

Monarch Conservation Database Web Application Quick Reference MCD Version 1.1.2 04/02/2020

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Monarch Conservation Database Field Definitions

Plan Fields

Plan Details

- Name: provide a name for the plan
 - This is an open text field
 - **This is a required field**
 - The plan name must be unique
- Author: indicate the organization or the organization of the individual who authored the plan
 - This is a drop down menu
 - **This is a required field**
 - Different author organization can be selected using the drop down menu
 - If you do not see your organization please email FW3_monarchconservation@fws.gov.
 - If you are not a part of a particular group or organization, select “Private Individual”
- Start/End Date: indicate the date on which the plan became or will become effective and the date on which the plan expired or will expire
 - These are date fields with the format MO/DA/YEAR
- Type: indicate the plan type
 - This is a [drop down menu](#)
 - If “Other”, please provide additional details in the Notes section
- Has this plan been finalized: indicate if the plan has been finalized by a federal agency, state or local government, tribal government, business, organization or individual
 - This is a yes/no field
 - **This is a required field**
- Have all of the efforts associated with the plan been completed or implemented: indicate if all of the efforts associated with the plan have been completed or at least implemented
 - This is a yes/no field
 - **This is a required field**
 - If the answer is “No”, users must answer the Policy for Evaluating Conservation Effort (PECE) implementation questions below
- State(s): indicate which the state(s) to which the plan applies
 - This is a drop down menu/multiple check box; more than one state may be selected
- County(ies): indicate which county(ies) to which the plan applies
 - This is a drop down menu/multiple check box; more than one county may be selected
- Notes: provide any additional information about that plan that may be useful or as requested in other questions in the form
 - This is an open text box

Policy for Evaluating Conservation Effort (Implementation)

- Resources available: are the resources (e.g. staffing, funding, etc.) necessary to implement the conservation effort available?
 - This is a yes/no field
 - **This field is required fields IF the answer to “Have all efforts associated with the plan been completed or implemented” is “No”**
- Legal Authority: is there the legal authority to implement the conservation effort?
 - This is a yes/no field
 - **This field is required fields IF the answer to “Have all efforts associated with the plan been completed or implemented” is “No”**
- Procedural Requirements: have the applicable legal procedural requirements (e.g. environmental reviews) necessary for implementation of the effort been addressed?
 - This is a yes/no field
 - **This field is required fields IF the answer to “Have all efforts associated with the plan been completed or implemented” is “No”**
- Authorizations: have the applicable authorizations (e.g. permits, landowner permissions) necessary to implement the conservation effort been obtained?
 - This is a yes/no field
 - **This field is required fields IF the answer to “Have all efforts associated with the plan been completed or implemented” is “No”**
- Participation: is the necessary level of voluntary participation identified, and is there a high level of certainty the plan will obtain that level of voluntary participation?
 - This is a yes/no field
 - **This field is required fields IF the answer to “Have all efforts associated with the plan been completed or implemented” is “No”**
- Regulatory: are there regulatory mechanisms in place to allow for implementation of the conservation effort?
 - This is a yes/no field
 - **This field is required fields IF the answer to “Have all efforts associated with the plan been completed or implemented” is “No”**
- Funding: is there a high level of certainty that the party(ies) to the agreement or plan that will implement the conservation effort will obtain the necessary funding?
 - This is a yes/no field
 - **This field is required fields IF the answer to “Have all efforts associated with the plan been completed or implemented” is “No”**
- Implementation: is an implementation schedule (including incremental completion dates) for the conservation effort provided?
 - This is a yes/no field
 - **This field is required fields IF the answer to “Have all efforts associated with the plan been completed or implemented” is “No”**

- Agreements: have all parties involved in implementation of the conservation effort approved of this conservation plan?
 - This is a yes/no field
 - **This field is required fields *IF* the answer to “Have all efforts associated with the plan been completed or implemented” is “No”**

Effort Fields

Site Details

- Site (Location) Name: provide a name for the site of the conservation effort
 - This is an open text box
 - **This is a required field**
 - The site name should be unique
- Organization leading the Conservation Effort Implementation: choose the organization primarily responsible for implementing the effort
 - This is a drop down menu/text box
 - **This is a required field**
 - Different organizations can be selected using the drop down menu
 - If you do not see your organization please email FW3_monarchconservation@fws.gov
 - If you are not a part of a particular group or organization, select “Private Individual”
- Collaborators: indicate organization(s) that are collaborators on the effort
 - This is a multiple check box
 - More than one organization can be identified as a collaborator
 - Adding organizations as collaborators will allow other registered users that are associated with that organization to be able to view (but not edit) the details of your effort record
- IMMP Site Label: indicate the Integrated Monarch Monitoring Program site label if applicable and known
 - This is an open text box
 - The Integrated Monarch Monitoring Program is a national initiative to monitor monarch populations and habitat throughout the breeding range. For more information, of if you are interested in participating in the IMMP, please email monarchs@monarchjointventure.org, or visit <https://monarchjointventure.org/get-involved/mcsp-monitoring>.
- Plans: indicate which plan(s) the effort(s) is being implemented under if applicable
 - This is a drop down menu/search box
 - Plans can be selected by using the drop down menu or searched for by typing the plan name (if known) directly into the text box

Site Location Details

- Land Use Baseline: indicate the land use at the site before the activity was implemented
 - This is a [drop down menu](#)
 - Please refer to the [land use type definitions](#) for guidance and use best judgement when selecting
 - **This is a required field**
- Land Use After Effort: indicate the land use at the site after activity implementation
 - This is a [drop down menu](#)
 - Please refer to the [land use type definitions](#) for guidance and use best judgement when selecting
 - **This is a required field IF the land use will change as a result of implementation of the effort**
- Acres: indicate the footprint of the project site (i.e. the area over which the activity is being implemented) in acres
 - This is an open text box
 - If providing a shapefile, this field will be auto-populated
 - **This is a required field**
 - Multiple patches of land may be combined into one site **IF**
 - all patches have the same land use type (or dominant land use type) and the same activities are implemented on all patches **AND**
 - the activities at the site have the same implementation status
 - activities that have a status of “not yet implemented”, “implemented”, or “completed for less than 3 years”, they are considered future activities and can be combined
 - activities that have a status of “completed for more than 3 years”, they are considered current activities and can be combined
 - current and future activities cannot be combined
- Land Ownership: indicate if the site under private or public ownership
 - This is a [drop down menu](#)

