

**USDA NRCS MONARCH BUTTERFLY WILDLIFE
HABITAT EVALUATION GUIDE AND DECISION SUPPORT TOOL: *SOUTHERN GREAT
PLAINS EDITION***

EXECUTIVE SUMMARY

In response to the decline in the monarch butterfly (*Danaus plexippus*) population, the USDA Natural Resources Conservation Service (NRCS) is providing technical and financial assistance to help producers establish and enhance monarch habitat. In the southern Great Plains, the effort is primarily focused on improving monarch habitat on NRCS land uses¹ of Pasture, Range, Associated Agricultural Land, and to lesser extent on Crop.

When working with decision-makers on the nation's private agricultural lands, the NRCS utilizes a 9-step conservation planning process (USDA 2013). The nine steps are:

- Step 1: Identify Problems (resource concerns) and Opportunities
- Step 2: Determine Objectives
- Step 3: Inventory Resources
- Step 4: Analyze Resource Data
- Step 5: Formulate Alternatives
- Step 6: Evaluate Alternatives
- Step 7: Make Decisions
- Step 8: Implement the Plan
- Step 9: Evaluate the Plan

When monarch butterfly habitat has been identified by the decision maker as a resource concern, NRCS staff should use an approved habitat evaluation or appraisal guide to inventory habitat and help develop a plan (NRCS 2010). This *Monarch Butterfly Wildlife Habitat Evaluation Guide* (Monarch WHEG) and *Decision Support Tool: Southern Great Plains Edition* is designed as a planning support tool for staff located in portions of the southern Great Plains.

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 semi-arid grasslands. Development of wildlife habitat is seldom accomplished during a single year, and the results are seldom static. Rather, the commitment requires resource inventories (formal or informal) during different seasons and over many years.

This guide differs from many NRCS WHEG's as it is designed, not just to evaluate monarch habitat conditions, but as a complete planning support tool where alternatives (national conservation practices) are presented for different plant community types. The evaluation portion of this guide provides a method to assess current monarch habitat condition (referred to as *benchmark habitat conditions*), to present alternatives to the decision maker based on prediction of future conditions (referred to as *planned habitat conditions*), and finally to determine if the objectives are met by applying the WHEG after habitat development efforts are installed (referred to as *applied habitat conditions*). Conditions are expressed by assigning a qualitative monarch butterfly habitat condition rating of *poor*, *fair*, *good* or *excellent*. These ratings are assigned at the conservation practice implementation scale, not at the farm or ranch scale.

¹ Land use terms are from Conservation Delivery Streamlining Initiative

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INTRODUCTION

Monarch Habitat Development and Management

The eastern U.S. migratory population of the monarch butterfly (*Danaus plexippus plexippus*) has suffered significant declines over the past two decades. An overview of monarch biology and habitat needs are provided in the document titled NRCS [Monarch Butterfly Habitat Development Project](#) (USDA 2015)². Before assessing habitat conditions, the conservation planner must (1) understand basic monarch life requirements, (2) understand the soils and plants in their work area, and (3) understand how the use of national conservation practices in the planning and contracting process effect change on the lands. This document is more than just a wildlife habitat evaluation guide, it is a decision support tool. It provides conservation planning alternatives linked to the appropriate NRCS national conservation practices that can be used to change the benchmark habitat conditions.

The agricultural working lands of the southern Great Plains are primarily dominated by livestock operations or cropland, including small grains. The result of the conversion of native grasslands to agricultural lands has been a permanent degradation of the soils, seed banks and plant communities. Brush has encroached on much of the lands, as has an array of introduced grasses. These changes add complexity to monarch habitat restoration and management efforts, particularly efforts to re-construct a sustainable native forb component. With the removal of fire and the native herbivory, maintaining a seral plant community (mid-successional habitat) requires that the land manager provide a surrogate to the natural periodic disturbances that maintained the forb component. Regions with more annual rainfall require more intense and more frequent disturbance than arid regions.

Monarch butterflies rely on forbs for forage in all life stages, with perennial forbs being particularly important. Accordingly, monarch butterfly habitat assessments target the forb component, with specific attention to larval host-plants (milkweeds) and adult nectar sources. The native forb component in a grassland system is highly dependent on the associated grass component (species, density, and height). The grass component provides the stability for the system. Forb abundance, distribution and richness are managed through management of the grass.

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 (USDA 2013). These WHEGs identify the most limiting factor and consider the proximity to, and interrelationships with components of other habitats. This approach is particularly appropriate for resident species with limited mobility, distribution and home ranges (e.g. New England cottontail). Because monarch butterflies are migratory and travel long distances in search of host plants on which to lay their eggs, and because the larval host plants for a single gravid female may be broadly distributed, evaluation of monarch habitat mandates a different approach.

² <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/>, and 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/>.

The eastern population of monarch butterflies are migratory, and when not migrating, the movement of individual monarchs is not well understood. However, when not migrating females appear to move long distances to find host plants (milkweed). (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 an individual monarch's life cycle. Accordingly, rather than evaluate habitat within the context of home range of a population as is done with non-migratory species, this guide is narrowly applied 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 other habitats. Based on best available science (Pleasants and Oberhauser 2012; Brower et al. 2011), the limiting factor for monarchs in the Midwestern U.S. is the availability of breeding habitats (milkweed abundance and distribution). A decline of milkweed has not been demonstrated for the southern Great Plains. Rather, the highly variable climate in this region results in a high variability in fall nectaring resources. Nectaring resources in the southern Great Plains, particularly in the fall of the year are important to monarchs (Brower et al. 2006; Brower and Pyle 2004). The fact is that little is known about monarch butterfly population stressors, related to habitat in the southern Great Plains.

In consideration of this lack of understanding, this WHEG will provide a score for breeding habitat and a score for nectaring habitat, with a single final monarch habitat condition rating based on both habitat components. This approach will allow the decision maker to identify objectives (breeding habitat, nectaring habitat or both) for each area being assessed, and then to tailor the monarch habitat development strategy to meet the objective.

