- Denote the ROP vegetative transect geo-location and direction on the datasheet and base map (see page 1 of datasheet, and see Figure 2 and 3 for examples). Note the latitude and longitude on the datasheet, and determine the direction (i.e., compass bearing) of a 72.6-foot belt transect that would include vegetation that is most representative of the community in the assessment area. If the plant community within a 72.6 foot radius from the ROP is fairly homogeneous, then use a north, south, east, or west compass bearing.
- Sample vegetation along each ROP transect within each assessment area using the following criteria:
  - **Milkweed:** Walk the full distance of the transect noting the number of *Asclepias* stems (plants<sup>8</sup>) emerging from within the belt transect (6' X 72.6'). Document the findings on the datasheet for this assessment area.
  - **Monarch Nectaring Forbs:** Collect monarch nectaring forb data within three, 6' x 6' plots. The first plot (P1) will be located between 10 – 16 feet; the 2<sup>nd</sup> plot (P2) between 40 – 46 feet; and the 3<sup>rd</sup> plot (P3) between 60 – 66 feet. *Note: This effort is made as the planner is returning along the tape from 72.6-foot mark to the starting point after counting monarch stems.* Visually estimate the absolute percent cover<sup>9</sup> and the number of monarch nectaring forbs species<sup>10</sup> present in each plot. Document findings on the datasheet.
- Repeat this sampling approach for each ROP within the assessment area.

$V^{MWD}$ : Average milkweed stem density per acre	Benchmark Score	Planned Score	Applied Score
Milkweed absent in belt transects and the AA.	0.10	0.10	0.10
Milkweed absent in belt transects; however, individual milkweed stems present in the AA.	0.15	0.15	0.15
10 – 200	0.30	0.30	0.30
201 – 300	0.50	0.50	0.50
301 – 500	0.80	0.80	0.80
> 500	1.00	1.00	1.00

<sup>8</sup> A milkweed “plant” is a stem emerging from the ground, surrounded by soil. The most common milkweeds in the Midwest (common and swamp milkweeds) are rhizomatous with above ground stems having a common root system. To count in this tally, the stem must originate from the soil within the belt transect. Each stem emerging from the soils is considered a plant for tallying purposes, regardless of the origination point under the soil surface.

<sup>9</sup> Absolute cover is the percent shading that would occur if the sun was directly over the plot. Absolute cover for a single species would never exceed 100 percent, but cumulative (many species) would commonly exceed 100 percent in an herbaceous plant community.

<sup>10</sup> Nectaring forbs are included on the Monarch WHEG Plant List in the appendix. *Asclepias* spp. serve as both a caterpillar host plant and a preferred nectaring species, and are included in the monarch nectaring forb inventory.

Alternatives and Planning Considerations:

- If the score is 0.15 or less consider using Conservation Cover (327) to plant milkweed to increase milkweed densities.
- If the score is 0.3 – 0.5, consider implementing one or more of the following Conservation Practice Standards to increase milkweed densities as the targeted condition and with improving monarch breeding success as the stated purpose.
  - Herbaceous Weed Control (315), Conservation Cover (327), Prescribed Burning (338), and/or Early Successional Habitat Management (647) to increase milkweed densities.
- If the score is 0.8 - 1.0, consider implementing Conservation Practice Standards Prescribed Burning (338) and/or Early Successional Habitat Management (647) to maintain milkweed densities.

V <sup>FC</sup> : Forb Cover: Average monarch nectaring forb cover within the AA	Benchmark Score	Planned Score	Applied Score
Absent (≤ 2.0%)	0.10	0.10	0.10
Rare (2.1-5.0%)	0.20	0.20	0.20
Uncommon (5.1 – 15.0%)	0.30	0.30	0.30
Moderately abundant (15.1 – 25.0% cover)	0.60	0.60	0.60
Abundant (25.1% – 35.0% cover)	0.80	0.80	0.80
Very Abundant (> 35.0%)	1.00	1.00	1.00
V <sup>FR</sup> : Forb Richness: Average number of monarch nectaring forb-species within the AA	Benchmark Score	Planned Score	Applied Score
< 1	0.10	0.10	0.10
1 -2	0.30	0.30	0.30
2.1 – 3.5	0.50	0.50	0.50
> 3.5	0.80	0.80	0.80
> 3.5 and two or more species of <i>Asclepias</i> represented in V <sup>MWD</sup>	1.00	1.00	1.00

Alternatives and Planning Considerations:

- If the score is 0.3 or less for either VFC or VFR, consider planting nectaring species with the use of Conservation Cover (327) to increase monarch nectaring, forb cover and species richness.
- If the score is 0.3 – 0.5 consider one or more of the following to increase monarch nectaring, forb cover and richness, and improve adult-monarch foraging habitat as the targeted conditions.
  - Herbaceous Weed Control (315), Conservation Cover (327), Prescribed Burning (338), and/or Early Successional Habitat Management (647).
- If the score is > 0.5 consider the implementing Prescribed Burning (338) and/or Early Successional Habitat Management (647) to maintain or enhance current conditions.