Site Location Spatial

- State: indicate the State(s) in which site is located
 - This is a drop down menu/multiple check box; more than one state may be selected
 - If providing a shapefile, this field will be auto-populated
 - **This is a required field**
- County: indicate the County(ies) in which the site is located
 - This is a drop down menu
 - Multiple counties may be associated with the site, but counties must be added one at a time
 - If all counties in a state need to be selected, please select “All” from the drop down menu
 - If providing a shapefile, this field will be auto-populated

- **This is a required field**

Conservation Activities

- Habitat Management Goal: indicate the overarching habitat management goal or objective of the activity
 - This is a [drop down menu](#)
 - **This is a required field**
- Sub-activity: provide additional details about the activity performed
 - This is a [drop down menu/multiple check box](#); more than one sub-activities may be selected
 - **This is a required field**
- Affected Acres: indicate over how many acres the activity was implemented if different from the overall site acreage
 - This is an open text box
- Implementing Organization: indicate the organization primarily responsible for implementing the activity if different from the organization of the record owner
 - This is a drop down menu
 - Different organizations can be selected using the drop down menu
 - If you do not see the organization please email FW3_monarchconservation@fws.gov
- Status: indicate whether the activity is completed for more than 3 years, completed for less than 3 years, implemented (but not yet completed), or not yet implemented
 - This is a [drop down menu](#)
 - **This is a required field**
- Start Date: indicated the date on which implementation of the activity began or will begin
 - This is a date fields with the format MO/DA/YEAR
 - **This is a required field**
- End Date: indicate the date on which implementation of the activity ended or will end (this does NOT include maintenance and monitoring)
 - This is a date fields with the format MO/DA/YEAR
- Target Species: indicate the primary reason for implementing the activity
 - This is a [drop down menu](#)

Conservation Gains

- Milkweed Protocol: indicate the protocol used to measure milkweed metrics
 - This is a [drop down menu](#)
 - If the protocol used is not available, please provide additional details in the notes section
- Milkweed Baseline Survey Date: indicate the date on which baseline(i.e. before effort implementation) milkweed metrics were measured
 - This is a date fields with the format MO/DA/YEAR

- Post Effort Milkweed Survey Date: indicate the date on which post effort (i.e. after effort implementation) milkweed metrics were measured
 - This is a date fields with the format MO/DA/YEAR
- Milkweed Baseline Density: indicate the milkweed density in stems per acre before the activity(ies) was implemented
 - This is an open text box
 - **This is a required field; if you do not have the time or resources to measure baseline milkweed density at the site or you have a new site where the milkweed has not yet established itself, you may leave this field blanks and FWS biologists will populate this field with estimates provided in the “All Hands on Deck Publication” by Thogmartin et al., 2017 during data analysis.**
 - **Estimated baseline milkweed density for each land use type from Thogmartin et al., 2017 can be found in [Threats and Activities Table](#) of this document; FWS biologists will use the baseline land use type for the site to determine the estimated baseline milkweed density from the Estimated Baseline Milkweed Density column**
 - **Example: if the baseline land use type at the site was “Grassland (NLCD)”, the corresponding estimated baseline milkweed density from Thogmartin et al., 2017 is 3.09 stems per acre**
- Milkweed Post Effort Density: indicate the milkweed density in stems per acre after the activity(ies) was implemented
 - This is an open text box
 - **This is a required field; if you do not have the time or resources to measure post effort milkweed density at the site or you have a new site where the milkweed has not yet established itself, you may leave this field blank and FWS biologists will populate this field with estimates provided in the “All Hands on Deck Publication” by Thogmartin et al., 2017 during data analysis.**
 - **Estimated post effort milkweed density for each land use type from Thogmartin et al., 2017 can be found in [Threats and Activities Table](#) of this document; FWS biologists will use the post effort land use type for the site to determine the estimated post effort milkweed density from the Potential/Amended Milkweed Density column**
 - **Example: if the post effort land use type at the site was “Grassland (NLCD)”, the corresponding estimated potential or amended milkweed density from Thogmartin et al., 2017 is 40 stems per acre**
- Milkweed Baseline Diversity: indicate the number of species observed before implementation of the activity(ies)
 - This is an open text box
- Milkweed Post Effort Diversity: indicate the number of species observed after implementation of the activity(ies)

- This is an open text box
- Was one milkweed species dominant (i.e. >80% proportional abundance) during the baseline survey: indicate if one species is dominant (i.e. accounts for >80% of species observed) before implementation of the activity(ies)
 - This is a yes/no field
- Was one milkweed species dominant (i.e. >80% proportional abundance) during the post effort survey: indicate if one species is dominant (i.e. accounts for >80% of species observed) after implementation of the activity(ies)
 - This is a yes/no field
- Blooming Nectar Plant Protocol: indicate the protocol used to measure blooming nectar plant metrics
 - This is a [drop down menu](#)
 - If the protocol used is not available, please provide additional details in the notes section
- Blooming Nectar Plant Baseline Date: indicate the date on which baseline(i.e. before effort implementation) blooming nectar plant metrics were measured
 - This is a date fields with the format MO/DA/YEAR
- Blooming Nectar Plant Post Effort Date: indicate the date on which post effort (i.e. after effort implementation) blooming nectar plant metrics were measured
 - This is a date fields with the format MO/DA/YEAR
- Blooming Nectar Plant Baseline Frequency 0.25m Plot: indicate the percent of 0.25m plots with blooming nectar plants before implementation of the activity(ies)
 - This is an open text box
- Blooming Nectar Plant Post Effort Frequency 0.25m Plot: indicate the percent of 0.25m plots with blooming nectar plants after implementation of the activity(ies)
 - This is an open text box
- Blooming Nectar Plant Baseline Frequency 0.5m Plot: indicate the percent of 0.5m plots with blooming nectar plants before implementation of the activity(ies)
 - This is an open text box
- Blooming Nectar Plant Post Effort Frequency 0.5m Plot: indicate the percent of 0.5m plots with blooming nectar plants after implementation of the activity(ies)
 - This is an open text box
- Blooming Nectar Plant Baseline Frequency 1.0m Plot: indicate the percent of 1.0m plots with blooming nectar plants before implementation of the activity(ies)
 - This is an open text box
- Blooming Nectar Plant Post Effort Frequency 1.0m Plot: indicate the percent of 1.0m plots with blooming nectar plants after implementation of the activity(ies)
 - This is an open text box
- Blooming Nectar Plant Baseline Density: indicate the number of blooming nectar plants per meter² before implementation of the activity(ies)
 - This is an alternate field to blooming nectar plant frequency

