

Nationwide Monarch Butterfly Candidate Conservation Agreement for Energy and Transportation Lands

Sampling Protocols

1. Effectiveness Monitoring Tools

A. Sampling Protocols from Revised CCAA Draft

- The extent of sampling required is considered a key concern for participation in this voluntary agreement. Requiring too much sampling is expected to result in less participation, and therefore, less conservation benefit. Too little monitoring, and the Program Administrator and the Service will be unable to track and evaluate the conservation delivery obligated by Partners engaging in this agreement.
- The following protocols are intended as the baseline expectation for Partners engaging in this agreement. Each Partner will be responsible for determining how and when it is best to conduct monitoring in light of the approach detailed here.

B. Online Resources

- Online resources for milkweed and nectar plant identification can be found at:
 - [Monarch Joint Venture Publications](#)
 - [Xerces Society Nectar Plant Guides](#)
 - Local or regional universities, extension offices, herbariums, or conservation organizations.

Purpose

Biological effectiveness monitoring within the Agreement is intended to:

1. Verify that adopted acres are suitable monarch habitat and whether the objectives of the Agreement are being met.
2. Inform adaptive management, and determine whether adjustments to management may improve monarch habitat.
3. Be practical for a wide-range of partners with varying levels of available staff, and minimize the administrative burden for both the Service and Partners, and
4. Allow for flexibility and adaptability to the wide range of habitat conditions, conservation measures, and likely results that may occur across the wide geographic range included in the Agreement.

2. Effectiveness Monitoring and Compliance Reporting

Compliance reporting will include a concise summary of effectiveness monitoring conducted and any summarized results. Describe:

1. Where monitoring was conducted (including map) and, if applicable, notes regarding implementation.
2. For supplemental effectiveness monitoring, the method(s) used and a summary of lessons learned, or any results that inform future implementation.
3. Summary of results including a short narrative, plus applicable tables or figures. (e.g. confirmed improvement of suitable habitat, unexpected results, and any recommendations for future implementation or monitoring).

3. Biological Effectiveness Monitoring Expectations

Considering this, effectiveness monitoring required by this Agreement would answer two questions to verify that the adopted acres the Partner has committed to the Agreement contain suitable habitat for monarchs:

1. Are numerous milkweed stems present within the sample area? Specifically, by location:
 - a. In the Midwest and Eastern U.S., do sample areas support a milkweed density of at least 150 stems per acre (or six stems or more per sample plot)?¹, or
 - b. If in the Western and Southern U.S., do sample areas support a milkweed density of at least 60 stems per acre (or two stems or more per sample plot)?, or
2. Are potentially flowering nectar plants present across more than 10 percent of the sample area?

To be considered suitable habitat in the Midwest and Eastern United States (see states previously noted), the sample plot must have six milkweed stems or a minimum of 10 percent cover of potentially flowering nectar plants. For all other states in the Western or Southern U.S., either presence of two or more milkweed stems, or the minimum of 10 percent cover of potentially flowering nectar plants, during the time sampled within the growing season.

For the first question, the specific question posed by monitoring is based on the geographic context of the adopted acres and the corresponding sample plot location. Conservation measures provided in Midwestern and eastern states are anticipated to support milkweed stem densities of 150 stems/acre, based on the “biologically reasonable” milkweed stem density expected for rights-of-way in the Midwest by experts consulted by Thogmartin et al. (2017, Supplement 3).

For the second question, we defined “potentially flowering nectar plants” as all flowering plants that can provide nectar for monarchs at some point throughout the growing season. The plants do not have to be in flower at the time of monitoring. We considered 10 percent to be a minimum cover of nectar plants that would facilitate monarch conservation and that we could reasonably expect to be present across the diverse array of potential habitats that may occur on adopted acres – for example, from open grasslands to desert scrub.

4. Monitoring Requirements

The following protocols are intended as the minimum expectation for Partners engaging in this Agreement, and we encourage additional monitoring effort by defining scalable adaptive management triggers, defining protocols that can be integrated in other established monitoring efforts, and offering incentives as explained in supplemental conservation measures (Section 6.4). Each Partner will be responsible for determining how and when it is best to conduct monitoring in light of the approach detailed here.

• Surveyor Experience and Background

Effectiveness monitoring surveys are intended to be quickly and efficiently conducted by Partner personnel working in the area as part of other job duties, where possible. The methods included are simplified and intended to be completed by any individual with a basic understanding of this protocol, the ability to properly identify milkweed (of any species applicable to their region), and the ability to identify the difference between potentially flowering nectar plants and other forms of non-nectaring vegetation, such as grasses or sedges.