Rating Monarch Habitat

The first step in evaluating monarch habitat in a project area is to subdivide the project (e.g. tract, farm, WRP easement) into smaller areas for an assessment of quality of habitat. 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 use). Conservation alternatives are formulated for each assessment area independent of the habitat conditions in adjacent assessment areas.

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 monarch habitat condition ratings* are based on current conditions. If the rating is *poor, fair* or *good*, then the WHEG provides habitat development alternatives (NRCS conservation practice standards). The predicted future conditions are then used to determine a *planned monarch habitat condition rating*. Decisions are then made for each AA based on the change from the benchmark to the planned rating. Following implementation of selected conservation practices³, the assessment can be applied again to determine the actually gains in habitat quality (*applied monarch habitat condition rating*). At no time in the evaluation of the project area, is a cumulative score or rating provided for the entire project area. Rather, multiple evaluations are made (once for each AA), with an eventual rating decision being rendered at the assessment area scale.

³ 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 and their clients are encouraged to visit Journey North's citizen-observational data <https://www.learner.org/jnorth/>.

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 the WHEG as a planning tool, and not a farm bill financial assistance ranking tool, assures that the scoring process is not encumbered with concern over consequences of the rating related to farm bill program eligibility.

REFERENCE DOMAIN

Figure 1 provides the reference domain (area of applicability) for the southern Great Plains edition of the NRCS Monarch WHEG. The reference domain is based on three Land Resource Regions (LRR) (USDA 2006).

- H: *Central Great Plains Winter Wheat and Range Region,*
- I: *Southwest Plateaus and Plains Range and Cotton Region*
- J: *Southwestern Prairies Cotton and Forage Region*

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

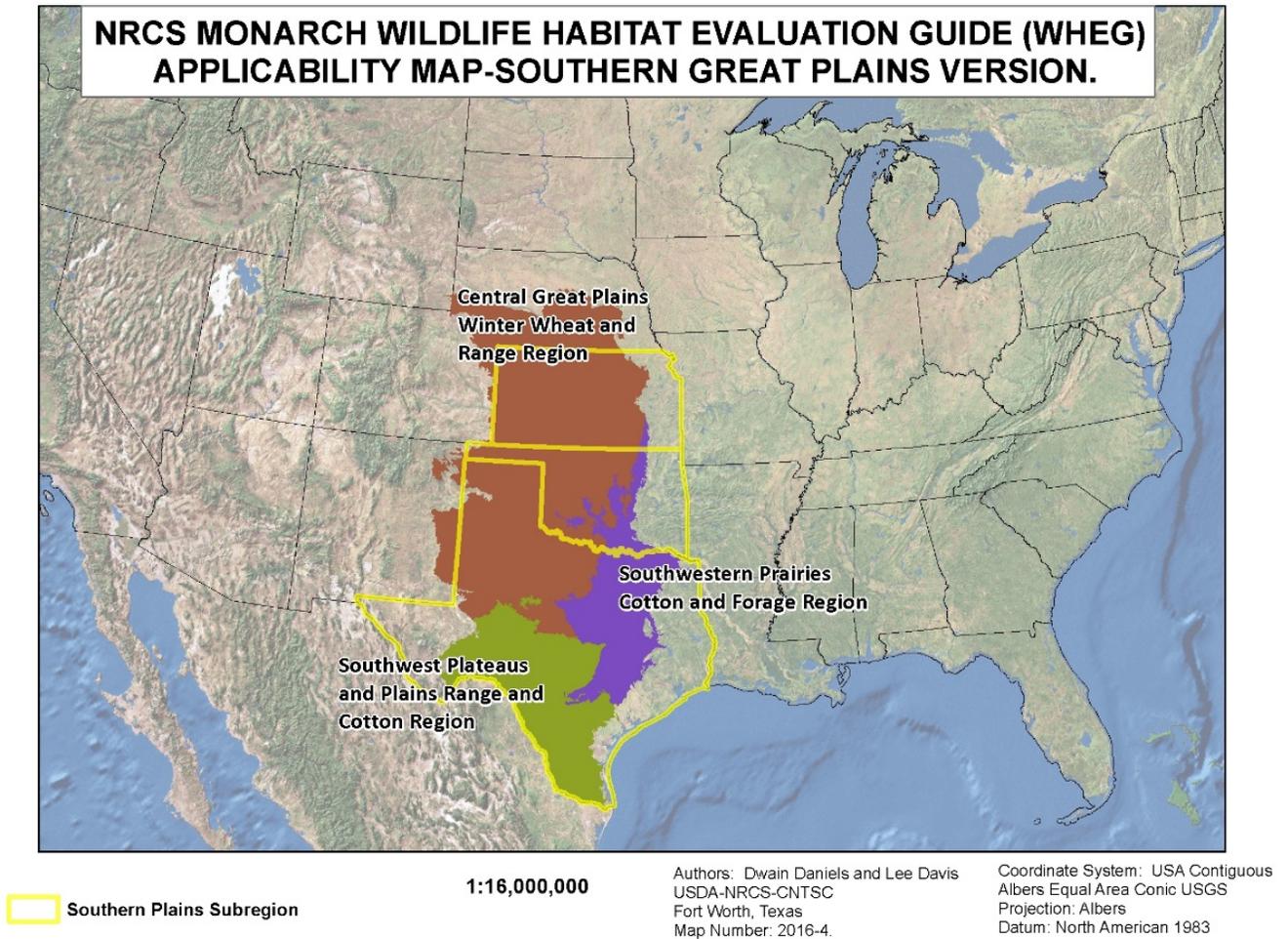


Figure 1: Applicability region for the NRCS Monarch WHEG; Southern Great Plains Edition.

EXCLUSIONS

This WHEG is designed for use on grasslands, savannahs or areas supporting brush or trees that were once grasslands or savannahs within the reference domain. This WHEG shall not be applied to forested areas (forested swamps, riparian forested areas or forested uplands that were historically forested) and are providing other important ecosystem services. Such areas contained within the project area are provided a rating of N/A. Historic grasslands, invaded by woody species do not fall under this exemption.