- This is an open text box
- Blooming Nectar Plant Post Effort Density: indicate the number of blooming nectar plants per meter² after implementation of the activity(ies)
 - This is an alternate field to blooming nectar plant frequency
 - This is an open text box
- Blooming Nectar Plant Baseline Richness: indicate the number of blooming nectar plant species observed before implementation of the activity(ies)
 - This is an open text box
- Blooming Nectar Plant Post Effort Richness: indicate the number of blooming nectar plant species observed after implementation of the activity(ies)
 - This is an open text box

Policy for Evaluating Conservation Efforts (Effectiveness)

- Our initial approach was to evaluate any conservation effort that has not been completed for more than 3 years, been implemented but not completed, or not yet been implemented against the Policy for Evaluating Conservation Efforts (PECE). The PECE policy provides criteria to determine whether conservation efforts will be effective and whether conservation efforts not yet implemented will be implemented and effective. We have since determined that, due to the required fields in the MCD, all conservation efforts in the MCD associated with a specific sub-activity are effective. As a result, we will only be evaluating efforts that are attached to a plan and have not yet been implemented for the certainty of implementation, which are assessed through the effort's associated plan (see "[Plan Fields](#)"). Please note that you may still be prompted to answer PECE effectiveness questions for your efforts based on the information you provide, but to reiterate, you may ignore the PECE questions for conservation efforts.

Drop Down Menu Domains

Plan Drop Down Menu Field Domains

Plan Types

- Mitigation (Regulatory)
- Mitigation (Non-regulatory/Volunteer)
- Site Specific (Regulatory)
- Site Specific (Non-regulatory/Volunteer)
- City/Metro (Regulatory)
- City/Metro (Non-regulatory/Volunteer)
- County (Regulatory)
- County (Non-regulatory/Volunteer)
- State (Regulatory)
- State (Non-regulatory/Volunteer)
- Regional (Regulatory)
- Regional (Non-regulatory/Volunteer)
- National (Regulatory)
- National (Non-regulatory/Volunteer)
- Candidate Conservation Agreement
- Candidate Conservation Agreement w/Assurances
- Habitat Conservation Plan
- Natural Community Conservation Plan
- Other (Please Describe in Notes)

Effort Drop Down Menu Field Domains

Landowner Type

- Private
- Public
- Mixed

Land Use Classification

- (see [Threats and Activities Table](#))
- (see [Land Use Type Definitions](#))

Activity Type

- (see [Threats and Activities Table](#))

Sub-activity Type

- (see [Threats and Activities Table](#))
- (see [Sub-activity Definitions](#))

Status

- Not yet implemented
- Implemented (but not completed)
- Completed within 3 years
- Completed for more than 3 years

Target Taxon

- Monarchs
- Pollinators
- General Wildlife Habitat
- General Resource Management
- Other (Please specify in Notes)

Milkweed Survey Protocol

- Integrated Monarch Monitoring Program
- Environmental Defense Fund Habitat Quantification Tool Protocol
- Rights-of-Way as Habitat Working Group Protocol
- Other (Please specify in Notes)

Blooming Nectar Plant Survey Protocol

- Integrated Monarch Monitoring Program
- Environmental Defense Fund Habitat Quantification Tool Protocol
- Rights-of-Way as Habitat Working Group Protocol
- Other (Please specify in Notes)

Threats and Activities Table

General Land Use Classification	Land Use Classification (Thogmartin et al. 2017)	Estimated Baseline Milkweed Density (Thogmartin et al., 2017)	Potential/Amended Milkweed Density (Thogmartin et al., 2017)	Habitat Management Goal/Activity	Management Sub-activity
Developed	22 - Developed Low Intensity (NLCD) (Inside Urban Areas)	1.00	50.00	Increase Milkweed to Enhance Habitat and Nectar Resources	Conservation Mowing
	23 - Developed Med Intensity (NLCD)	0.50	25.00		Early Successional Habitat Development/Management
	24 - Developed High Intensity (NLCD)	0.10	10.00		Establish Field Border
	26 - Developed Low Intensity (NLCD) (Outside Urban Areas)	19.74	84.50		Herbicide Treatment to Enhance
	21 - Developed Open Space (NLCD) Linear	0.00	16.31		Planting
	25 - Developed Open Space (NLCD) Core	0.00	3.09		Prescribed Burning
					Other (Please specify in Notes)
				Increase Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Conservation Mowing
					Early Successional Habitat Development/Management
					Establish Field Border
					Herbicide Treatment to Enhance
				Planting	
				Prescribed Burning	
				Other (Please specify in Notes)	
				Increase Milkweed and Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Conservation Mowing
					Early Successional Habitat Development/Management
					Establish Field Border
					Herbicide Treatment to Enhance
				Planting	
				Prescribed Burning	
			Other (Please specify in Notes)		
			Mitigate Negative Impacts of Herbicide Use on Habitat and Nectar Resources	Implement EPA Guidance	
				Implement FWS Pollinator Guidance	
				Implement NRCS Integrated Pest Management	
			Implement Other Best Management Practice (Please Specify in Notes)		
			Mitigate Negative Impacts of Insecticide use on Habitat Quality	Implement EPA Guidance	
				Implement FWS Pollinator Guidance	
				Implement NRCS Integrated Pest Management	
			Implement Other Best Management Practice (Please Specify in Notes)		
Roads	120 - TIGER Secondary Roads	57.15	175.00	Increase Milkweed to Enhance Habitat and Nectar Resources	Conservation Grazing
	110 - TIGER Primary Roads and Ramps	57.15	150.00		Conservation Mowing
	140 - TIGER Local Roads	57.15	100.00		Early Successional Habitat Development/Management
	174 - TIGER Private Roads	3.09	3.09		Establish Field Border
	180 - All TIGER Roads (Inside Urban Areas)	0.00	0.00		Herbicide Treatment to Enhance
					Implement Integrated Vegetation Management
				Planting	
				Prescribed Burning	
				Other (Please specify in Notes)	
			Increase Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Conservation Grazing	
				Conservation Mowing	