The minimum monitoring protocol is intended to be completed by individuals with minimal training. Surveyors

¹ Because the sample plots cover 1,500 square feet, six milkweed stems per plot would indicate a density of 174 milkweed stems per acre.

with species-level identification skills and abilities may choose to conduct more robust monitoring protocols as part of their supplemental monitoring.

- **Timing Required**

Effectiveness monitoring is intended to describe the cumulative result of conservation measures on adopted acres. Sampling can be conducted during the growing season, and ideally during seasons where monarchs are on the landscape, on the appropriate subset of plots within the adopted acres. The Partner should consider the habitat response to conservation measures. If conducting monitoring in areas actively managed, Partners may either conduct monitoring prior to implementing conservation measures (if sustaining suitable habitat) or postpone effectiveness monitoring to an appropriate time following implementation.

5. Sampling Methods

The following sampling guidelines are from the CCAA/CCA. For additional background on monitoring and sampling, we recommend [Measuring and Monitoring Plant Populations](#) by Elzinga et al. BLM Technical Reference 1730-1. This guidance provides an overview of random selection of sites, transects, estimating cover, and other important monitoring considerations.

- **Sample Plot Location and Size**

Plot locations will be randomly or systematic-randomly selected by the Partner prior to the time of survey. Plot locations occur in sites or management areas and are distributed to ensure geographic dispersion of sample plots to represent the entirety of a Partners' enrolled lands. It is the Partner's responsibility to determine how to distribute and randomize plot locations. Randomization of plots is intended to remove bias in the selection of plot locations prior to sampling in the field as explained in the following protocol.

When planning distribution of sample plots, Partners must consider several key decision factors:

1. Location and size of the site managed by conservation measures. If implementation of conservation measures occurred over a large area, several sample points may be necessary to characterize the vegetative response and effectiveness.
2. Type of conservation measures implemented. Most Partners will likely implement more than one conservation measure. Ensure that sampling is conducted in at least one location of each conservation measure implemented annually.
3. Geographic extent. Partners are expected to select sample sites across the full geographic extent where conservation measures are implemented. Plots should not be limited to a small portion of the Partners operating region, within a single project, or otherwise not distributed throughout the extent where conservation measures are being implemented.

Sample plots expected for effectiveness monitoring will consist of a plot 1,500 square feet (sf) in size, sampled as either a 150 feet x 10 feet wide transect, or a 22-foot radius circle. This plot size aligns with other current monarch habitat monitoring protocols, including methodologies developed by Monarch Joint Venture and UIC's Rights-of-Way as Habitat Working Group that are recommended as supplemental monitoring (Caldwell and Cariveau pers. comm. 2018). Both the Monarch Joint Venture's Roadside Habitat for Monarchs Evaluation Tool (Monarch Joint Venture 2019b) and UIC's Rights-of-Way as Habitat Working Group Pollinator Habitat Scorecard (UIC 2019) use milkweed and potentially flowering nectar plant cover as part of their protocols. This overlap allows Partners to incorporate these more robust monitoring protocols, if they wish.

The following monitoring protocols are adapted from the Monarch Joint Venture's Roadside Habitat for

Monarchs assessment protocol for roadsides (NCHRP; Monarch Joint Venture 2019b). This protocol was modified so that it would apply across transportation and energy lands of varying size and configuration. We further modified it to ensure that it would yield information necessary for effectiveness and compliance monitoring in this Agreement.