MONARCH HABITAT IN THE SOUTHERN GREAT PLAINS

Most key wildlife species in North America have been studied for centuries. Life and habitat requirements of these species are well understood and documented. This is not true for the monarch butterfly. There remain many data gaps and mysteries regarding the monarch, in particular about habitat and management of those habitats. These data gaps are particularly noticeable in the southern Great Plains, where the first generation of monarchs enter the U.S. in the spring. Most monarch research has concentrated on the summer breeding range, further north and east.

The following monarch biology, however, is well understood:

- Fall migration brings monarchs to virtually all counties in the southern Great Plains, but they tend to concentrate in the central portions of the three states.
- Spring migration patterns (primarily based on observational data, rather than tagging) have demonstrated a less concentrated pattern as they move north, but the spring migrants tend to disperse more easterly than the fall pattern.
- Gravid females lay eggs almost exclusively on plants in the genus *Asclepias* (milkweeds).
- The most important plant family for nectaring is the Composite family (Asteraceae).
- Fall nectaring resources in the southern Great Plains, and particularly TX, are critical to monarch survival at the wintering grounds, as monarchs increase their sugar intake and lipid storage as they near Mexico where they will shelter for the winter (Brower et al. 2006).
- Most gravid females that overwintered in Mexico and returned to the U.S. in the spring of the year lay eggs in the southern Great Plains.

The following are not well understood:

- The movement (direction and distance traveled) of gravid females during egg laying⁴
- The significance of late summer/fall breeding in the southern Great Plains to the wintering monarch population in Mexico
- Importance of spatial scale and configuration of monarch butterfly habitats for either migration or reproduction
- Nectar feeding habits of adults
- Impacts of the red imported fire ant (RIFA) predation at the population scale⁵
- The impact of milkweed distribution or densities in the southern Great Plains on the monarch population
- Establishment and management techniques for key milkweeds of the region

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

⁵ Predation of eggs and larva by the Red Imported Fire Ant (RIFA) can have devastating impacts on breeding success of monarchs at the local scale (Calvert 1996, Calvert 2004).

With consideration of what is and is not well understood regarding monarch biology and habitats, NRCS elected to design this WHEG to consider only those portion(s) of the agricultural operation where monarch butterfly habitat has been identified as a resource concern by the decision-maker. 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 broad habitat improvement decisions. The results of this WHEG are not cumulative for the project area (farm or ranch), but rather provide a monarch habitat condition rating (*poor, fair, good or excellent*) for each assessment area⁶. The WHEG is based on the best available science.

TIMING OF THE EVALUATION

For many situations, this WHEG can be applied during any time of the year (with the use of remote sensing or a field visit without vegetative data collection). For example, if the project areas is cropland or hayland there is no need to conduct a site visit. However, for many situations an inventory of important monarch nectar sources and an inventory of milkweeds (*Asclepias* spp.) are required. Ideally, the vegetative inventory is applied when species richness of the forb component is at its highest level. The climate in the southern Great Plains is highly variable, with short-term and long-term droughty conditions being normal and expected. As is common to semi-arid regions, the fauna and flora in the southern Great Plains has evolved to respond rapidly to these highly variable natural and normal climatic cycles. During droughts, nectaring floral resources and milkweeds are reduced. During wet periods, the same site can provide an abundance of these floral resources (Figure 2). These dynamic site conditions make habitat assessment more complex, as plant species densities and richness are often reflective of soil moisture levels prior to the site visit. Professional judgement is required in these situations, and predicting normal conditions may be warranted.

⁶ The concept of an assessment area is provided in detail in the Instructions; Step 1(c) on page 8.



Figure 2: Photo demonstrating the initiation of regrowth of *Asclepias asperula* late in the growing season, following a rain event.

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 prove.

- GPS
- 100-foot measuring tape
- 6' pocket tape measure or 6' x 6' quadrat.
- Pin flags or stakes
- Compass
- Clipboard
- WHEG, supporting documents, and data sheets
- Plant ID field guide

INSTRUCTIONS

STEP 1: DEVELOP A MONARCH HABITAT PROJECT BASE MAP (FIGURES 3 and 4):

- a. Delineate the outside boundaries of the project area. The “*project area*” is a single polygon that contains all areas that will be considered for monarch habitat development. *Note: The project area will vary in size and complexity. It may be the USDA Tract boundary, or may be as small as a portion of single field. The scope of the project area boundaries is determined when the client identifies those portions of the operation where monarch habitat is a resource concern.*
- b. Identify areas contained within the project area that will *not* be evaluated. Identify and delineate those areas contained within the project area where the decision-maker has no interest in development of monarch habitat. For example, monarch habitat may not be identified as a resource concern on a cropland or hayland field contained within the project area delineation. Another example would be a dense stand of 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 (e.g. by placing the word “OUT”) on the base map.
- c. 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 use. Identify each assessment area on the base map. To not conflict with Common Land Units (CLU) and USDA field numbering, the planner may wish to 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 (dense stands of *Juniperus* spp. on steep slopes) then each polygon supporting these conditions would 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.
- d. 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

