



USDA NRCS MONARCH BUTTERFLY
HABITAT EVALUATION GUIDE (WHEG),
AND DECISION SUPPORT TOOL:
MIDWEST EDITION 2.0 (SEPTEMBER
2018)

Midwest Monarch Butterfly WHEG: 2.0

ABSTRACT

The Midwestern U.S. is some of the most intensively cropped regions of the world (right photo), which adds significant challenges to development of monarch habitat at the spatial distribution and scale needed for the species. This monarch wildlife habitat evaluation guide is applied by conservation planners when monarch butterfly habitat is identified as a resource concern. This planning guide includes a quality assessment protocol that rates the habitat as either N/A, poor, fair, good, or excellent.

USDA

NRCS;Lee.Davis@ftw.usda.gov
Developed by NRCS Central National Technology Support Center (CNTSC), Fort Worth, TX with the assistance of the NRCS State Biologists in Iowa, Illinois, Indiana, Minnesota, Missouri, Ohio, and Wisconsin. Contact Lee Davis, Biologist, at lee.davis@ftw.usda.gov.

USDA NRCS MONARCH BUTTERFLY WILDLIFE HABITAT EVALUATION GUIDE (WHEG) AND DECISION SUPPORT TOOL; *Midwest Edition: Version 2.0*

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 agricultural producers and other landowners to assist in the establishment of new monarch butterfly habitat and to assist with the enhancement of existing habitat. In the Midwestern United States, the effort is primarily focused on improving monarch habitat on NRCS land uses of Crop, Farmsteads, Range, and Associated Agricultural Land as defined by NRCS Field Office Technical Guides¹.

When working with decision-makers on the nation's private agricultural lands, the NRCS uses a 9-step conservation planning process (USDA 2013). During the planning process, if wildlife is identified as a resource concern, NRCS policy requires the use of an approved Wildlife Habitat Evaluation Guide to identify habitat deficiencies (USDA 2010), and to present alternatives to the client. When the monarch butterfly (*Danaus plexippus*) is the target species, NRCS staff in the Midwestern United States will utilize this guide (*USDA NRCS Monarch Butterfly Wildlife Habitat Evaluation Guide and Decision Support Tool; Midwest Edition 2.0*) to support implementation of the conservation planning process.

Monarch butterflies prefer a mid-successional (seral stage) plant community, rich and abundant in nectar-rich forbs. These conditions are seldom static, but rather require regular monitoring to identify the need to implement periodic disturbance (e.g. mowing, burning, disking, grazing or application of herbicides).

Temporary and permanent changes to soils, the seed bank and soil hydrology from past or current row-crop farming can complicate wildlife habitat development. The NRCS National Planning Procedures Handbook (NPPH) explains that conservation planning by its nature "is both progressive and adaptive" (USDA 2013). Unlike many NRCS national conservation practices (e.g. 328-Pond, 340-Cover Crop, and 649-Structures of Wildlife), the development of targeted conditions of a forb-rich perennial grassland habitat is seldom accomplished during a single year.

This Monarch Butterfly Wildlife Habitat Evaluation Guide (WHEG) and Decision Support Tool is designed to assess and rate current monarch habitat condition (benchmark conditions) on different portions of a farm or ranch, provide habitat development alternatives for each assessment area², predict/plan future outcomes (planned conditions), and to provide a mechanism to quantify gains in habitat quality (applied conditions). Unique to this guide, quantitative scores for each assessment area is converted to a qualitative monarch butterfly habitat rating of *N/A*, *poor*, *fair*, *good* or *excellent*. Thus, an agricultural operation, is not provided a monarch rating for the entire operation, but rather a different rating is provided to each assessment area (AA). The user of this WHEG will discover that it is constructed to be applied in a flexible approach depending on the objectives of the conservation planner and decision maker.

This conservation planning tool includes the body of the WHEG (commonly referred to as the "instructions"), an excel field data sheet, and technical support documents (planting lists, plant identification guides) contained in the appendices.

¹ Land use terms are from USDA-NRCS NPPH Circular 180-14-1, 10-1-2013

² *Assessment Area* is a portion of the larger monarch butterfly habitat development project that has unique abiotic (soils, slope, or wetness) or vegetative conditions.

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INTRODUCTION

The portion of the North American monarch butterfly (*Danaus plexippus*) population that overwinters in the highlands of Central Mexico, has suffered significant declines over the last two decades. For more specific information on the monarch butterfly population decline and biology, users of this WHEG are encouraged to read the document titled *NRCS Monarch Butterfly Habitat Development Project* (USDA 2015)³ and the Appendix to this WHEG. Implementing NRCS conservation practices to benefit the monarch butterfly will benefit other grassland wildlife species that occupy periodically disturbed mid-successional (seral plant community stage) habitats. Any monarch butterfly habitat project must target forbs.

Monarch Butterfly and Habitat in the Midwest. In the absence of natural free-ranging herbivory and natural wildfires, artificial disturbances (e.g. prescribed burning, treatments with herbicides, brush management, prescribed grazing, or light disking) are periodically required to achieve and/or sustain the desired habitat condition of a mid-seral grassland plant community. Without such disturbance, the forb component will reduce in both richness and abundance (Figure 1), as will sedges and rushes in herbaceous wetlands. These habitats also require periodic management actions to control encroachment of trees and shrubs.



Figure 1: Without periodic disturbances, grassland habitats in the Midwest often become monotypic stands of grass, of poor value to monarch butterflies.