1. Select Location of Sample Plots. Partners develop a basis to distribute sample plots across their adopted acres to ensure geographic dispersion (see considerations noted above) and then randomly select locations of sample plots in an amount corresponding to the minimum required (Table 14-4). For example, a DOT could choose to put a certain number of sample plots in each DOT region. It would then select precise plot locations within each region randomly, prior to field visits. That is, first select the strata (e.g., the adopted acres in a DOT region) and then use a method to select plot locations within each stratum where each location is equally likely to be selected.
 - With advance planning, Partners can conduct monitoring when other site visits or maintenance checks are scheduled. This allows for efficiencies in monitoring, and engaging and training staff in monarch conservation who may not be aware of the project otherwise. This may require coordination between personnel responsible for implementing the Agreement and individuals conducting work in the field.
 - Random selection of sample plot locations within adopted acres can include, but is not limited to, GIS random point generation, pre-determined random intervals along a corridor, or another method that allow for selecting plot locations randomly prior to being in the field. The Partner's approach(es) to random sample plot selection will be described within their implementation plan.
2. Define Sample Plot Boundaries. Observers locate the previously selected plot location. Once at that location, the sample plot boundary should oriented in a direction parallel to the orientation of the corridor or area sampled. Once identified, the observer should mark their starting location (the randomly selected point) and then walk a 150 foot (45.7 m) length parallel to the direction of the corridor or area sampled. For example, along a road, sample habitat walking parallel to the road heading in a direction facing traffic, along the length of the survey area, focusing only on a 10-foot width of ground along the transect, making a rectangular study area. If using the 22-foot radius circular plot option, determine the boundary of the plot radius by measuring the radius of the plot using the pre-identified plot location as a foci from which to measure the radius. Regardless of plot shape, before assessment, observers should stretch out a measuring tape to find out how many steps it takes to walk 150 ft (for rectangular plots), or 22 ft (for circular plots).; once calibrated, observers can pace this distance for future assessments.
 - Consider assessing multiple plots or transects to characterize large or variable areas. If sampling a long, linear area such as a roadside, or a gas pipeline corridor, or a large non-linear parcel, observers can either survey a single plot in a randomly selected location, or sample several locations for an overall averaged result. If sampling several locations to acquire an average result, we recommend sampling approximately every 3/10th of a mile (1640 feet or 500 meters) until the end of the area is reached. Then average the results among the samples. That would yield data pooled from the multiple samples for a single sample plot location. Depending on the type of habitat encountered, greater or fewer stops may be needed to give the observer a good characterization of the area. Some areas may contain variations in large and small patches of habitat, and their interspersions. The sampling can be repeated at intervals systematically throughout the area of interest.
3. Observe Habitat and Record Data. Observers walk through the sample plot, zig-zagging back and forth and

recording data. The goal is to see the plants throughout the defined sample plot; observers may choose the best way to move through the area to achieve a confident visual characterization of the plot. At a minimum, required fields in Table 14-2 are recorded for each sample plot. When determining whether to collect optional data, Partners should consider the associated adaptive management thresholds.

While not required, we encourage Partners to take photographs of the plot at the time of sampling to document conditions observed. Partners may choose to submit photographs as part of their annual reporting. The Program Administrator may also request photos as additional documentation of monitoring conducted.

4. Apply Adaptive Management (As Warranted).

- If Partners are characterizing adopted acres using the required data fields in Table 14-2 (presence vs. absence metrics), adaptive management is triggered when 10% of monitoring plots demonstrate a lack of adequate milkweed and nectar plant cover. When this happens, Partners will evaluate the success of the management measures on the site and make management adjustments to achieve habitat targets.
- If Partners are characterizing adopted acres using the optional vegetative data fields in Table 14-2 (milkweed stem counts, and percent cover of potentially flowering nectar plants), adaptive management is triggered when the 90% confidence interval is below the criteria for milkweed stem density and percent cover of potentially flowering nectar plant species.

Note that if few survey plots are used (e.g. 10), variability in the data may be more likely to trigger adaptive management. Partners may voluntarily choose to increase their number of samples to minimize the chances of triggering the threshold. For example, in the first approach above, adaptive management would be triggered if one of 10 survey plots demonstrated a lack of adequate milkweed and nectar plants, but not if 1 of 11 plots did.

• **Sampling Frequency**

The frequency of sampling (i.e., minimum number of sample plots requiring sampling annually) corresponds to the extent of the adopted acres, which is defined for each Partner based on their minimum required adoption rate and the extent of their enrolled lands. Partners reporting adopted acres above their minimum target are not required to monitor additional points above the minimum threshold associated with their adopted acres target. For example, if a Partner is required to adopt at least 20,000 acres, but voluntarily adopts and carries out conservation measures on an additional 15,000 acres – for a total of 35,000 adopted acres – it would only be required to carry out habitat monitoring for the original target of 20,000 acres, or 30 sites.

We intend for sampling to characterize areas where conservation measures are applied, facilitate adaptive management actions where they are needed to meet the objectives of the Agreement, and to be readily accomplished by rights-of-way and land managers. These land managers are also tasked with implementation of conservation measures and covered activities while also sustaining operations of their infrastructure. The sampling effort described in Table 14-4 reflects a balance between adequate monitoring of the Agreement's benefits to the monarch and input on feasibility from Partners received during its development.

Table 14-4 from the Agreement. Sampling Frequency Expected for Biological Effectiveness Monitoring

Estimated Adopted Acres	Anticipated No. of Annual Samples
Fewer than 1,000	10
1,001 to 10,000	30
10,001 to 30,000	50
30,001 to 60,000	70
60,001 or more	70, plus one additional point for each 1,000 acres exceeding 60,001 adopted acres.

As an example of the cumulative monitoring conducted under this Agreement, assuming that at least 30 Partners potentially participate in this Agreement, the required minimum sampling effort would yield data from at least 2,100 sample plots each year.