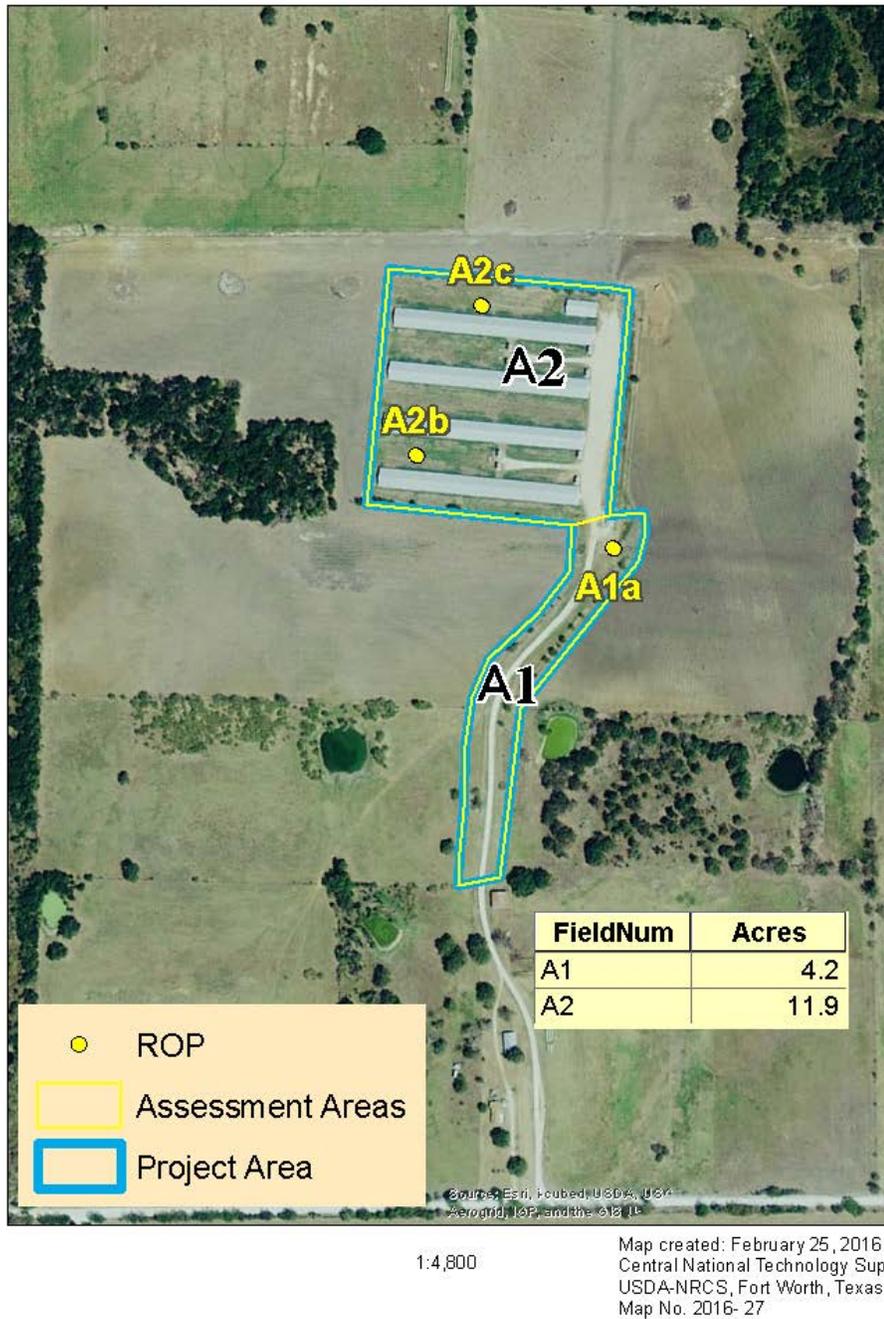
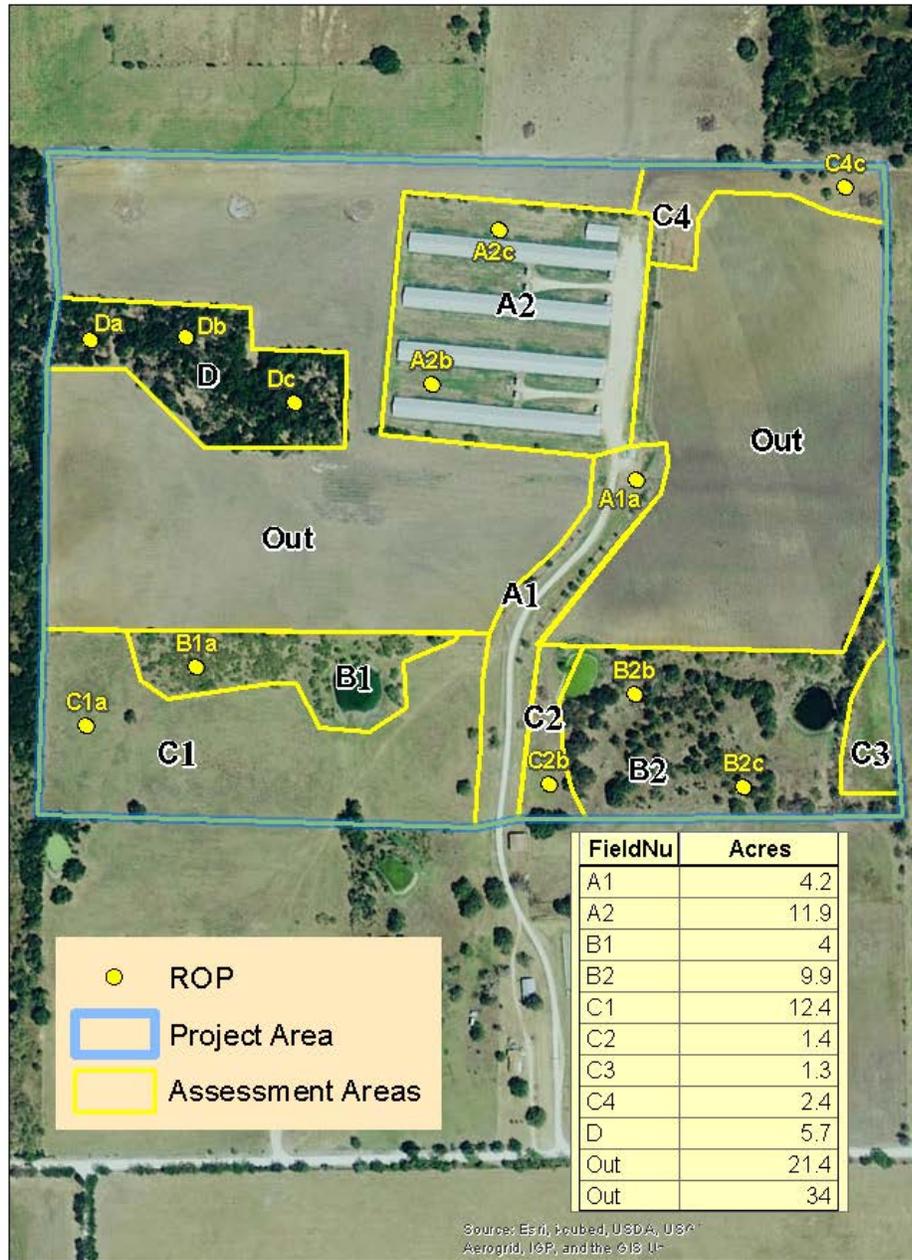