General Land Use Classification	Land Use Classification (Thogmartin et al. 2017)	Estimated Baseline Milkweed Density (Thogmartin et al., 2017)	Potential/Amended Milkweed Density (Thogmartin et al., 2017)	Habitat Management Goal/Activity	Management Sub-activity
					Early Successional Habitat Development/Management
					Establish Field Border
					Herbicide Treatment to Enhance
					Implement Integrated Vegetation Management
					Planting
					Prescribed Burning
					Other (Please specify in Notes)
					Conservation Grazing
					Conservation Mowing
					Early Successional Habitat Development/Management
					Establish Field Border
					Herbicide Treatment to Enhance
					Implement Integrated Vegetation Management
					Planting
					Prescribed Burning
					Other (Please specify in Notes)
				Mitigate Negative Impacts of Mowing on Habitat and Nectar Resources	Conservation Mowing
					Other (Please specify in Notes)
				Mitigate Negative Impacts of Herbicide Use on Habitat and Nectar Resources	Implement EPA Guidance
					Implement FWS Pollinator Guidance
					Implement NRCS Integrated Pest Management
					Implement Other Best Management Practice (Please Specify in Notes)
Barren	31 - Barren (NLCD)	0.00	0.00	Increase Milkweed to Enhance Habitat and Nectar Resources	Early Successional Habitat Development/Management
					Planting
					Other (Please specify in Notes)
				Increase Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Early Successional Habitat Development/Management
					Planting
					Other (Please specify in Notes)
				Increase Milkweed and Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Early Successional Habitat Development/Management
					Planting
					Other (Please specify in Notes)
Forest	41 - Deciduous Forest (NLCD)	0.00	0.00	Increase Milkweed to Enhance Habitat and Nectar Resources	Brush Management
	42 - Evergreen Forest (NLCD)	0.00	0.00		Conservation Grazing
	43 - Mixed Forest (NLCD)	0.00	0.00		Early Successional Habitat Development/Management
					Establish Field Border
					Establish Riparian Herbaceous Cover
					Open Canopy
					Planting
					Prescribed Burning
					Range Planting
					Other (Please specify in Notes)
			Increase Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Brush Management	
				Conservation Grazing	
				Early Successional Habitat Development/Management	
				Establish Field Border	
				Establish Riparian Herbaceous Cover	
				Open Canopy	
				Planting	

General Land Use Classification	Land Use Classification (Thogmartin et al. 2017)	Estimated Baseline Milkweed Density (Thogmartin et al., 2017)	Potential/Amended Milkweed Density (Thogmartin et al., 2017)	Habitat Management Goal/Activity	Management Sub-activity	
				Increase Milkweed and Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Prescribed Burning	
					Range Planting	
					Other (Please specify in Notes)	
					Brush Management	
					Conservation Grazing	
					Early Successional Habitat Development/Management	
					Establish Field Border	
					Establish Riparian Herbaceous Cover	
					Open Canopy	
					Planting	
					Prescribed Burning	
					Range Planting	
					Other (Please specify in Notes)	
					Land Purchase	
	Grassland	76 - Grassland (NLCD)	3.09		40.00	Implement Land Protection to Prevent Loss of Habitat and Nectar Resources
77 - Grassland (NLCD) PADUS Protected		3.09	250.00	Other (Please specify in Notes)		
				Implement EPA Guidance		
				Implement FWS Pollinator Guidance		
				Implement NRCS Integrated Pest Management		
				Implement Other Best Management Practice (Please Specify in Notes)		
				Mitigate Negative Impacts of Insecticide use on Habitat Quality	Brush Management	
					Conservation Cover	
					Conservation Grazing	
					Conservation Mowing	
					Early Successional Habitat Development/Management	
					Establish Field Border	
					Establish Riparian Herbaceous Cover	
					Forage Harvest Management	
					Herbicide Treatment to Enhance	
			Native Grassland Management			
			Planting			
			Prescribed Burning			
			Range Planting			
			Other (Please specify in Notes)			
			Increase Blooming Nectar Plants to Enhance Habitat and Nectar Resources		Brush Management	
				Conservation Cover		
				Conservation Grazing		
				Conservation Mowing		
				Early Successional Habitat Development/Management		
				Establish Field Border		
				Establish Riparian Herbaceous Cover		
				Forage Harvest Management		
				Herbicide Treatment to Enhance		
				Native Grassland Management		
				Planting		
				Prescribed Burning		
				Range Planting		

General Land Use Classification	Land Use Classification (Thogmartin et al. 2017)	Estimated Baseline Milkweed Density (Thogmartin et al., 2017)	Potential/Amended Milkweed Density (Thogmartin et al., 2017)	Habitat Management Goal/Activity	Management Sub-activity	
				Increase Milkweed and Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Other (Please specify in Notes)	
					Brush Management	
					Conservation Cover	
					Conservation Grazing	
					Conservation Mowing	
					Early Successional Habitat Development/Management	
					Establish Field Border	
					Establish Riparian Herbaceous Cover	
					Forage Harvest Management	
					Herbicide Treatment to Enhance	
					Native Grassland Management	
					Planting	
					Prescribed Burning	
					Range Planting	
					Other (Please specify in Notes)	
			Mitigate Negative Impacts of Grazing on Habitat and Nectar Resources	Conservation Grazing		
				Other (Please specify in Notes)		
			Mitigate Negative Impacts of Mowing on Habitat and Nectar Resources	Conservation Mowing		
				Other (Please specify in Notes)		
			Mitigate Negative Impacts of Improper Fire Regime on Habitat and Nectar Resources	Prescribed Burning		
				Other (Please specify in Notes)		
			Implement Land Protection to Prevent Loss of Habitat and Nectar Resources	Land Purchase		
				Protect as Easement		
				Other (Please specify in Notes)		
Transmission Line ROW	100 - HSIP Transmission Line (Outside Urban Areas)	3.09	150.00	Increase Milkweed to Enhance Habitat and Nectar Resources	Brush Management	
	101 - HSIP Transmission Line (Inside Urban Areas)	0.00	0.00		Conservation Grazing	
					Conservation Mowing	
					Designate as Conservation Area	
					Early Successional Habitat Development/Management	
					Establish Field Border	
					Herbicide Treatment to Enhance	
					Implement Integrated Vegetation Management	
					Planting	
					Prescribed Burning	
					Other (Please specify in Notes)	
					Increase Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Brush Management
						Conservation Grazing
						Conservation Mowing
						Designate as Conservation Area
			Early Successional Habitat Development/Management			
			Establish Field Border			
			Herbicide Treatment to Enhance			
			Implement Integrated Vegetation Management			
			Planting			
			Prescribed Burning			
			Other (Please specify in Notes)			
				Brush Management		