The foundation to all wildlife habitats, and the restoration of those habitats, is the soil. The highly productive grass-dominated ecosystems in the Midwest support primarily deep fertile soils, high in base compounds and organic matter (Mollisols, or soils with a mollic epipedon). Today, this region is

³ <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 <https://monarchjointventure.org/>, Monarch Watch <http://www.monarchwatch.org/>, Xerces <http://www.xerces.org/>, and Journey North's citizen observational data <https://www.learner.org/jnorth/>.

dominated by highly mechanized row-crop farming operations supporting continuous cultivation (Figure 2).



Figure 2: The Midwest supports some of the most productive and profitable farming operations in the world, limiting opportunities to incorporate monarch butterfly habitat.

Of much lesser extent, other soils in this region derived under woodland vegetation, or a combination of grasses and trees (savannah ecosystem). Years of soil tillage and erosion have reduced the organic matter, altered structure and minimized soil biota (Figure 3). These permanent changes (degradation) in the soils, seed bank, and the natural plant community complicate habitat restoration efforts, particularly efforts to re-construct a sustainable native forb component. Consideration of invasive and noxious grasses (e.g. fescue, smooth brome, and Reed canary grass) and broadleaf weeds (e.g. Canada thistle, purple loosestrife, and Russian knapweed), further complicate the monarch butterfly habitat development process in this region.



Figure 3: The impacts of intense cropping systems on soils necessitate habitat projects that can be integrated into highly altered Midwest landscapes.

Evaluating Monarch Habitat

Most NRCS wildlife evaluation guides determine the quality of habitat at the farm/ranch scale and provide a cumulative habitat score for the entire farm or ranch. The objective of these types of wildlife habitat guides is to identify the most limiting habitat factor (USDA 2003). The habitat needs for the target species are typically well understood. These types of WHEGs include the consideration of proximity and interrelationships to adjacent habitats, including habitats not within the project area (area encompassing all AAs). This approach is particularly appropriate for resident species with limited mobility (e.g. gopher tortoise, sage grouse, lesser prairie chicken). Identifying limiting factors for a highly mobile, multi-generational, migratory, invertebrate species, mandates a different approach.

When not migrating, the movement of individual monarchs is not well understood, though adults appear to move very long distances to acquire life requirements (Brower 1995, Brower et al. 2011). Additionally, little is known about the importance of the spatial connectivity of habitats. What is known, is that the Eastern population of the North American monarch butterfly is at-risk (USDA 2015). Increasing the abundance, quality and distribution of habitat across its summer range is considered paramount to recover the species (Flockhart et al. 2014, Inamine et al. 2016, and Throgmartin et al. 2017). In consideration of the above statements, this monarch butterfly habitat guide recognizes that monarch butterflies are highly mobile and that the importance of connectivity and adjacency is unknown⁴. Thus, this WHEG is applied independently to different portions of the project area. Each unique area within the project area, is referred to as an *assessment area*. A farm or ranch (project area) will commonly have multiple assessment areas, including narrow linear habitats (Figure 4). Following independent implementation of the protocols to each assessment area.



Figure 4: Common milkweed (Asclepias syriaca) growing adjacent to a soybean field. Milkweed (Asclepias spp.) and floral resources are often near cropland. The opportunities for large scale habitat restoration in the Midwest are limited, as this region supports some of the most productive soils in the world.

⁴ Within the monarch conservation community, many suspected that the lack of somewhat evenly distributed habitats across the migration path, may be as limiting to the overwintering population as is total acres of habitat. Hence one population stressor might be inadequate distribution of habitat acres, rather than total acres.

Based on best available science (Pleasants and Oberhauser 2012; Brower et al. 2011), a limiting factor for monarchs in the Midwest is the availability of quality breeding habitat (i.e., grassland containing a significant milkweed component). Additionally, others suggest the lack of nectaring habitat, particularly during the fall migration, may be a population stressor (Agrawal 2018; Agrawal 2017; Brower et al. 2006). Because the importance of nectar habitat is gaining appreciation within the scientific community this WHEG provides for three scores. One score for nectaring habitat, another for breeding habitat, and a composite score for those projects with an objective of providing both breeding and nectaring habitat.

The habitat quality ratings (*N/A*, *poor*, *fair*, *good*, and *excellent*) 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 with flexibility by incorporating professional judgments deemed necessary for unique site conditions, including 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.

Time Requirements to Apply the WHEG

This WHEG is designed to allow for application of Rapid Methods for most projects. It is anticipated that application of the rapid approach will only add less than one hour to the traditional conservation planning process. Application of the vegetative sampling methods required in the comprehensive method will add approximately two additional hours to the conservation planning process.

REFERENCE DOMAIN

Figure 5 provides the reference domain (area of applicability) for the NRCS Monarch WHEG; Midwest edition. The reference domain includes two Land Resource Regions (LRR) (USDA 2006) - M (Central Feed Grains and Livestock Region) and K (Northern Lake States Forest and Forage Region).