Figure 3: Example of a monarch habitat base map where the conservation planner and decision-maker identifies monarch habitat as a resource concern within the farm road rights-a-way (A1) and the farm headquarters (A2). Note the concept that an assessment area need not be contiguous. This assessment area (A) is divided into two subareas (A1 and A2). ROP denotes Representative Observation Point.

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. 2016-28

Figure 4: Example of a monarch habitat development base map for a complex project. Note again that the concept that an assessment area need not be contiguous, as the open herbaceous assessment area C has four subareas (C1, C2, C3, and C4). ROP denotes Representative Observation Point.

STEP 2: Utilize the National Conservation Planning Screening Level Criteria to Identify and Rate Assessment Areas with the Rapid Monarch Habitat Assessment Approach.

To increase efficiency, this WHEG provides that the user can screen AA's that are conducive to a rapid monarch habitat assessment. Vegetative sampling to determine the presence of milkweed and/or nectaring species has no value for a cropland area; thus, a rapid assessment is used on cropland. This monarch WHEG identifies nine monarch plant community types⁷. Plant community types are used to assist with this screening process and to refine the consideration of conservation planning alternatives. Each type is defined in the appropriate Step (steps 2, 3 and 4). The benchmark condition will be determined using this rapid approach for following monarch plant community types: *Forest*, *Brush*, *Crop*, *Intensively Managed Pasture or Range*, and *Intensively Managed Hay*.

- a. Identify all assessment areas with the plant community type of *Forested*. Within the reference domain of this WHEG, these areas are typically narrow zones of woody vegetation that border open areas, but they also may be larger blocks of hardwoods supporting species such as elm (*Ulmus* spp.), green ash (*Fraxinus pennsylvanica*), pecan (*Carya illinoensis*), or oaks (*Quercus* spp.) These areas were historically forested and do not include sites that were historically grasslands or savannah. These assessment areas are excluded from the application of this WHEG and the conservation planner with identify these areas as OUT per Step 1(b). No alternatives for the monarch will be provided for the forest plant community type.

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.

- b. As defined below, identify all assessment areas with the plant community type of *Brush*, *Crop*, *Intensively Managed Pasture or Range*, or *Intensively Managed Hay*. No vegetative sampling will be required for these plant community types. Monarch habitat development alternatives are presented for each plant community type below (see Steps 3b, c, d, and e). If none of the alternatives are selected, reconsider the decision to identify the monarch as a resource concern for this AA and identify the AA as OUT on the base map. *Note: If the monarch is not identified as a resource concern, then these areas should have been identified as OUT, per step 1 (b).*

Brush – These areas support brush at a density that prohibits implementation of other management options (e.g. herbaceous vegetation is sparse due to shading), without first implementing brush management.

Crop – Any area that is being annually planted for harvest other than wildlife food plots, and the decision maker has identified the monarch as a resource concern.

⁷ Monarch WHEG plant community types are related specifically to this WHEG and should not be confused with the term “landuse” in the NRCS National Conservation Planning Manual or program guidance.

Intensively⁸ Managed Pasture or Range – These areas are commonly fertilized, mowed, treated with herbicides, but not always. Past degradation (e.g. cropping or overgrazing, invasion by non-native grasses, fertilization, and herbicide application) will impact the forb component for many years. Thus, some areas where the application of fertilizers and herbicides has ceased but the impacts remain, will be included in this plant community type. Based on professional experience, the forb species richness is predicted to be very low. Examples are intensively managed Bermuda grass (*Cynodon dactylon*) or non-native bluestems (*Bothriochloa spp.*), smooth brome (*Bromus inermis*), tall fescue (*Schedonorus arundinaceus*) pastures.

Intensively Managed Hay – These areas are commonly fertilized, mowed, treated with herbicides, but not always. Fertilizations, past degradation and invasion by non-native grasses, and some haying practices can reduce the forb component to negligible levels. Forb species richness is predicted to be very low. These areas are typically Bermuda grass, Kline grass (*Panicum coloratum*), and fescue (*Schedonorus spp.*), but also include alfalfa. .

- c. If *brush*, document a condition rating of N/A or *poor* based on the following table, and end the assessment of benchmark habitat conditions for this assessment area. **CAUTION:** *The monarch habitat plant community type of brush is limited to situations where woody plants are severely limiting the value of the AA for monarchs. Areas that support brush but still provide value for monarchs, do not fall within the brush community type, but rather fall within monarch plant community types that will be evaluated in Step 3 (Standard Monarch Habitat Evaluation Approach). For an area to be considered as the brush monarch plant community type, the conservation planner must determine that the AA warrants the use of the rapid assessment approach and screening of the AA by providing a monarch habitat rating of poor without any further consideration or evaluation.*

Condition	Rating
Desirable native woody communities, with composition such as live oak (<i>Quercus virginiana</i>), cedar elm (<i>Ulmus crassifolia</i>), or post oak (<i>Quercus stellata</i>) and the density of the woody component prohibits management for monarch habitat. ⁹	N/A
Brush is determined to be noxious or problematic species such as honey mesquite (<i>Prosopis glandulosa</i>), <i>Juniper spp.</i> , sweet acacia (huisache) (<i>Vachellia farnesina</i>), or running live oak (<i>Quercus fusiformis</i>). And, the density of such brush is at (or will soon reach) levels where implementation of any practice other than brush management is not recommended or would not result in sustainable favorable monarch habitat conditions.	Poor
User notes: <i>The determination of brush plant community type should consider the relationships between the brush species and herbaceous vegetation. For example, honey mesquite has less influence on herbaceous species abundance and richness than juniper.</i>	

⁸ The term *intensively* is used identify financial inputs (fertilizer, herbicides mowing, haying) and is not reflective on the level of strategic management involving inventorying of the plant community and manipulation of livestock to obtain future conditions.