- i. Apply the following formula to determine Monarch Habitat Condition Rating (benchmark, planned, or applied (resultive) rating).

$$V^{IR} \left[ \frac{(V^{WMR}) + 5(V^{MWD}) + (V^{FC}) + (V^{FR})}{8} \right]$$

- ii. Determine benchmark monarch habitat condition rating and end the assessment of current conditions.

Monarch Habitat Condition Score	Benchmark Score	Planned Score	Implemented Score
0.00 – 0.25	<i>poor</i>	<i>poor</i>	<i>poor</i>
0.26 – 0.49	<i>fair</i>	<i>fair</i>	<i>fair</i>
0.50 – 0.74	<i>good</i>	<i>good</i>	<i>good</i>
0.75 – 1.00	<i>excellent</i>	<i>excellent</i>	<i>excellent</i>

**STEP 4:** Evaluate Alternatives and Determine Planned Condition

Monarch Habitat Success Criteria: The minimum criteria to meet conservation practice standard Upland Wildlife Habitat Management (645) for the monarch butterfly is a rating of *good*. In addition to a determination of a benchmark habitat condition rating, planners will need to produce planned condition ratings for those AAs where the client is considering a monarch butterfly habitat development alternative. This is accomplished by using best professional judgement to plan future conditions (based on implementation of conservation practices) and inputting those planned future conditions into the WHEG. If planned conditions are rated *poor* or *fair* and the monarch remains a resource concern for that AA, then the plan does not meet a Resource Management System (RMS) (NRCS 2013). Determine if monarch habitat remains a resource concern for the AA. Continue the progressive planning process.

**STEP 5:** Document Decisions in Client’s Conservation Plan

Following consideration of the findings and presentation of alternatives, incorporate monarch butterfly habitat decisions in the conservation plan for those AA’s where the monarch butterfly remains an objective. Provide plan implementation assistance, as needed.

**STEP 6:** Evaluate Plan Implementation

Seldom can any conservation practice be installed with confidence without the need to revisit the site to determine the post implementation (applied) conditions and identify adaptive management needs that would benefit the conservation effort. As mentioned in the executive summary, the NRCS National Planning Procedures Handbook explains that conservation planning by its nature “is both progressive and adaptive” (USDA 2013). This statement is particularly true for wildlife habitat efforts on grasslands. Progressive and adaptive planning requires follow up, monitoring and flexibility. It is anticipated that this WHEG may be used two to three years after the plan is established, not only to measure gains in monarch habitat quality (applied or resultive conditions ratings), but also to continue the progressive and adaptive planning process.



## DEFINITIONS

*Assessment area (AA):* A portion(s) of a planning unit of a project area that differ from other portions of the project area. This subdivision/delineation of AA's is based on differences in soils<sup>11</sup>, slope, vegetation, current or future landuse, and etc. Delineations are made when the differences between two areas are significant enough to result in either (i) a different rating or (ii) a different habitat development recommendation. The purpose of delineation of an AA is to allow for input (data collection) and output (alternatives for treatment). Unique areas contained within a larger AA that are too small for application of a different conservation practice, should be included in a larger AA; however, they will not be sampled. An AA may include non-contiguous sub-assessment areas (subareas). An example would be if a project contained three non-contiguous areas on steep slopes with shallow soils, and each area is dominated by juniper. The characteristics (and treatments) of these three subareas are so similar that they are considered a single AA.

*Base map:* A map of the entire project area with delineations and notations of assessment areas, sizes of assessment areas and/or subarea, representative observation points, transects, other notations. The final map will denote the baseline condition rating, or the rating may be provided in another format (e.g. tabular)

*Benchmark habitat condition rating (benchmark rating):* A qualitative rating (e.g. poor, fair, good, or excellent) that reflects the current habitat conditions or value. This rating is often derived from cumulative quantitative scoring of different habitat condition variables.

