

2019

Monarch Conservation Implementation Plan



Prepared by the Monarch Joint Venture
staff and partner organizations.

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Executive Summary

It will take widespread collaboration between all sectors to reach our nation's monarch conservation targets and preserve the monarch migration for generations to come. The Monarch Conservation Implementation Plan (The Implementation Plan) serves as a guiding document for ongoing or new conservation actions, and may serve to inform other funding sources in an effort to coordinate monarch conservation efforts throughout the U.S. This plan is intended for any individual or entity to use to identify and integrate monarch conservation actions into existing or planned efforts.

The Implementation Plan was derived from the North American Monarch Conservation Plan (CEC 2008), and is updated annually by the Monarch Joint Venture (MJV): a national conservation partnership of more than 80 entities working together to conserve the monarch migration. As a national coordinating body, the MJV will help identify opportunities for collaboration and support and guide conservation actions carried out by various conservation stakeholders.

North American Monarch Conservation Plan objectives include:

1. Threats, Prevention, Control and Mitigation
2. Innovative Enabling Approaches
3. Research, Monitoring, Evaluation and Reporting
4. Education, Outreach, and Capacity Building

The Implementation Plan supports the above objectives by identifying and prioritizing monarch conservation actions in the United States, in collaboration with Canada and Mexico, and promoting cooperation between diverse organizations in the U.S. to effectively and efficiently achieve those actions. The strategies and actions were contributed, prioritized, and reviewed by representatives from MJV partner organizations and other stakeholders, including members of the [Mid-America Monarch Conservation Strategy](#). MJV personnel synthesized the final plan. If you have any questions or comments regarding the plan, please [contact the MJV](#).

The MJV is excited to be a part of a rapidly growing conservation movement. A 2014 Presidential Memorandum includes provisions specifically for monarch butterflies. In 2015, the U.S. government published a *Federal Strategy to Promote the Health of Honey Bees and Other Pollinators* that affirmed the commitment of federal agencies to monarch conservation. In addition, the U.S. Fish and Wildlife Service has completed a [Species Status Assessment](#) to inform their upcoming decision (projected in June 2019) about whether or not the species warrants listing under Endangered Species Act. These developments continue to drive monarch conservation efforts forward by engaging broader interest and participation in order to recover both the eastern and western North American monarch populations.

Monarch conservation is growing as a part of larger pollinator conservation movement. Monarchs are a flagship species for pollinator, grassland, wildlife and environmental conservation. Efforts to create, restore, or enhance monarch habitat will benefit a suite of other organisms and issues. Their charisma provides an opportunity to engage a broad and diverse set of stakeholders in conservation on a large scale.

Researchers, non-governmental organizations, academic institutions, and agencies have collaborated under the [Monarch Conservation Science Partnership](#) (MCSP) to identify targets for monarch conservation. The goal for the eastern monarch population is to **reach and maintain** an area of 6 hectares of forest in Mexico occupied by overwintering monarchs by 2020. In the 2018-2019 overwintering season, [a population size of 6.05 hectares was recorded](#). The large population is an encouraging sign for monarchs, and an inspiration for monarch conservation partners to continue this work together. Good weather conditions during the breeding season likely supported the increase, as well as efforts across North America to protect and restore habitats. However, monarchs cannot rely on persistent good growing-seasons to sustain them into the future. Collective efforts to establish, maintain and protect

high quality habitat for monarchs are critically important, and must continue. If a population size of over 6 hectares were maintained, the eastern monarch population would be at a substantially lower risk of declining to a point at which recovery would be unlikely (Semmens et al. 2016).

Western monarchs, which overwinter in forested groves along California's Pacific coast, are at an even greater risk of extinction than the eastern population. In the winter of 2018-2019, less than [1% of the historic population size remained](#). The Xerces Society (along with a coalition of researchers and conservation partners) set a short-term goal to stabilize the western monarch population this year to ensure it can rebound from devastatingly low numbers.

Habitat restoration and conservation is a primary means of reaching our monarch population goals. In the east, the central flyway of the U.S. has been identified as a high priority for habitat restoration efforts, including the addition of at least [1.3 to 1.8 billion milkweed stems](#) and abundant nectar resources to support monarch reproduction and migration (Thogmartin and Diffendorfer et al. 2017). In the west, the [Western Monarch Call to Action](#) identified the following priority actions for recovering the western population: 1) protect and manage California overwintering sites; 2) restore breeding and migratory habitat in California; 3) protect monarchs and their habitat from pesticides; 4) protect, manage, and restore summer breeding and fall migration monarch habitat outside of California; and 5) answer key research questions about how to best aid western monarch recovery. Research, monitoring, education, and partnership building are also important aspects contributing to a nationally coordinated approach at achieving these targets.