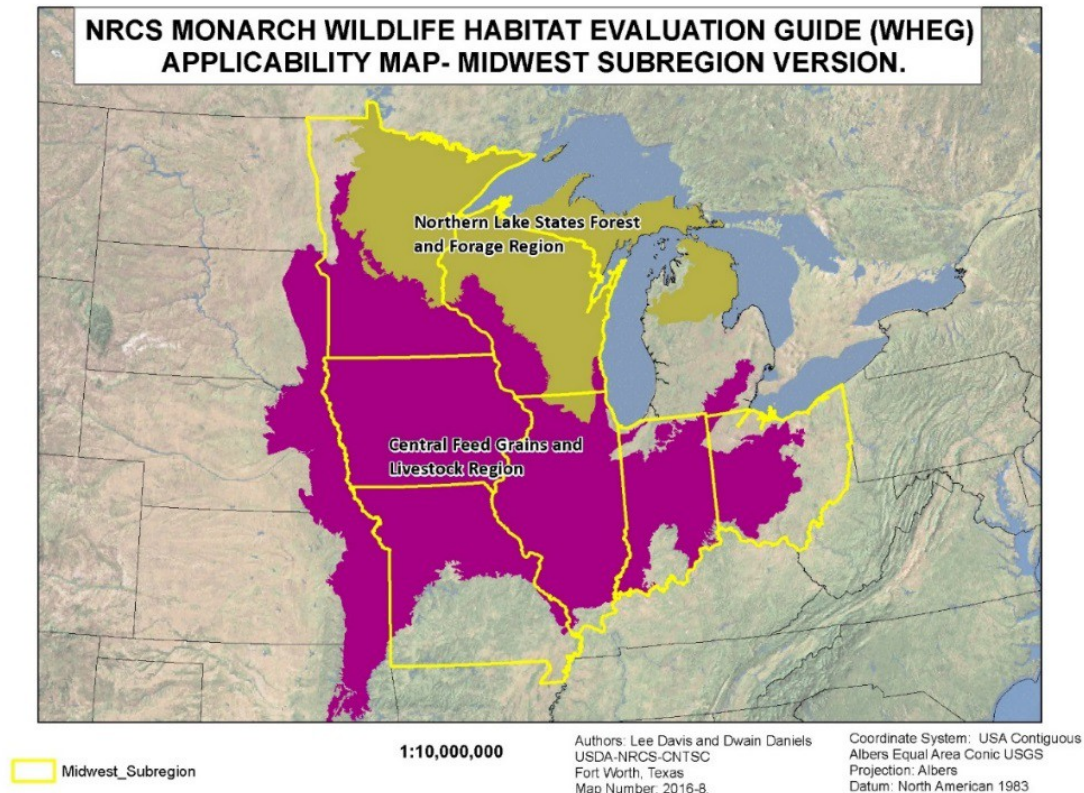


Figure 5: Applicability region for the NRCS Monarch WHEG; Midwest Edition.

The 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 degraded habitats that were once fully functional 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)⁵ 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".

⁵ Prairie soils invaded by early-successional woody are not considered forested for this exclusion. Examples of woody species that commonly invade grasslands in the Midwest include black locust (*Robinia pseudoacacia*), box elder (*Acer negundo*), eastern red cedar (*Juniperus virginiana*), elms (*Ulmus* spp.) and ash (*Fraxinus* spp.)

MONARCH BUTTERFLY: QUICK FACTS

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, as the science remains very dynamic. The Midwestern U.S. is critical to monarch butterflies that overwinter in Mexico. The WHEG is based on the best available science with the anticipation of future modifications.

The following are well understood:

- Adult monarchs leaving the overwintering grounds in Mexico move primarily north and northeast.
- Gravid females (i.e., carrying fertilized eggs internally) from Mexico, interrupt their northern migration, to lay eggs, primarily in Texas, but also in northern Mexico and other southcentral and southeastern states. Monarchs (1st Generation) born in in this region breed and migrate north and northeast to lay eggs (2nd Generation), some reaching Canada.
- Depending on the annual variability in weather, monarchs produce 3-5 generations of butterflies each year.
- Gravid females lay eggs (200-400 eggs) almost exclusively on plants in the genus *Asclepias*.
- The most important plant family for nectaring is the Composite family (Asteraceae).
- Summer breeding habitat in many portions of the Midwest is very limited (Pleasants and Oberhauser 2112; Brower et al. 2011).
- Monarchs with a natal origin of the Midwest contribute significantly to the total overwintering population in Mexico (Wassenaar, L.I. and K.A. Hobson 1998; Flockhart et al 2016; Flockhart et al. 2017). Note: The percent contribution from any one region of the U.S. varies each year, depending on the annual variability in weather (Flockhart et al. 2017).
- Gravid females are selective of the digestibility of individual plants (Baum and Sharber 2012; Fischer et al. 2015)
- Recent data demonstrates some sensitivity to milkweed density (Kasten 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 laying⁶
- preferred or importance of spatial scale and/or configuration of patterns of the monarch butterfly habitats for either migration or reproduction

⁶ Female monarchs lay 400[±] eggs over many weeks, but the vast majority of the eggs are laid within a 7-10-day period (Edson 2007).

TIMING OF THE EVALUATION

For most 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 forbs and milkweed (*Asclepias* spp.) is required. Ideally, this vegetative inventory is applied when species richness of the forb component is at its highest level, and when conditions are suitable for plant identification.



Figure 6: Late summer is an ideal time of the year to inventory a site for species richness and abundance.