*Habitat condition variable (V):* A non-static habitat characteristic (e.g. vegetation, size, connectivity) that can be changed with the implementation of conservation practice standards. Static conditions or characteristics (e.g. soil type) fail to meet the definition of a variable. Variables are assigned scores from 0.1 – 1.0 based on the matrix being measured or planned within the assessment area. A score of 1.0 reflects the range of conditions for that variable that would occur if the habitat is in excellent condition. Similarly, a score of 0.4 reflects the range of conditions (matrix being measured) that would occur for that variable when at 40% of the value to the species needed to reach 1.0. The final habitat condition rating (*poor, fair, good or excellent*) is based on a single habitat condition variable, or a subset of variables applied to a mathematical formula. In a habitat assessment rating formula, variables are often mathematically weighted by importance. A score of 0.0 is reserved for conditions that are not salvageable or restorable.

*Planned habitat condition rating (planned rating):* In consideration of habitat development alternatives, the WHEG can be re-applied to plan future conditions or results. If the rating remains as *poor* or *fair*, additional alternatives are needed to meet the criteria of National Conservation Practice Standard 645. If the rating is *good*, additional alternatives are presented for consideration. If the rating is *good* or *excellent*, the requirements of operation and maintenance is presented to the decision maker.

*Project area:* A single polygon (outside boundaries) that delineates the entire area being evaluated for potential monarch habitat. Most commonly the project area will follow common land unit or field

boundaries, but not always. There will commonly be areas within the project area where monarch habitat is not identified as a resource concern (e.g. cropland field, hay field, bottomland hardwood forest).

*Reference domain:* From Smith et al. (1995). The furthest-most geographic reach, range, scope of the applicability of the WHEG. The reference domain delineates the outside boundary of the area (single polygon) that contains all sites (reference sites) used to build, test, or calibrate the WHEG. The reference domain establishes a boundary of applicability of the WHEG. There may be areas, within the reference domain, where the WHEG is not applicable. For example, in application of an early successional upland grassland WHEG, it would be prohibited to apply the WHEG on mature forested swamp community. Those areas are typically assigned a rating of N/A. These situations are described in the Exclusions section of the WHEG.

*Representative observation point (ROP):* Concept derived from the Corps of Engineers Wetland Delineation Manual (1987). A point contained within an assessment area that represents the average conditions (e.g. soils, vegetation, disturbance, slope, and wetness) that are occurring within the AA. Proper selections of ROP's allow for sampling intensities to be less than what would be required under random sampling strategies.

*Resultive (applied) habitat condition rating (resultive rating):* After full implementation of the selected national conservation practice standard(s), the WHEG can be re-applied to the assessment area to determine results. If the rating remains as *poor* or *fair*, additional alternatives are needed to meet the criteria of National Conservation Practice Standard 645. If the rating is *good*, additional alternatives may be presented for consideration. If the rating is *good* or *excellent*, consideration of actions required to maintain the habitat are presented.

## 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., L.S. Fink and P Walford. 2006. Fueling the fall migration of the monarch butterfly. *Integrative and Comparative Biology*. Vol. 46, Issue 6. Pp. 1123-1142.

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.

Pleasants, J.M., and K.S. Oberhauser. 2012. Milkweed loss in agricultural fields because of herbicide use: effect on the monarch butterfly population.

U.S. Army Corps of Engineers. 1987. Corps of Engineers Wetland Delineation Manual. Wetlands Research Program Technical Report Y-87-1 (online version).

Edson, Jim. 2007. Observational Data of a Single Monarch Female. Data available at <http://www.learner.org/cgi-bin/jnorth/jn-query-byday?1175819575>.

Flockhart, D.T., L.I. Wassenaar, T.G. Martin, K.A. Hobson, M.B. Wunder and D. R. Norris. 2016. Tracking multi-generational colonization of the breeding grounds by monarch butterflies in eastern North America. *Proceeding of the Royal Society* 280: 20131087.

Smith, R.D., A. Ammann, C. Bartoldus, and M.M. Brinson. 1995. An approach for assessing wetland functions using hydrogeomorphic classification, reference wetlands, and functional indices. Technical Report WRP-DE-9, U.S. Corps of Engineers, Army Engineer Waterways Experiment Station, Vicksburg, MS.

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. 2010. USDA, Natural Resources Conservation Service Conservation Practice Standards in NRCS National Handbook of Conservation Practices. September 2010.

USDA. 2013. NRCS - National Planning Procedures Handbook. Handbooks, Title 180 – Conservation Planning and Application; Part 600. On-line version.

USDA. 2015. NRCS Monarch Butterfly Habitat Development Project. On-line Edition <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/plantsanimals/pollinate/?cid=nrseprd402207>

Wassenaar, L.I. & Hobson, K.A. (1998) Natal origins of migratory monarch butterflies at wintering colonies in Mexico: new isotopic evidence. *Proceedings of the National Academy of Sciences of the United States of America*, 95, 15436–15439.

**DATASHEET**

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