Plan Priorities

The priority areas identified in this plan include:

1. Monarch habitat conservation on public and private lands, including enhancement and improved management of milkweed and nectar resources throughout the monarch range, and conservation of western overwintering sites.
2. Education and outreach to increase interest, awareness, and engagement in monarch conservation.
3. Research on and monitoring of monarchs and their habitats to inform conservation work.
4. Building partnerships and collaboration to advance monarch conservation across the United States.



Monarch Habitat Conservation, Maintenance and Enhancement

There is strong evidence that the primary threat to monarchs in the eastern U.S. is widespread loss of breeding habitat (Pleasants and Oberhauser 2012, Pleasants 2015), which includes milkweed host plants (primarily plants of the genus *Asclepias*). Additional research shows eastern monarchs face threats on their migration as well (Kantola et al. 2019, Tracy et al. 2019). For both the eastern and western populations, the preservation, restoration and enhancement of both breeding and migratory habitats are critical; these habitats contains both native milkweeds and nectar plants.

In the eastern range, the North Central region (i.e. "Corn Belt") and the South Central region have been emphasized as important areas for monarch reproduction and migration. The Corn Belt region has historically produced a high percentage of the monarchs that migrate to the overwintering grounds in Mexico each fall (Wassenaar and Hobson 1998, Oberhauser et al. 2001), and the South Central region plays a significant role in supporting both the spring and fall migrations (Miller et al. 2012, Flockhart et al. 2013, Flockhart et al. 2017). However, studies have concluded that we need an approach that engages "all hands" and "all regions" to most effectively support the eastern population (Oberhauser et al. 2017, Flockhart et al. 2017, Thogmartin et al. 2017).

In the western U.S., conservation strategies focus on the protection, management, and identifying, protecting, and enhancing breeding and migration habitat, and migratory pathways. The Central Valley and foothills in California, but also other areas, ([Western Monarch Milkweed Mapper Habitat Suitability Models](#)) have been prioritized as important breeding areas for monarchs, and an area which habitat restoration and conservation is essential. There is some interchange between eastern and western populations (Morris et al, 2015) but amount of interaction between populations is currently unknown.

Education to Enhance Awareness of Monarch Conservation Issues and Opportunities

The monarch migration is one of the most magnificent of all natural phenomena. Many different issues are connected to monarch conservation, ranging from wildlife conservation to land productivity, and from water quality to human health and learning. Therefore, monarchs are an excellent flagship species for conservation. Monarchs inspire people to engage in conservation by creating, restoring, and managing habitat beneficial to a wide variety of organisms and issues.

Education and outreach are necessary for successful conservation. We must communicate clear, consistent and science-based information promoting collective action to restore and manage habitat for monarchs and other pollinators as widely, effectively and accessibly as possible. Raising awareness and educating stakeholders about monarchs, their importance, and ways to get involved, are essential for engaging all hands on deck to reach our conservation goals.

Research and Monitoring to Inform Monarch Conservation Efforts

Research and monitoring helps us understand many aspects of monarch conservation, including biology, population trends and habitat quality and availability. The MCSP is a consortium of scientists and conservation professionals from government, academia and NGOs formed in 2014 to better understand threats to monarch populations at the landscape level, model population trends, and develop conservation tools.

The MCSP designed the Integrated Monarch Monitoring Program (IMMP) to monitor monarch butterflies and their habitats nationally to inform conservation at all scales. MJV leads implementation of the IMMP, supporting engagement of conservation partners at a variety of levels, tailored to each partner. IMMP monitoring can also assess effectiveness of conservation practices and inform future work. The MJV also leads citizen science involvement in the IMMP. Citizen scientists have contributed greatly to our understanding of monarch biology and ecology, and they continue to be a driving force in monarch conservation today. These volunteers, young and old, not only help researchers and conservationists understand monarch populations and habitat distribution; they become invested in the conservation of monarchs beyond their monitoring activities (Lewandowski and Oberhauser, 2016).