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 data sheets
- Plant ID field guide

INSTRUCTIONS

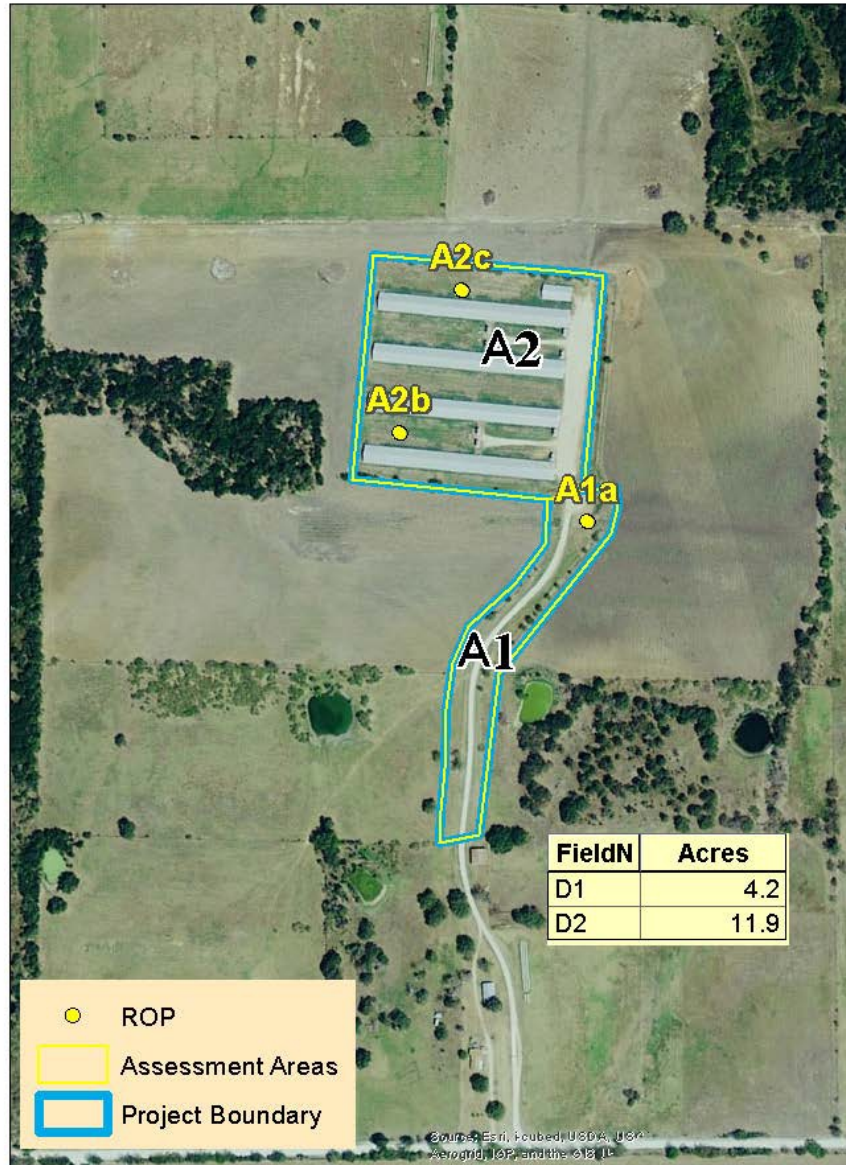
STEP 1: Develop a Project Base Map (Figures 7 and 8):

- a. Delineate the entire area to be evaluated on aerial imagery. The area to be considered for monarch habitat improvements is referred as the “*project area*,” which may consist of one or more assessment areas (AAs). *Note: Commonly, the project area will be the USDA Tract boundaries, but not always. In some situations, it may be a single field or a portion of field. The decision of the project area boundary is left to the discretion of the conservation planner and client (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, the client might not be interested in converting a cropland field into monarch habitat. Identify such areas by placing the word “OUT” on the base map.
- c. Identify all areas with the monarch WHEG land-type⁷ of *Forested*. These areas include narrow zones of woody vegetation (riparian areas) and blocks of forested species such as elm (*Ulmus* spp.), green ash (*Fraxinus pennsylvanica*), pecan (*Carya illinoensis*), or oaks (*Quercus* spp.). The *forested* monarch land-type is limited to areas that were historically and currently forested, and do not include sites that were once grasslands or savannahs. Exclude all such areas from the application of this WHEG. If determined to be the *forested* monarch WHEG land-type, document a rating of “N/A” on the base map and continue the evaluation other areas.

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.
- d. Subdivide the remainder of the project area into unique assessment areas (AAs). As appropriate, subdivide the remainder of the project area into areas that have similar characteristics, such as ecological sites, vegetation, soils, slope, and management. These unique areas are referred to as *assessment areas* (AA). Identify each AA 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 such as a dense stand of eastern red cedar (*Juniperus virginiana*) on steep slopes, then each polygon supporting these conditions will be assigned the same AA 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 “sub-areas”) 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 sub-area) on the base map.

⁷This monarch butterfly WHEG requires the identification of a “Monarch Butterfly WHEG Land-type” for each Assessment Area. Monarch habitat development options and decisions are provided for each monarch land-type. There are 5 Monarch Butterfly WHEG Land-Types in this WHEG: *FORESTED*, *CROP*, *MONOTYPIC GRASS OR LEGUMES*, *FORESTED*, or *OTHER PRIMARILY HERBACEOUS COMMUNITIES*. The *FORESTED* Monarch WHEG Land-type is unique as the WHEG prohibits conversion of the *FORESTED* monarch WHEG land-type to monarch habitat.