General Land Use Classification	Land Use Classification (Thogmartin et al. 2017)	Estimated Baseline Milkweed Density (Thogmartin et al., 2017)	Potential/Amended Milkweed Density (Thogmartin et al., 2017)	Habitat Management Goal/Activity	Management Sub-activity	
				Increase Milkweed and Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Conservation Grazing	
					Conservation Mowing	
					Designate as Conservation Area	
					Early Successional Habitat Development/Management	
					Establish Field Border	
					Herbicide Treatment to Enhance	
					Implement Integrated Vegetation Management	
					Planting	
					Prescribed Burning	
					Other (Please specify in Notes)	
					Mitigate Negative Impacts of Herbicide Use on Habitat and Nectar Resources	Implement EPA Guidance
						Implement FWS Pollinator Guidance
			Implement NRCS Integrated Pest Management			
			Mitigate Negative Impacts of Mowing on Habitat and Nectar Resources	Implement Other Best Management Practice (Please Specify in Notes)		
				Conservation Mowing		
				Other (Please specify in Notes)		
Rail Line ROW	200 - TIGER Rails (Outside Urban Areas)	3.09	200.00	Increase Milkweed to Enhance Habitat and Nectar Resources	Brush Management	
	201 - TIGER Rails (Inside Urban Areas)	0.00	0.00		Conservation Grazing	
					Conservation Mowing	
					Early Successional Habitat Development/Management	
					Establish Field Border	
					Herbicide Treatment to Enhance	
					Implement Integrated Vegetation Management	
					Planting	
					Prescribed Burning	
					Other (Please specify in Notes)	
				Increase Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Brush Management	
					Conservation Grazing	
					Conservation Mowing	
					Early Successional Habitat Development/Management	
					Establish Field Border	
					Herbicide Treatment to Enhance	
					Implement Integrated Vegetation Management	
				Increase Milkweed and Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Planting	
					Prescribed Burning	
					Other (Please specify in Notes)	
			Brush Management			
			Conservation Grazing			
			Conservation Mowing			
			Early Successional Habitat Development/Management			
			Establish Field Border			
			Herbicide Treatment to Enhance			
			Implement Integrated Vegetation Management			
			Planting			
			Prescribed Burning			
			Other (Please specify in Notes)			
			Implement EPA Guidance			

General Land Use Classification	Land Use Classification (Thogmartin et al. 2017)	Estimated Baseline Milkweed Density (Thogmartin et al., 2017)	Potential/Amended Milkweed Density (Thogmartin et al., 2017)	Habitat Management Goal/Activity	Management Sub-activity
				Mitigate Negative Impacts of Herbicide Use on Habitat and Nectar Resources	Implement FWS Pollinator Guidance
					Implement NRCS Integrated Pest Management
				Mitigate Negative Impacts of Mowing on Habitat and Nectar Resources	Implement Other Best Management Practice (Please Specify in Notes)
					Conservation Mowing
				Other (Please specify in Notes)	
Shrubland	52 - Shrubland (NLCD)	3.09	3.09	Increase Milkweed to Enhance Habitat and Nectar Resources	Brush Management
					Conservation Cover
					Conservation Grazing
					Conservation Mowing
					Early Successional Habitat Development/Management
					Establish Field Border
					Establish Riparian Herbaceous Cover
					Forage Harvest Management
					Herbicide Treatment to Enhance
					Planting
					Prescribed Burning
					Range Planting
				Other (Please specify in Notes)	
				Increase Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Brush Management
					Conservation Cover
					Conservation Grazing
					Conservation Mowing
					Early Successional Habitat Development/Management
					Establish Field Border
					Establish Riparian Herbaceous Cover
					Forage Harvest Management
					Herbicide Treatment to Enhance
					Planting
					Prescribed Burning
					Range Planting
				Other (Please specify in Notes)	
				Increase Milkweed and Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Brush Management
					Conservation Cover
			Conservation Grazing		
			Conservation Mowing		
			Early Successional Habitat Development/Management		
			Establish Field Border		
			Establish Riparian Herbaceous Cover		
			Forage Harvest Management		
			Herbicide Treatment to Enhance		
			Planting		
			Prescribed Burning		
			Range Planting		
			Other (Please specify in Notes)		
			Mitigate Negative Impacts of Grazing on Habitat and Nectar Resources	Conservation Grazing	
				Other (Please specify in Notes)	
			Mitigate Negative Impacts of Mowing on Habitat and Nectar Resources	Conservation Mowing	
				Other (Please specify in Notes)	

General Land Use Classification	Land Use Classification (Thogmartin et al. 2017)	Estimated Baseline Milkweed Density (Thogmartin et al., 2017)	Potential/Amended Milkweed Density (Thogmartin et al., 2017)	Habitat Management Goal/Activity	Management Sub-activity
				Mitigate Negative Impacts of Improper Fire Regime on Habitat and Nectar Resources	Prescribed Burning Other (Please specify in Notes)
				Implement Land Protection to Prevent Loss of Habitat and Nectar Resources	Land Purchase Protect as Easement Other (Please specify in Notes)
Cropland	1 - Corn LOW	0.05	4.04	Increase Milkweed to Enhance Habitat and Nectar Resources	Brush Management
	14 - Soybeans LOW	0.05	4.04		Conservation Cover
	3 - Other Crops (CDL) LOW	3.09	5.56		Conservation Grazing
	4 - Other Crops (CDL) MEDIUM	5.30	7.74		Early Successional Habitat Development/Management
	5 - Other Crops (CDL) HIGH	7.50	9.93		Enroll in CRP and Implement Qualifying CP
	6 - Fallow Idle (CDL) HIGH	3.09	4.05		Enroll in CSP and Implement Qualifying CP
	7 - Fruit Xmas Trees Vines (CDL) LOW	3.09	5.56		Enroll in EQIP and Implement Qualifying CP
	8 - Fruit Xmas Trees Vines (CDL) MEDIUM	5.30	7.74		Enroll in WRE and Implement Qualifying CP
	9 - Fruit Xmas Trees Vines (CDL) HIGH	7.50	9.93		Establish Field Border
	2 - Corn LOW (Marginal)	0.05	200.00		Establish Riparian Herbaceous Cover
	15 - Soybeans LOW (Marginal)	0.05	200.00	Forage Harvest Management	
				Herbicide Treatment to Enhance	
				Planting	
				Prescribed Burning	
				Range Planting	
				Strip Disking/Tillage to Enhance	
				Other (Please specify in Notes)	
				Increase Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Brush Management
					Conservation Cover
					Conservation Grazing
			Early Successional Habitat Development/Management		
			Enroll in CRP and Implement Qualifying CP		
			Enroll in CSP and Implement Qualifying CP		
			Enroll in EQIP and Implement Qualifying CP		
			Enroll in WRE and Implement Qualifying CP		
			Establish Field Border		
			Establish Riparian Herbaceous Cover		
			Forage Harvest Management		
			Herbicide Treatment to Enhance		
			Planting		
			Prescribed Burning		
			Range Planting		
			Strip Disking/Tillage to Enhance		
			Other (Please specify in Notes)		
			Increase Milkweed and Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Brush Management	
				Conservation Cover	
				Conservation Grazing	
				Early Successional Habitat Development/Management	
			Enroll in CRP and Implement Qualifying CP		
			Enroll in CSP and Implement Qualifying CP		
			Enroll in EQIP and Implement Qualifying CP		