Partnerships and collaboration to advance monarch conservation

Engaging partners across the monarch breeding and migratory range is critical to supporting overall recovery. To reach our nation's ambitious targets, commitment from a diverse set of stakeholders is required. It is important to recruit, educate, and inspire a broad spectrum of individuals and entities across North America to take action. Highlighting that monarch conservation will have cascading benefits is an important way to get 'All Hands on Deck' for monarchs.

Integrating partnership building and collaboration into each of the above priorities is necessary in order for habitat conservation, education and outreach, and research and monitoring efforts to be successful and maintained long-term. Collaborative work promotes efficiency, reduces redundancy, and provides opportunities to bring in stakeholders that do not focus specifically on monarchs, but on the other species and issues connected to monarch conservation.

To facilitate a coordinated and collaborative approach to monarch conservation across the U.S., the MJV engages partners through planning and networking, fostering collaboration, establishing priorities, and disseminating information. Partners are key agents, actively engaging in monarch conservation work aligned with the priorities of the Implementation Plan, sharing information freely, seeking out and leveraging existing resources, and promoting and building up the work of partners.

Monarch Joint Venture Mission and Vision

Recognizing that North American monarch (*Danaus plexippus*) conservation is a responsibility of Mexico, Canada and the United States, as identified in the North American Monarch Conservation Plan (CEC 2008), this Joint Venture will work throughout the U.S. to conserve and protect monarch populations and their migratory phenomena by implementing science-based habitat conservation and restoration measures in collaboration with multiple stakeholders.

We will achieve our mission by coordinating and facilitating partnerships and communications in the U.S. and North America to deliver a combination of habitat conservation, education, and research and monitoring.

The vision of this Joint Venture is that abundant monarch populations that will exist for future generations to enjoy. More broadly, we believe in promoting monarchs as a flagship species whose conservation will sustain habitats for pollinators and other plants and animals.

2019 Monarch Conservation Implementation Plan

Priority Ranking Considerations: The actions outlined in this plan are **all** important for monarch conservation. While we recognize that individual or organizational priorities vary, MJV sub-committees and staff have assigned priority rankings with input from the partnership. For actions pertaining to the **western monarch population**, actions were prioritized based on their importance for western monarch conservation only; eastern or nationally relevant actions were ranked separately. Ranking levels are explained below:

- **Sustain:** Rankings with Sustain indicate that this action is underway and should continue.
- **High:** Actions with great potential to be implemented, to be highly successful, and to have a strong impact on monarch population numbers.
- **Med:** Actions ranked as medium priority are expected to have lower impacts on population numbers than those ranked a high priority.
- **Low:** If actions are well underway with appropriate resources and there is no or minimal need for long-term maintenance, the action was given a low priority. In addition, low priority was given to actions for which the importance is unknown or that have relatively low effect on population numbers.

Intended Audience: This plan is intended for use by any individual or entity implementing or funding monarch conservation activities (including, but not exclusive to, MJV partners) as a guiding document for the most important U.S. monarch conservation actions.

Considerations for listed resources or projects: This plan is a living document that is updated annually, and as additional resources, research, or other relevant details are presented. The resources column is not comprehensive at this time. If you would like to submit details to be considered for adding to the plan, please [contact MJV](#).

Considerations for geographic scope of the plan: Recognizing that three North American countries— Canada, Mexico and the U.S. — are responsible for different elements of monarch conservation, this plan focuses on actions that are to be conducted in the U.S., or for which the U.S. plays some role.

Other considerations: The letters preceding the strategies (H, E, R, and P) refer to the priorities they fall into. These include Habitat (H), Education (E), Research (R), and Partnerships (P). **Habitat** for monarchs, whenever mentioned in the plan, refers to areas that include *both* milkweed and nectar sources. The use of **habitat** also implies use by monarchs, other pollinators, and other wildlife throughout the document.

Priority 1: Monarch Habitat Conservation, Maintenance and Enhancement

Objective 1: Create, restore, enhance, and maintain habitat on public and private lands.