Monarch Butterfly Habitat Base Map

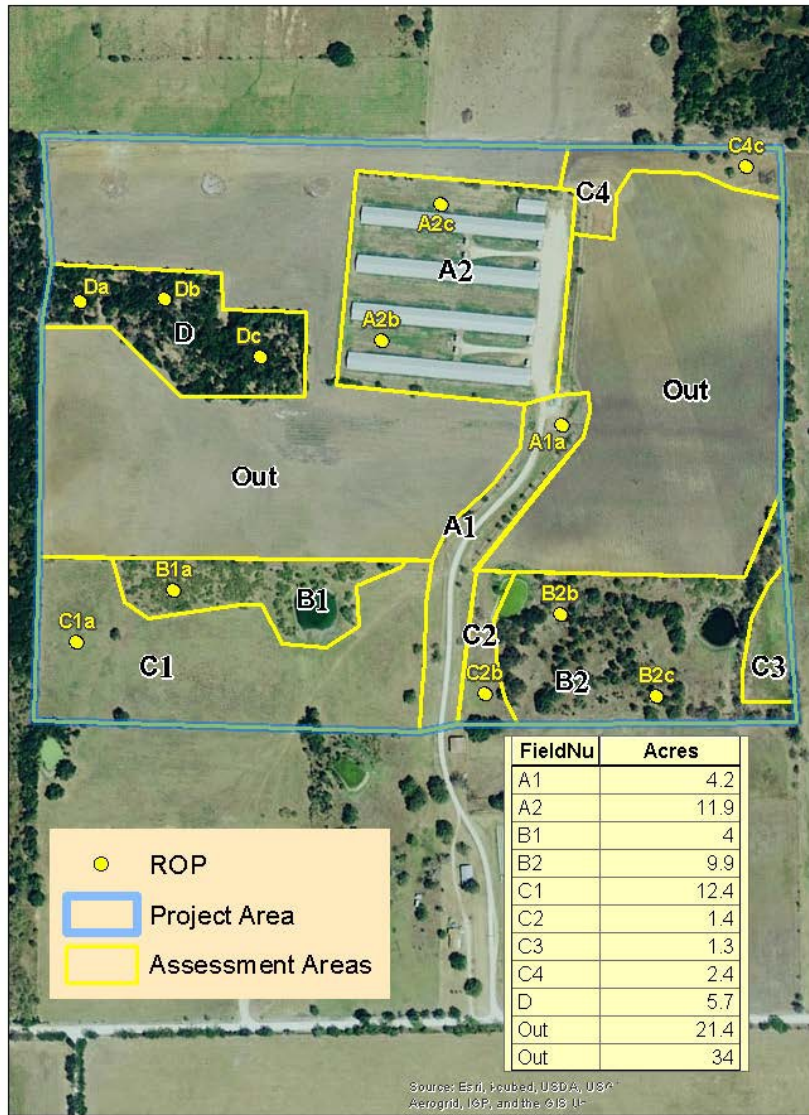


1:4,800

Map created: February 19, 2016
Central National Technology Support Center
USDA-NRCS, Fort Worth, Texas
Map No. 2016-25

Figure 7: Example of a monarch habitat development base map for a less complex project. Note the concept 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 (e.g., A1a, A2b, and A2c).

Monarch Butterfly Habitat Base Map



1:4,800

Map created: February 29, 2016
 Central National Technology Support Center
 USDA-NRCS, Fort Worth, Texas
 Map No. 2016-26

Figure 8: Example of a monarch habitat development base map for a complex project. 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 (e.g., B1a, B2b, B2c, Da, Db, and Dc).

USER NOTE: To save staff time, this WHEG allows the planner to rapidly screen AAs that will not require the full application of the WHEG protocols, based on the plant community. For example, vegetative sampling to determine the density of milkweed and/or nectaring species has no value for a cropland area under consideration of conversion to monarch habitat. This rapid screening process, and the presentation of conservation planning alternatives, are based on four monarch WHEG Land-types⁸. Each type is defined in Steps 2 (Rapid Method) and 3 (Comprehensive Method). To support the rapid screening concept, no vegetative sampling or numeric scoring will occur in Step 2. Rather, the WHEG directs the user to apply a benchmark rating of *poor*.

STEP 2 (Rapid Method): Identify Monarch WHEG Land-types that have low species richness or abundance. These Monarch Land-types allow for a rapid decision on monarch butterfly habitat quality.

- a. Determine the Monarch WHEG Land-type and document the decision on the data sheet(s) for the assessment area.
 - i. *CROP* – Any area that (i) is being annually planted for harvest of a product, or (ii) is planted to alfalfa (*Medicago sativa*).
 - A. Document a benchmark condition rating of *poor* and end the assessment.
 - B. If the planning consideration 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 assessment⁹.
 - o Alternatives and Planning Considerations:
 - Decision maker will convert the AA into productive habitat by implementing a core habitat establishment practice standard (Appendix C.) such as Conservation Cover (327) or Field Border (386), with the additional criteria to enhance wildlife, pollinator and beneficial organism habitat, with the monarch butterfly as the target wildlife species.
 - In addition, the decision maker will implement threat reduction techniques and/or practices sufficient to achieve minimum variable scores of $V^{IR} = 0.2$, and $V^{WMR} = 0.3$.
 - Implement any number of supporting practices (Appendix C.), as appropriate.
 - ii. *MONOTYPIC GRASSES or LEGUMES (including pasture, managed hay, farmsteads, and other frequently-managed areas, OR areas with low forb richness or abundance)* - These areas support primarily monotypic non-native or native grass species. Plant species richness is low. Examples are reed canary grass (*Phalaris arundinacea*), Kentucky bluegrass (*Poa pratensis*), smooth brome (*Bromus inermis*), fescue (*Schedonorus* spp.), bluestems (*Andropogon and Schizachyrium* spp.), switch grass (*Panicum virgatum*), and clover (*Trifolium* spp.). There may be some woody encroachment, but not to such a level to warrant a land-type of *Brush*.
 - A. Document a benchmark condition rating of *poor* and end the assessment of benchmark habitat conditions on the datasheet.