General Land Use Classification	Land Use Classification (Thogmartin et al. 2017)	Estimated Baseline Milkweed Density (Thogmartin et al., 2017)	Potential/Amended Milkweed Density (Thogmartin et al., 2017)	Habitat Management Goal/Activity	Management Sub-activity	
					Enroll in WRE and Implement Qualifying CP	
					Establish Field Border	
					Establish Riparian Herbaceous Cover	
					Forage Harvest Management	
					Herbicide Treatment to Enhance	
					Planting	
					Prescribed Burning	
					Range Planting	
					Strip Disking/Tillage to Enhance	
					Other (Please specify in Notes)	
					Mitigate Negative Impacts of Herbicide Use on Habitat and Nectar Resources	Implement EPA Guidance
						Implement FWS Pollinator Guidance
						Implement NRCS Integrated Pest Management
					Mitigate Negative Impacts of Insecticide use on Habitat Quality	Implement EPA Guidance
			Implement FWS Pollinator Guidance			
			Implement NRCS Integrated Pest Management			
			Mitigate Negative Impacts of Haying on Habitat and Nectar Resources	Implement Other Best Management Practice (Please Specify in Notes)		
				Implement EPA Guidance		
				Implement FWS Pollinator Guidance		
				Implement NRCS Integrated Pest Management		
				Implement Other Best Management Practice (Please Specify in Notes)		
				Implement Pollinator Appropriate Haying Plan		
				Other (Please specify in Notes)		
Hay/Pasture	10 - Hay Alfalfa (CDL) LOW	3.09	40.00		Brush Management	
	78 - Pasture (NLCD)	3.09	40.00		Conservation Cover	
	79 - Pasture (NLCD) PADUS Protected	3.09	126.55		Conservation Grazing	
					Conservation Mowing	
					Early Successional Habitat Development/Management	
					Enroll in CRP and Implement Qualifying CP	
					Enroll in CSP and Implement Qualifying CP	
					Enroll in EQIP and Implement Qualifying CP	
					Enroll in WRE and Implement Qualifying CP	
					Establish Field Border	
					Establish Riparian Herbaceous Cover	
					Forage Harvest Management	
					Herbicide Treatment to Enhance	
					Planting	
					Prescribed Burning	
					Range Planting	
					Strip Disking/Tillage to Enhance	
					Other (Please specify in Notes)	
					Increase Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Brush Management
						Conservation Cover
			Conservation Grazing			
			Conservation Mowing			
			Early Successional Habitat Development/Management			
			Enroll in CRP and Implement Qualifying CP			
			Enroll in CSP and Implement Qualifying CP			
			Enroll in EQIP and Implement Qualifying CP			
			Enroll in WRE and Implement Qualifying CP			

General Land Use Classification	Land Use Classification (Thogmartin et al. 2017)	Estimated Baseline Milkweed Density (Thogmartin et al., 2017)	Potential/Amended Milkweed Density (Thogmartin et al., 2017)	Habitat Management Goal/Activity	Management Sub-activity	
					Establish Field Border	
					Establish Riparian Herbaceous Cover	
					Forage Harvest Management	
					Herbicide Treatment to Enhance	
					Planting	
					Prescribed Burning	
					Range Planting	
					Strip Disking/Tillage to Enhance	
					Other (Please specify in Notes)	
					Brush Management	
					Conservation Cover	
					Conservation Grazing	
					Conservation Mowing	
					Early Successional Habitat Development/Management	
					Enroll in CRP and Implement Qualifying CP	
					Enroll in CSP and Implement Qualifying CP	
					Enroll in EQIP and Implement Qualifying CP	
					Enroll in WRE and Implement Qualifying CP	
				Increase Milkweed and Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Establish Field Border	
					Establish Riparian Herbaceous Cover	
					Forage Harvest Management	
					Herbicide Treatment to Enhance	
					Planting	
					Prescribed Burning	
					Range Planting	
					Strip Disking/Tillage to Enhance	
					Other (Please specify in Notes)	
					Mitigate Negative Impacts of Herbicide Use on Habitat and Nectar Resources	Implement EPA Guidance
						Implement FWS Pollinator Guidance
						Implement NRCS Integrated Pest Management
					Implement Other Best Management Practice (Please Specify in Notes)	
					Implement EPA Guidance	
				Mitigate Negative Impacts of Insecticide use on Habitat Quality	Implement FWS Pollinator Guidance	
					Implement NRCS Integrated Pest Management	
					Implement Other Best Management Practice (Please Specify in Notes)	
				Implement Pollinator Mowing Plan to Prevent Loss of Habitat and Nectar Resources	Conservation Mowing	
					Other (Please specify in Notes)	
				Implement Pollinator Grazing Plan to Prevent Loss of Habitat and Nectar Resources	Conservation Grazing	
					Other (Please specify in Notes)	
				Implement Pollinator Haying Plan to Prevent Loss of Habitat and Nectar Resources	Implement Pollinator Appropriate Haying Plan	
					Other (Please specify in Notes)	
Wetlands	95 - Herbaceous Wetlands (NLCD)	61.37	68.16	Increase Milkweed to Enhance Habitat and Nectar Resources	Conservation Mowing	
	90 - Woody Wetlands (NLCD)	61.37	68.16		Drawdown	
					Early Successional Habitat Development/Management	
					Enroll in WRE and Implement Qualifying CP	
					Establish Riparian Herbaceous Cover	
				Herbicide Treatment to Enhance		
				Planting		