⁹ If the decision-maker identifies the woody species as desirable and the AA is determined to have a high potential for many species of other wildlife but not monarchs (too much shade for monarchs), then provide a monarch habitat conditions rating of N/A. If rating is NA then monarch habitat development is not recommended and the assessment ends for this AA.

To improve monarch habitat in these assessment areas would require Brush Management (314), followed by consideration of other alternatives such as:

Conservation Cover (327), with an additional criteria to “enhance wildlife, pollinator and beneficial organism habitat,” with the monarch as the target wildlife species.

Prescribed Burning (338), with improved wildlife habitat as at least one of the purposes and the objective of an increase in the forb component.

Prescribed Grazing (328), with an additional criteria to “improve or maintain food and/or cover for fish and wildlife species of concern.” The monarch would be the species of concern.

Range Planting (550), with the additional criteria “for improving forage, browse or cover for wildlife,” with the monarch being the target wildlife species.

Upland Wildlife Habitat Management (645), with monarch being the target species and planting of annuals (e.g. annual sunflowers) that provide forage for migrating monarchs.

- d. If *crop* document a condition rating of *poor*, and end the assessment of benchmark habitat conditions for this assessment area.

If the decision maker remains committed to improving monarch habitat but will continue to crop the AA, implement measures to:

(i) “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).

(ii) “Prevent or mitigate on-site pesticide risks to pollinators and other beneficial species through direct contact,” with monarchs being the target beneficial species.

If the decision maker remains committed to improving monarch habitat and is interested in a change of use, consider the following.

Conservation Cover (327), with an additional criteria to “enhance wildlife, pollinator and beneficial organism habitat”, with the monarch as the target wildlife species.

Range Planting (550), with the additional criteria “for improving forage, browse or cover for wildlife,” with the monarch being the target wildlife species.

Upland Wildlife Habitat Management (645), with the monarch being identified as the target wildlife species.

- e. If *intensively managed pasture or range*, document a condition rating of *poor* and end the assessment of benchmark habitat conditions for this assessment area.

If Monarch habitat remains a resource concern of the client and the decision-maker is *not* interested in a change to a more rich/native plant community, then implement measures that will:

- (i) “Prevent or mitigate offsite pesticide risks to plants and animals from drift.”
Milkweeds and monarch nectaring forbs will be the target plants of concern, and the monarch will be the target animal of concern.
- (ii) “Prevent or mitigate on-site pesticide risks to pollinators and other beneficial species (monarchs) through direct contact.”

If Monarch habitat remains a resource concern and the decision-maker is interested in a change to a more rich/native plant community¹⁰, then alternatives are:

Conservation Cover (327), with an additional criteria to “enhance wildlife, pollinator and beneficial organism habitat,” with the monarch as the target wildlife species.

Herbaceous Weed Control (315), with additional criteria to “restore or release native or create desired plant communities and wildlife habitats consistent with the ecological site.” The monarch will be the target species in rendering these considerations.

Prescribed Grazing (528), with an additional criteria to “improve or maintain food and/or cover for fish and wildlife species of concern.” The monarch would be the species of concern.

Range Planting (550), with the additional criteria “for improving forage, browse or cover for wildlife,” with the monarch being the target wildlife species.

- f. If *intensively managed hay*, document a condition rating of *poor* and end the assessment of benchmark habitat conditions.

If the decision-maker remains committed to improving monarch habitat, but is *not* interested in a change to a more rich/native plant community, implement measures that will:

- (i) “Prevent or mitigate offsite pesticide risks to plants and animals from drift.”
Milkweeds and monarch nectaring forbs will be the target plants of concern, and the monarch will be the target animal of concern.

¹⁰ Conversion of introduced grass to a mix of native species can be challenging. Staff lacking experience in this activity are encouraged to consult with a technical specialist and/or NRCS technical guidance on this subject.

- (ii) “Prevent or mitigate on-site pesticide risks to pollinators and other beneficial species (monarchs) through direct contact.”

Consider:

Forage Harvest Management (511), with an additional purpose to “maintain and/or improve wildlife habitat.” The monarch will be the target wildlife species. Delayed cutting of alfalfa until after bloom for the last cutting can result in significant improvements in nectaring resources for fall migrants. If the benchmark condition is alfalfa with delayed haying until after peak migration, then score this area as fair and end the assessment.

If the decision-maker remains committed to improving monarch habitat, and is considering a change of plant community type, then consider:

Conservation Cover (327), with an additional criteria to “enhance wildlife, pollinator and beneficial organism habitat,” with the monarch as the target wildlife species.

Range Planting (550), with the additional criteria “for improving forage, browse or cover for wildlife,” with the monarch being the target wildlife species.

STEP 3: STANDARD APPROACH: IDENTIFY AND RATE ASSESSMENT AREAS WITH THE USE OF THE STANDARD MONARCH HABITAT EVALUATION APPROACH. *Note: These AA’s are anticipated to have a low, medium or high forb species richness, but not “very low”. Sampling of the herbaceous vegetative community is required in this approach.*

- a. As defined below, identify all assessment areas with the monarch WHEG plant community type of *Passively Managed Pasture or Range*, *Passively Managed Hay*, *Ungrazed Grassland* or *Other*. Application of the standard monarch habitat assessment approach will be required for these plant community types.