⁸ Monarch WHEG Land-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. The WHEG’s rapid method is used to determine monarch habitat quality ratings for CROP, MONOTYPIC GRASS or LEGUMES and BRUSH types. A more rigorous protocol is used for the Land-type of OTHER PRIMARILY HERBACEOUS COMMUNITIES.

⁹ If the CROP AA is immediately adjacent to monarch habitat, consider pesticide drift risks to the adjacent habitat.

- 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 for this AA.
- Alternatives and Planning Considerations:
 - Decision maker will convert the AA into productive habitat by implementing core management practice standards, such as Herbaceous Weed Treatment (315), Prescribed Burning (338) or Early Successional Habitat Development and Management (357); and habitat establishment practice standards (Appendix C.), such as Conservation Cover (327) or Field Border (386), as appropriate. , with the additional criteria to enhance wildlife, pollinator and beneficial organism habitat, with the monarch butterfly as the target wildlife species.
 - In addition, the decision maker will implement threat reduction techniques and/or practices sufficient to achieve minimum variable scores of $V^{IR}= 0.2$, and $V^{WMR}= 0.3$.
 - Implement any number of supporting practices, as appropriate.
 - Implement strategic disturbance periodically throughout the life of the plan to increase milkweed and/or monarch nectaring plant species richness, abundance and cover by applying core management practices.
- 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 land-type should not be used if forested, rather it is used for historic grasslands invaded 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:
 - Decision maker will convert the AA into productive habitat by implementing core management practice Brush Management (314) and as needed, core establishment practices such as Conservation Cover (327) or Field Border (386).
 - In addition, the decision maker will implement threat reduction techniques and/or practices sufficient to achieve minimum variable scores of $V^{IR}= 0.2$, and $V^{WMR}= 0.3$.
 - Implement any number of supporting practices, as appropriate.

STEP 3 (Comprehensive Method): Assign ratings for the subset of the other AAs with a monarch WHEG land type of *Other Primarily Herbaceous Communities*.

- i. **OTHER PRIMARILY HERBACEOUS COMMUNITIES** – These areas support grasses and may have a significant forb component including glades, prairies, savanna, conservation areas, old fields, and odd areas. There may be some woody encroachment, but not to the level to warrant a land-type of *Brush*.
 - A. Document the benchmark habitat conditions on the datasheet.
 - B. Continue to Step 4

Determine the monarch habitat scores for the assessment areas identified as the Monarch land-type *OTHER PRIMARILY HERBACEOUS COMMUNITIES*, by considering the following monarch habitat variables:

- Insecticide Risk Condition V^{IR}
- Weed Management Risk Condition V^{WMR}
- Average Milkweed Stem Density V^{MWD}
- Forb Cover V^{FC}
- Forb Richness V^{FR}

Insecticide Risk Condition

| V^{IR} Insecticide Risk Condition ¹⁰ | Benchmark Score | Planned Score | Applied Score |
|--|-------------------------------------|---------------|---------------|
| A portion of the AA is treated with insecticides, including insecticidal seed treatments. | STOP (AA rating is <i>poor</i>) | | |
| A portion of the AA is located within 100 feet of areas treated with insecticides, AND no insecticide drift techniques are be assured. | 0.2 | 0.2 | 0.2 |
| A portion of the AA is located within 100' of areas treated with insecticides, AND the AA is either (a) located where it is not downwind of the areas treated with insecticides (seed treatment or foliar), based on prevailing wind direction during the growing season ¹¹ , or (b) insecticides are not applied (seed treatment or foliar) when wind is blowing towards the AA. | | | |
| AND > 25% of the AA is within 100' of treated areas. | 0.5 | 0.5 | 0.5 |
| AND <25% of the AA is within 100' of treated areas. | 0.7 | 0.7 | 0.7 |

¹⁰V is used for the term “variable”. These are variables used to calculate the final score and rating for the AA.

¹¹ State Offices will provide guidance on how staff will determine prevailing wind direction.

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| | | | |
|--|-----|-----|-----|
| The AA meets conditions for a score of 0.5 above, AND offsite pesticide drift mitigation techniques from Table 3 of TN-190-AGR-9 are implemented to meet a target index score of at least 20 points. | 0.8 | 0.8 | 0.8 |
| The AA meets conditions for a score of 0.7 above, AND offsite pesticide drift mitigation techniques from Table 3 of TN-190-AGR-9 are implemented to meet a target index score of at least 20 points. | 0.9 | 0.9 | 0.9 |
| The entire AA is greater than 100' from any area treated with insecticides (including seed treatment). | 1.0 | 1.0 | 1.0 |