General Land Use Classification	Land Use Classification (Thogmartin et al. 2017)	Estimated Baseline Milkweed Density (Thogmartin et al., 2017)	Potential/Amended Milkweed Density (Thogmartin et al., 2017)	Habitat Management Goal/Activity	Management Sub-activity
				Increase Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Prescribed Burning
					Other (Please specify in Notes)
					Conservation Mowing
					Drawdown
					Early Successional Habitat Development/Management
					Enroll in WRE and Implement Qualifying CP
					Establish Riparian Herbaceous Cover
					Herbicide Treatment to Enhance
					Planting
					Prescribed Burning
				Other (Please specify in Notes)	
				Increase Milkweed and Blooming Nectar Plants to Enhance Habitat and Nectar Resources	Conservation Mowing
					Drawdown
					Early Successional Habitat Development/Management
					Enroll in WRE and Implement Qualifying CP
					Establish Riparian Herbaceous Cover
					Herbicide Treatment to Enhance
					Planting
					Prescribed Burning
					Other (Please specify in Notes)
Other (Please specify in Notes)					
Unspecified	Unspecified				

Land Use Type Definitions

Land use types refer to those used in Thogmartin et al., 2017 and are derived from a number of datasets, including Cropland Data Layer (CDL), National Land Cover Dataset (NLCD), Topologically Integrated Geographic Encoding and Referencing (TIGER), and Homeland Security Infrastructure Program (HSIP).

- The majority of the agricultural land use types were derived from the Cropland Data Layer. Designations of “LOW,” “MEDIUM,” or “HIGH” indicate the relative amenability or potential for milkweed introduction. Corn and soybean fields within the CDL were further divided as “marginal” according to their Crop Productivity Index as defined in the 2012 National Commodity Crop Productivity Index distributed by the Soil Survey Geographic Database (https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/?cid=nrcs142p2_053627). See Appendix 3 of the Monarch Conservation Plan User’s Manual (https://www.umesc.usgs.gov/management/dss/monarch/desktop_monarch_conservation_planning_tools.html) for the following definitions:
 - 1 - Corn LOW
 - 2 - Corn LOW (Marginal)
 - 3 - Other Crops (CDL) LOW
 - 4 - Other Crops (CDL) MEDIUM
 - 5 - Other Crops (CDL) HIGH
 - 6 - Fallow Idle (CDL) HIGH
 - 7 - Fruit Xmas Trees Vines (CDL) LOW
 - 8 - Fruit Xmas Trees Vines (CDL) MEDIUM
 - 9 - Fruit Xmas Trees Vines (CDL) HIGH
 - 10 - Hay Alfalfa (CDL) LOW
 - 14 - Soybeans LOW
 - 15 - Soybeans LOW (Marginal)
- The definitions of the developed land use types are from the National Land Cover Dataset (<https://www.mrlc.gov/nlcd2011.php>) but are divided into certain categories (i.e. linear, core, within urban, outside urban) by processing the Cropland Data Layer. (https://www.nass.usda.gov/Research_and_Science/Cropland/SARS1a.php).
 - 21 - Developed Open Space (NLCD) Linear: areas at the edge of open space with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. A process was implemented to identify linear, single-cell width areas of developed open space.
 - 22 - Developed Low Intensity (NLCD) (Inside Urban Areas): areas within urban and suburban landscapes with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% percent of total cover.
 - 23 - Developed Med Intensity (NLCD): areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover.

- 24 - Developed High Intensity (NLCD): highly developed areas where people reside or work in high numbers. Impervious surfaces account for 80% to 100% of the total cover.
- 25 - Developed Open Space (NLCD) Core: areas on the interior of open space with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. A process was implemented to identify linear, single-cell width areas of developed open space. Those remaining areas of developed open space area were defined as “core”.
- 26 - Developed Low Intensity (NLCD) (Outside Urban Areas): areas at the edge of urban and suburban landscapes with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% percent of total cover.
- The definition of the following land use types are from the National Land Cover Dataset (<https://www.mrlc.gov/nlcd2011.php>):
 - 31 - Barren (NLCD): areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.
 - 41 - Deciduous Forest (NLCD): areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change.
 - 42 - Evergreen Forest (NLCD): areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.
 - 43 - Mixed Forest (NLCD): areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75% of total tree cover.
 - 52 - Shrubland (NLCD): areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.
 - 76 - Grassland (NLCD): areas dominated by graminoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.
 - 77 - Grassland (NLCD) PADUS Protected: areas that are under conservation protection per the Protected Areas Database (<https://gapanalysis.usgs.gov/padus/>) and dominated by graminoid or herbaceous vegetation, generally greater than 80% of total vegetation.
 - 78 - Pasture (NLCD): areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation.
 - 79 - Pasture (NLCD) PADUS Protected: areas of grasses, legumes, or grass-legume mixtures that are under conservation protection per the Protected Areas Database (<https://gapanalysis.usgs.gov/padus/>). Pasture/hay vegetation accounts for greater than 20% of total vegetation.

- 90 - Woody Wetlands (NLCD): areas where forest or shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
- 95 - Herbaceous Wetlands (NLCD): areas where perennial herbaceous vegetation accounts for greater than 80% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
- Transmission line data is from the Homeland Security Infrastructure Program (<https://www.dhs.gov/infrastructure-information-partnerships>) and is defined as electric power transmission lines
 - 100 - HSIP Transmission Line (Outside Urban Areas)
 - 101 - HSIP Transmission Line (Inside Urban Areas)
- Road and rail data are U.S. Census Bureau Topologically Integrated Geographic Encoding and Referencing (TIGER) products (<https://www.census.gov/geo/maps-data/data/tiger.html>)
 - 110 - TIGER Primary Roads and Ramps: primary roads are generally divided, limited-access highways within the interstate highway system or under state management, and are distinguished by the presence of interchanges. These highways are accessible by ramps and may include some toll highways. A ramp is a road that allows controlled access from adjacent roads onto a limited access highway, often in the form of a cloverleaf interchange. These roads are unaddressable.
 - 120 - TIGER Secondary Roads: secondary roads are main arteries, usually in the U.S. Highway, State Highway or County Highway system. These roads have one or more lanes of traffic in each direction, may or may not be divided, and usually have at-grade intersections with many other roads and driveways. They often have both a local name and a route number.
 - 140 - TIGER Local Roads: generally a paved non-arterial street, road, or byway that usually has a single lane of traffic in each direction. Roads in this feature class may be privately or publicly maintained. Scenic park roads would be included in this feature class, as would (depending on the region of the country) some unpaved roads.
 - 174 - TIGER Private Roads: a road within private property that is privately maintained for service, extractive, or other purposes. These roads are often unnamed.
 - 180 - All TIGER Roads (Inside Urban Areas): roads within urban (see: Developed High Intensity) areas
 - 200 - TIGER Rails (Outside Urban Areas): rail road lines outside urban (see: Developed High Intensity) areas
 - 201 - TIGER Rails (Inside Urban Areas): rail road lines within urban (see: Developed High Intensity) areas
- Unspecified: please only use the “unspecified” option if a dominant land use type cannot be reasonably determined