Passively Managed Pasture or Range – These areas are grazed and support native or non-natives grasses. They may be a natural savannas or grasslands with some woody encroachment, but they do not meet the concept of the monarch plant community types of *forest*, or *brush* (as they can be managed for the monarch without a requirement to conduct brush management). *Note: Brush management might be a planning consideration, but it is not required.*

Ungrazed Grasslands – These areas are not being used for cropping or grazing by livestock, but are providing wildlife habitat, including habitat for the monarch. They may be grasslands, natural savannas or grasslands with some woody encroachment. Farm or Ranch road rights-a-ways, livestock working facilities, farmsteads and other associated agricultural lands would fall into this type. They do not meet the concept of monarch plant community types of *brush* or *forests*.

Unmanaged hay – These herbaceous areas maybe routinely cut for hay (“prairie hay”), occasionally seasonally grazed, or they are odd areas that lack the infrastructure for grazing (e.g.

fencing, water). They are routinely or periodically cut for hay, but application of fertilizer or herbicides are not routine practices. The plant community is typically somewhat rich, with a mix of grasses and some forbs.

- b. Determine the monarch habitat pesticide risks scores for each assessment area.

V ^{IR} : Insecticide Risk condition ¹¹	Score
AA is treated with insecticides	0.0 (stop assessment and provide a rating of <i>poor</i>)
AA is at risk of exposure to insecticides by drift. Examples are field borders and narrow strips of habitat within or immediately adjacent to cropland or orchards.	0.3
Monarchs frequenting the AA are not exposed to insecticides.	1.0
<i>User notes: Consider the timing of the pesticide application and the duration of the risk, in relation to when monarchs are in the area. Exposure includes seed treatment, direct application or drift. If V^{IR} scores as 0.0 then rate the AA as poor and stop the assessment.</i>	

V ^{HR} : Herbicide Risk Condition	Score
AA is will be treated with broad spectrum herbicides that impact forbs and milkweeds. See user notes below.	0.1
AA is treated with selective herbicides, such as 2, 4-D, that impact many forbs but not milkweeds, or is at risk of exposure by drift.	0.3
AA is not treated with herbicides.	1.0
<i>User notes when assessing herbicide risk condition:</i>	
<ul style="list-style-type: none"> ○ <i>Do not consider Individual Plant Treatments (IPT) for plants deemed undesirable for monarchs (brush, noxious weeds).</i> ○ <i>Do not consider treatments, such as NCP 314 (Brush Management) or 315 (Herbaceous Weed Control) when required for establishment of breeding or nectaring habitat.</i> ○ <i>This question relates to (non-IPT treatments and not part of weed control necessary for establishment of a rich plant community) herbicide treatments that will reduce the forb and/or milkweed component. Thus, the application occurs on a regular cycle (annually, biannually, every 5-10 years). Do not considered treated, if the application of herbicides was part of a past weed control program that has been discontinued (no treatment in recent years, or anticipated in the future).</i> 	

- c. Determine milkweed and nectar plant abundance benchmark conditions for assessment area.
- A. 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

¹¹ V is used for the term “variable”. These are variables used to calculate the final score for the assessment area.

location of the ROP's would remain based on points that best represent the assessment area, without consideration of the need in having a ROP in each subarea. *Note: If the AA is small and/or the species are very evenly distributed within the AA, then selection of a single ROP, or inventorying the entire AA would be suitable.*

- B. At each ROP, locate the direction of a 72.6-foot belt transect that would include vegetation that best represents the assessment area. Denote the location and or direction of the belt transects on the base map.
- C. Mark the start of the transect with a stake or flag, and lay out a measuring tape from this starting point.
- D. Sample vegetation along each transect using the following guidelines. *Note: There will be one data sheet for each assessment area.*

Milkweed Density (V^{MD}): Walk along one side of the transect noting the presence of *Asclepias* stems¹² emerging from the soil surface from within 3 feet of the tape (3' X 72.6'). While returning to the beginning of the vegetative transect, repeat this process on the other side of the tape (3' X 72.6'). Document the findings on the data sheet for this assessment area. *Note: "Training" the eye to accurately locate Asclepias prior to sampling is recommended. Asclepias oenotheroides can be particularly difficult to distinguish as milkweed.*

Monarch Nectaring Forb Cover (V^{FC}) and Richness (V^{FR}): Along the tape, collect monarch nectaring forb data within three 6' x 6' plots. The plots will begin at 10, 40 and 60 feet along the transect. Visually estimate the absolute percent cover¹³ of monarch nectaring forbs from the Monarch WHEG Plant List in the appendix. *Note: Count milkweeds in these nectar forb plots because they are also excellent sources of nectar for monarch butterflies.* Refer to the monarch plant identification sheets to assist with this effort if necessary. Document the findings on the data sheet.

- E. Determine milkweed abundance scores:

V ^{MD} : Average milkweed density in each transect	Score
No milkweeds stems were tallied on the transect or observed in the AA	0.1
No milkweed stems were tallied on the transect, but some were observed in the AA	0.2
0.1 – 4.0 stems	0.3
4.1 – 10 stems	0.5

¹² Stems: Milkweed species are either rhizomatous (e.g. common and swamp milkweed) or tap-rooted (most other species). When inventorying milkweed in this WHEG, a milkweed "stem" is single stem emerging from the soil I surface. Most milkweeds in the southern Great Plains are tap-rooted with multiple stems originating at or below the soil surface.). To count in this tally, the stem must originate from the soil within the belt transect.

¹³ 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.