Weed Management Risk Condition

| V ^{WMR} Weed Management Risk Condition | Benchmark Score | Planned Score | Applied Score |
|--|-------------------------------------|---------------|---------------|
| AA is treated with herbicides ¹ , OR weed management of the AA is <u>inconsistent</u> with Monarch Best Management Practices adopted by the state. | STOP (AA rating is <i>poor</i>) | | |
| A portion of the AA is located within 30' of areas treated with herbicides, AND weed management of the AA is <u>consistent</u> Monarch Best Management Practices adopted by the State. | 0.3 | 0.3 | 0.3 |
| AA meets the requirement for 0.3 (above), AND the Client agrees to implement off-site drift prevention or mitigation practices and/or techniques from Table 3 of TN 190-AGR-9 totaling an index score of at least 20. | 0.6 | 0.6 | 0.6 |
| Weed management is <u>consistent</u> with all applicable BMPs adopted by the state, AND the entire AA is located more than 30' of areas treated herbicides, while a portion of the AA is located within 100' of areas treated with herbicides. | 0.5 | 0.5 | 0.5 |
| AA meets all conditions prescribed for a score of 0.5 (above), AND the Client agrees to implement off-site drift prevention or mitigation practices and/or techniques from Table 3 of TN 190-AGR-9 totaling an index score of at least 20. | 0.85 | 0.85 | 0.85 |
| The entire AA is greater than 100' from any area treated with herbicides, AND weed management is <u>consistent</u> with all applicable monarch Best Management Practices. | 1.0 | 1.0 | 1.0 |

¹ Do not consider treatments, such as NCP Brush Management (314), Herbaceous Weed Treatment (315), or Individual Plant Treatments (IPT) when required for establishment of milkweed or nectaring habitat.

SAMPLE VEGETATION TO DETERMINE MILKWEED DEINSITY AND FORB COVER AND RICHNESS

- i. Use the following process for variable factors V^{MWD} , V^{FC} , and V^{FR}
- Locate *Representative Observation Points* (ROP's): Within the assessment area, locate at least three observation points 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 ROP's 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 and/or the community is ecologically diverse (species are evenly distributed within the AA), then selection of a single ROP, or inventorying the entire AA would be suitable.*
 - At each ROP, determine the direction of a 72.6 X 6' belt transect that would capture vegetation most representative of the community in the assessment area. If the plant community within a 72.6-foot radius from the ROP is homogeneous, then the belt transect may be oriented in any direction.
 - Denote the vegetative transect geo-location and direction on the data sheet or base map.
 - Sample vegetation within each assessment area by doing the following: *Note: There will be one data sheet for each assessment area; however, subareas are combined in one data sheet.*
 - **Milkweed:** Walk the full distance of the belt transect (72.6' X 6') noting the presence of *Asclepias* plants¹² emerging from within one side of the belt transect (72.6' X 3'). Upon the return to the ROP, repeat this process on the other side of the belt transect (72.6' X 3').¹³ Document the findings on the data sheet for this assessment area.
 - **Monarch Nectaring Forbs:** Collect monarch nectaring forb data within three 6' x 6' plots. The first 6' X 6' plot will be between 10 – 16 feet; the 2nd between 34 – 40 feet; and the 3rd between 60 and 66 feet. Visually estimate the absolute percent cover¹⁴ of monarch nectaring forbs¹⁵ in each plot. Document the findings on the data sheet.
 - Repeat this sampling approach at each transect within the assessment area.

¹² 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.

¹³ Young milkweed plants, and smaller species are difficult to inventory in dense or tall vegetation. Sub-diving the belt transect into halves (3' wide) allows for an improved inventory. In some plant communities, milkweed plants are obvious and inventorying the entire 6' wide belt transect can be done in a single pass.

¹⁴ 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.

¹⁵ Nectaring forbs are included on the Monarch WHEG Plant List in the appendix. *Asclepias* spp. serve as preferred nectaring species. As such, they are included in the monarch nectaring forb inventory.

| 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 |
| 100 – 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 |

- Alternatives and Planning Considerations:
 - If the score is 0.15 or less, the decision-maker will implement a core habitat establishment practice standard such as Conservation Cover (327), Field Border (386), etc. to increase milkweed density to at least 500 stems per acre.
 - If the score is 0.3 – 0.5, the decision-maker will implement one of the following options. Both options will increase milkweed density and improve larval-monarch foraging habitat as the targeted condition with monarch breeding and foraging habitat as the stated purpose:
 - Option 1: Conservation Cover (327) alone, or in combination with 315 or 338 or 647.
 - Option 2: Herbaceous Weed Treatment (315), Prescribed Burning (338), Early Successional Habitat Development and Management (647), etc.
 - If the score is 0.8 - 1.0, the decision-maker will implement core management practices such as Prescribed Burning (338), Early Successional Habitat Development and Management (647), etc. and as appropriate, supporting practices to maintain milkweed density.

| V^{FC} : Forb Cover: Average monarch nectaring forb cover within the AA | Benchmark Score | Planned Score | Applied Score |
|---|-----------------|---------------|---------------|
| Absent ($\leq 2.0\%$) | 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 ^{FR} : 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> are represented in the bel transect. | 1.00 | 1.00 | 1.00 |

- Alternatives and Planning Considerations (applies to V^{FC} and V^{FR}):
 - If the score is less than 0.3, the decision-maker will implement a core habitat establishment practice such as Conservation Cover (327), Field Border (386), etc. to increase forb cover.
 - If the score is 0.3 – 0.5, the decision maker will implement one of the following options. Both options will increase nectaring forb cover, and improve foraging habitat as the targeted conditions^{4,6} with breeding and foraging habitat as the stated purpose
 - Option 1: Conservation Cover (327) alone, or in combination with 315 or 338 or 647, with the additional criteria to “enhance wildlife, pollinator and beneficial organism habitat”, with an improvement in monarch nectaring habitat being the target conditions.
 - Option 2: Herbaceous Weed Treatment (315), Prescribed Burning (338), Early Successional Habitat Development and Management (647), etc., with the additional criteria to “enhance wildlife, pollinator and beneficial organism habitat”, with wildlife habitat as the purpose and monarch nectaring habitat as the target conditions.
 - If the score is > 0.5, the decision-maker will implement core management practices such as Prescribed Burning (338), Early Successional Habitat Development and Management (647), etc., and as appropriate, supporting practices to maintain nectaring forb cover or richness, respectively.
- ii. Apply the following formula(s) to determine Monarch Habitat Condition Rating (benchmark, planned, or applied rating) for the target habitat objectives (breeding, nectaring, or both breeding and nectaring).