Sub-activity Definitions

- Brush Management (Natural Resources Conservation Service Practice 314): management or removal of woody (non-herbaceous or succulent) plants including those that are invasive and noxious to create, enhance, or restore monarch habitat
- Conservation Cover (Natural Resource Conservation Service Practice 528): establishing and maintaining permanent vegetative cover to create, enhance, or restore monarch habitat
- Conservation Grazing (Natural Resources Conservation Service Practice 528): controlled harvest of vegetation with grazing animals to create, enhance, or restore monarch habitat
- Conservation Mowing: mowing to create, enhance, or restore monarch habitat
- Designate as Conservation Area: protecting and preserving a parcel or parcels of utility rights-of-way as habitat to create, enhance, or restore monarch habitat
- Drawdown: management of water levels in a man-made reservoir to create, enhance, or restore monarch habitat
- Early Successional Habitat Development/Management (Natural Resources Conservation Service Practice 647): manage plant succession to develop and maintain early successional habitat to benefit desired wildlife and/or natural communities
- Enroll in CRP and Implement Qualifying CP: enroll land in the Farm Service Agency's Conservation Reserve program qualifying conservation practices (see supplemental materials for qualifying practices: <http://iopscience.iop.org/article/10.1088/1748-9326/aa7637>)
- Enroll in CSP and Implement Qualifying CP: enroll in the Natural Resource Conservation Service's Conservation Stewardship Program and implement qualifying core conservation practice outlined in Table 1 of the 2016 Monarch Butterfly Conference Report (<https://www.fws.gov/savethemonarch/pdfs/MonarchConferenceReport2016.pdf>)
- Enroll in EQIP and Implement Qualifying CP: enroll in the Natural Resource Conservation Service's Environmental Quality Incentives Program and implement qualifying core conservation practice outlined in Table 1 of the 2016 Monarch Butterfly Conference Report (<https://www.fws.gov/savethemonarch/pdfs/MonarchConferenceReport2016.pdf>)
- Enroll in WRE and Implement Qualifying CP: enroll in the Natural Resource Conservation Service's Wetlands Reserve Easement program and implement qualifying core conservation practice outlined in Table 1 of the 2016 Monarch Butterfly Conference Report (<https://www.fws.gov/savethemonarch/pdfs/MonarchConferenceReport2016.pdf>)
- Establish Field Border (Natural Resources Conservation Service Conservation Practice 386): a strip of permanent vegetation established at the edge or around the perimeter of a field to create, enhance, or restore monarch habitat
- Establish Riparian Herbaceous Cover (Natural Resources Conservation Service Practice 390): grasses, sedges, rushes, ferns, legumes and forbs tolerant of intermittent flooding or saturated soils, established or managed as the dominant vegetation in the transitional zone between upland and aquatic habitats to create, enhance, or restore monarch habitat
- Forage Harvest Management (Natural Resources Conservation Service Practice 511): timely cutting and removal of forages from the field as hay, green-chop or ensilage to create, enhance, or restore monarch habitat

- Herbicide Treatment to Enhance: use of chemical herbicides to prepare the site for habitat creation, enhancement or restoration; using herbicides to control undesirable vegetation
- Implement EPA Guidance: implement U.S. Environmental Protection Agency guidance to reduce pesticide exposure to non-target wildlife and/or plants (for example, see <https://www.epa.gov/pollinator-protection/2013-summit-reducing-exposure-dust-treated-seed>)
- Implement FWS Pollinator Guidance: implementing methods from U.S. Fish and Wildlife Service guidance to reduce pesticide exposure to non-target wildlife and/or plants (see <https://www.fws.gov/pollinators/>)
- Implement Integrated Vegetation Management: use of biological, chemical, cultural, manual, mechanical or controlled burning techniques in utility rights-of-ways to create, enhance, or restore monarch habitat
- Implement NRCS Integrated Pest Management: implementing Natural Resource Conservation Service published methods to reduce pesticide exposure to non-target wildlife and/or plants (for example, see <https://directives.sc.egov.usda.gov/opennonwebcontent.aspx?content=34828.wba>)
- Implement Pollinator Appropriate Haying Plan: conduct haying in a way that creates, enhances, or restores monarch habitat
- Land Purchase: buying a parcel or parcels of land to prevent and protect from loss of habitat
- Native Grassland Management: managing and maintaining the site as native grassland
- Open Canopy: reducing tree canopy density to allow light to reach the understory and promote the establishment and growth of monarch habitat (i.e. milkweed and other blooming nectar plants)
- Planting:
 - Blooming nectar plants
 - Demonstration gardens
 - Educational gardens
 - Milkweed
 - Native grasses
 - Plants
 - Plugs
 - Pollinator gardens
 - Seeds
 - Urban gardens
- Prescribed Burning (Natural Resources Conservation Service Practice 338): application of a controlled fire to a predetermined area of land to create, enhance, or restore monarch habitat
- Protect as Easement: protecting a parcel or parcels of land by preserving as habitat
- Range Planting (Natural Resources conservation Service Practice 550): establishment of adapted perennial or self-sustaining vegetation such as grasses, forbs, legumes, shrubs and trees to create, enhance, or restore monarch habitat

- Strip Disking/Tillage to Enhance: strip disking and/or tilling the soil at the site to create, enhance, or restore monarch habitat

Literature Cited

Thogmartin, W.E., L. Lopez-Hoffman, J. Rohweder, J. Diffendorfer, R. Drum, D. Semmens, S. Black, I. Caldwell, D. Cotter, P. Drobney, L.L. Jackson, M. Gale, D. Helmers, S. Hilburger, E. Howard, K. Oberhauser, J. Pleasants, B. Semmens, O. Taylor, P. Ward, J.F. Weltzin, and R. Wiederholt. 2017. Restoring monarch butterfly habitat in the Midwestern US: 'all hands on deck'. *Environmental Research Letters*, Volume 12, Number 7.
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