10.1 – 20 stems	0.7
20.1 – 40 stems	0.8
> 40 stems	1.0

F. Determine monarch nectaring forb¹⁴ cover and species richness scores.

V ^{FC} (Forb Cover): Average percent monarch nectaring forb cover per plot within AA	Score
< 1%	0.1
1.0 – 4.0%	0.2
4.1 – 7.5% cover	0.6
7.6 – 10.0% cover	0.8
> 10%	1.0

V ^{FR} (Forb Richness): Total number of monarch nectaring forb species ¹⁵ used to determine percent cover in V ^{FC} .	Score
< 2	0.1
2 – 4	0.5
> 4	1.0

G. Determine Monarch Habitat Condition Score.

Apply the following formula to determine Monarch Habitat Condition Score for AA's with plant community type of *Passively Managed Pasture or Range*, *Passively Managed Hay*, *Ungrazed Grassland* or *Other*.

$$\text{Monarch Breeding Habitat Condition Score} = (V^{IR}) \frac{V^{HR} + 3V^{MD}}{4}$$

$$\text{Monarch Nectaring Habitat Condition Score} = \frac{2V^{IR} + V^{HR} + 3V^{FC} + V^{FR}}{7}$$

¹⁴ See appropriate NRCS monarch WHEG list for species to be considered.

¹⁵ The monarch WHEG list combines some species into a group. For example, goldenrods are all included into a single "species name", even though many goldenrod species may be encountered. See Appendix.

Cumulative Monarch Habitat Condition Score = Average of Monarch Breeding and Nectaring Scores.

Monarch Habitat Condition Score	Rating
0.00 - 0.25	<i>poor</i>
0.26 - 0.50	<i>fair</i>
0.50 - 0.75	<i>good</i>
0.75 – 1.00	<i>excellent</i>

STEP 4: PRESENT ALTERNATIVES AND PLANNING CONSIDERATIONS FOR EACH AA ASSESSED IN STEP 3.

- a. For all monarch plant community types consider the following alternatives and planning Considerations:

If the objective is monarch habitat, the score for either V^{IR} or V^{HB} is less than 1.0, and monarch habitat remains a resource concern then implement measures that will

“to prevent or mitigate offsite pesticide risks to plants” (milkweeds and monarch nectaring forbs) “and animals (monarch) from drift”

“to prevent or mitigate on-site pesticide risks to pollinators and other beneficial species” (monarchs) “through direct contact”

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If the objective is to provide breeding habitat and the V^{IR} is 1.0 and the V^{MD} score is:

- 0.2 or less, consider establishment of milkweed with the use of:

Conservation Cover (327), with the additional criteria to enhance wildlife, pollinator and beneficial organism habitat, and monarch breeding habitat as the target condition.

Range Planting (550), with the additional criteria “for improving forage, browse or cover for wildlife,” with the monarch being the target wildlife species.

- 0.3 to 0.5, consider implementing the following disturbances to increase milkweeds. *Note: Little is understood on management activities to increase milkweed densities specifically. The following alternatives are based on experience with other perennial forb species.*

Early Successional Habitat Management (647) on a portion (field border, strips) to potentially increase milkweed densities.

Prescribed Grazing (528), with the additional criteria to “improve or maintain food and/or cover for fish and wildlife” with the monarch being the species of concern and breeding habitat being the target habitat condition.

Prescribed Burning (338), with wildlife habitat as the purpose and monarch breeding habitat as the target condition.

- 0.7 - 1.0, and the objective is monarch breeding habitat consider the use of National Conservation Practices 315, 338, 528, 645, and 647 to maintain current conditions.

If the objective is to provide nectaring habitat and the monarch nectaring habitat score is < 0.75 , consider:

Conservation Cover (327), with the additional criteria to enhance wildlife, pollinator and beneficial organism habitat, and monarch breeding habitat as the target condition.

Early Successional Habitat Management (647) on a portion (field border, strips) to potentially increase milkweed densities.

Prescribed Burning (338), with wildlife habitat as the purpose and monarch breeding habitat as the target condition.

Range Planting (550), with the additional criteria “for improving forage, browse or cover for wildlife,” with the monarch being the target wildlife species.

If the objective is to provide nectaring habitat and the monarch nectaring habitat score is $\geq .75$, consider the use of National Conservation Practices 315, 338, 528, 645, and 647 to maintain current conditions

- b. In addition to considerations under Step 4(a), if the monarch plant community type is *Passively Managed Pasture or Range*, consider the following to raise (or maintain) the rating to *good* or *excellent*.

Prescribed Grazing (528), with the additional criteria to “improve or maintain food and/or cover for fish and wildlife” with the monarch being the species of concern and breeding habitat being the target habitat condition.

- c. In addition to considerations under Step 4(a), if the monarch plant community type is *Passively Managed Pasture or Range* or *Ungrazed Grasslands* and woody species are identified as a resource concern, consider the following:

Brush Management (314), with the objective on increasing forb abundance and/or distribution.

- d. In addition to considerations under Step 4(a), if the monarch plant community type is *Unmanaged hay*, the following is required:

Forage Harvest Management (511), with an additional purpose to “maintain and/or improve wildlife habitat.” The monarch will be the target wildlife species.

STEP 5: DETERMINE PLANNED CONDITIONS

Monarch Habitat Success Criteria: The planner should identify if the resource concern for the assessment area is breeding habitat, nectaring habitat or both. To meet the 645 standard for monarch habitat, a rating of *good* or *excellent* is required to meet national conservation practice standard Upland Wildlife Habitat Management (645). To determine planned conditions, staff will apply best professional judgement to predict future conditions (after installation of the planned conservation practice(s). If planned conditions are rated *poor* or *fair* and the monarch remains a resource concern for that AA, then the plan fails to meet a planning resource management system (RMS) (NRCS 2013). Continue the progressive planning process

STEP 6: 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 a resource concern. Provide plan implementation assistance, as needed.

STEP 7: EVALUATE PLAN

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 may be advantageous to apply this WHEG in subsequent years to continue the progressive and adaptive planning process. If applied after implementation of all the planned conservation practices, then the rating is considered an *applied monarch habitat condition rating*.

DEFINITIONS

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.

Assessment area (AA): A portion or portions 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 landuse, 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, representative observation points, transects, and 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 predicted 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 salvable or restorable.

Planned habitat condition rating (planned rating): In consideration of habitat development alternatives, the WHEG can be re-applied to predict 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 (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 (U.S. Army Corp of Engineers 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.

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