Breeding Habitat Formula:

$$BH\ Score = (2V^{IR} + V^{WMR} + 6V^{MWD})/9$$

Nectaring Habitat Formula:

$$NH\ Score = (V^{IR} + 2V^{WMR} + 4V^{FC} + 3V^{FR})/10$$

Composite Habitat Formula

$$WHEG\ Score = (BH + NH)/2$$

- iii. Determine benchmark monarch habitat condition rating for the target habitat (breeding, nectaring, or composite) and end the assessment of current conditions.

| Monarch Habitat Condition Score | Benchmark Score | Planned Score | Applied 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: DETERMINE PLANNED MONARCH HABITAT CONDITION RATING

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* for the limiting factor (breeding, nectaring or a composite score). Based upon the best professional judgement of NRCS staff biologists, the implementation of core establishment practices with or without core management practices is expected to result in a future WHEG score of 1.0 (*excellent* rating). However, the implementation of core management practices alone is expected to achieve a lower planned score of 0.8 (also an excellent rating). The above planned scores and ratings presume a weed management risk condition (V^{WMR}) score of at least 0.6. Based upon the best professional judgement of NRCS staff biologists, if the weed management risk condition score is less than 0.6, both forb cover and forb richness will suffer. For this reason, planned scores for these habitat variables will be automatically discounted in the WHEG datasheet, thereby, leaving no guesswork to the planner. 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

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: FOLLOW UP

Seldom can any conservation practice be installed with confidence without the need to revisit the site to determine the post implementation conditions and identify adaptive management needs that would benefit the conservation effort. As mentioned in the executive summary, 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 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 in subsequent years to not only measure gains in monarch habitat quality (applied 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 soils¹⁶, slope, vegetation, current or future land use, 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. N/A, 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 (N/A, *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.

Applied habitat condition rating (applied 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.

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Appendix A: Monarch WHEG Data Sheet:

- The data sheet can be accessed at the NRCS Monarch Butterfly Webpage.

Appendix B: Important Plants of the Monarch Butterfly – Midwest Staff Guide, Ver. 2.0

- The data sheet can be accessed at the NRCS Monarch Butterfly Webpage.

Appendix C: Commonly Applied Conservation Practices

- Provide on page 27

Appendix C: Commonly Applied Conservation Practices for the Development or Management of Monarch Butterfly Habitat in the Midwest

| Conservation Practice Standard | Code | Category (CR) ² | Practice Type ³ |
|--|------|----------------------------|----------------------------|
| Access Control | 472 | Supporting ⁴ | Management |
| Brush Management | 314 | Core | Management |
| Conservation Cover | 327 | Core | Establishment |
| Critical Area Planting | 342 | Supporting | Establishment |
| Early Successional Habitat | 340 | Supporting | Management |
| Fence | 382 | Supporting | Management |
| Field Border | 386 | Core | Establishment |
| Fire Break | 394 | Supporting | Management |
| Forage Harvest Management | 511 | Core | Management |
| Hedgerow Planting | 422 | N/A | Establishment |
| Herbaceous Weed Treatment | 315 | Supporting | Management |
| Integrated Pest Management | 595 | Supporting | Management |
| Prescribed Burning | 338 | Core | Management |
| Prescribed Grazing | 528 | Core | Management |
| Restoration of Rare or Declining Natural Communities | 643 | Supporting | Establishment |
| Riparian Forest Buffer | 391 | Supporting | Establishment |

² NRCS and the USFWS developed a Monarch Butterfly Conference Report (CR) in 2016. A CR serves as part of the consultation requirements of Section 7 of the Endangered Species Act (ESA), in the event of a positive listing decision under the ESA. Table 1 of the CR provides a list of conservation practice standards covered by the Conference Report. Table 1 is much more extensive than the list provided in the Monarch WHEG. The CR identifies 645 as the Umbrella practice, and designates all other practices as either Core or Supporting. A Core practice can stand alone, while a supporting practice most commonly is implemented in support of a Core Practice.

³ Conservation Practice Standards can be used to support monarch habitat by creating new habitat, or as a management tool to improved conditions of existing habitat.

⁴ This WHEG uses 3 practice categories:

Practice Categories:

1. Umbrella: Serves as the foundation for the conservation planning process for the monarch butterfly. Though required in the conservation plan, the umbrella practice is not required in a financial assistance contract.
2. Core: Can be planned and implemented as a standalone practice.
3. Supporting: Are not a standalone practice, but rather are used to support a core practice.

USDA NRCS MONARCH BUTTERFLY HABITAT EVALUATION GUIDE (WHEG), AND DECISION SUPPORT
TOOL: MIDWEST EDITION 2.0 (SEPTEMBER 2018)

| | | | |
|--------------------------------|-----|------------|---------------|
| Riparian Herbaceous Cover | 390 | Core | Establishment |
| Upland Wildlife Habitat Mgmt. | 645 | Umbrella | Management |
| Wetland Enhancement | 659 | Supporting | Management |
| Wetland Restoration | 657 | Supporting | Management |
| Wetland Wildlife Habitat Mgmt. | 644 | Supporting | Management |