Strategy	Actions	Ranking	Resources
H-1: Provide resources to assist land managers in developing restoring, enhancing and managing habitat	a) Provide regionally appropriate guidance for prioritizing and obtaining milkweed and nectar plant seeds and plugs.	High	<ul style="list-style-type: none"> • CDFA Healthy Soils Program • CEC: Monarch Conservation Toolbox • Field Museum Urban Monarch Conservation Tools • MJV: <ul style="list-style-type: none"> ○ Breeding Habitat Assessment Tool ○ Downloads and Links: Habitat Management section includes BMPs and other habitat guides ○ Webinar: Designing Seed Mixes for Native Habitat ○ Webinar: Enhancing existing landscapes for monarchs and native pollinators ○ Webinar: Habitat Restoration Fundamentals ○ Webinar: Meadow Establishment in the East ○ Webinar: The Three Pillars of Habitat Management • NRCS: <ul style="list-style-type: none"> ○ NRCS Cost Share Programs ○ Monarch Habitat Development Project • NWF (and other partners): How to plan a statewide monarch conservation summit • P2: <ul style="list-style-type: none"> ○ Ecoregional Planting Guides ○ Monarch Habitat Development Manuals ○ Webinars - Monarch Habitat Creation & Management Series • Prairie Resto: Guidelines for Establishing a Prairie • TPC: Prairie Reconstruction Tech Guides Series #6-10
	b) Disseminate regional technical habitat development guidelines for different habitat types online and through targeted training for different audiences. (see E-9)	High	
	c) Provide regional guidelines on management techniques for enhancing and maintaining existing habitat areas.	High	
	d) Integrate monarch efforts with other species conservation efforts to broaden impact. Encourage managers to take into consideration broad conservation goals for each project. (See E-2)	High	
	e) Identify practitioner audiences that are unaware of existing resources and share with them. (See E-1, E-2)	High	
	f) Test or ground-truth recommended BMPs to make sure they are realistic or appropriate for the recommended landscapes. Use this to improve guidance how to apply BMPs in targeted land use sectors.	High	
	g) Expand financial resources available for habitat establishment and maintenance. Identify monarchs as a high priority species within conservation strategies, and leverage funding connections to other species and issues. (See E-2, P-1)	High	

			<ul style="list-style-type: none"> University of Minnesota, USGS: Effects of Grazing versus Fire for Prairie Management USFWS: Partners for Fish and Wildlife Program WAFWA: Western Monarch Butterfly Conservation Plan 2019-2069 Xerces: <ul style="list-style-type: none"> Managing for Monarchs in the West Milkweed Seed Finder Monarch Nectar Plant Guides Planting and Establishing Native Milkweed in California Pollinators in Natural Areas Pollinator Habitat Installation Guides Pollinator Resource Center Xerces and EPRI: Conservation Actions for Electric Power Companies to Support Monarchs (in review; final draft expected in April 2019)
H-2: Promote monarch habitat development, stewardship and restoration on public lands	a) Create new and maintain existing habitat on public lands. Promote management, such as prescribed grazing, on idle public lands to increase diversity and profitability.	Sustain (High)	<ul style="list-style-type: none"> 2014 Presidential Memorandum 2016 MN Executive Order: Directing Steps to Reverse Pollinator Decline and Restore Pollinator Health in MN Bureau of Land Management: Pollinator Initiative Department of Defense: DoD Pollinator Initiatives High-Level Working Group for Monarch Conservation MAFWA: Mid-America Monarch Conservation Strategy NPS: Pollinator Website NRCS: Monarch Habitat Development Project NRPA: <ul style="list-style-type: none"> Parks for Monarchs
	b) Facilitate information exchange and cooperation between land management agencies at all levels to encourage and recognize monarch and other pollinator habitat BMPs, monitoring opportunities, resource opportunities, and educational programming.	High	
	c) Encourage partnerships and cooperation between public and private programs to maximize reach and efficiency of habitat restoration projects.	High	
	d) Leverage the benefits of monarch habitat to other public lands conservation and management priorities to increase adoption of monarch habitat.	High	

	e) Create and implement policy change and encourage use of citizen advisory committees to inform habitat conservation on public lands.	Med	<ul style="list-style-type: none"> ○ Webinar - Pollinator Protection and Outreach Strategies: Multiple Methods that Make a Difference • NWF: State Monarch Summit Planning Guide • P2: Public Lands Learning Center • PCA: 2015-2020 National Seed Strategy • Regional Wildlife Agency coordination through AFWAs • State and local wildlife and agency pollinator initiatives • USFS: Monarch Butterfly Program • USFWS: Monarch Butterfly Conservation Initiative • WAFWA: Western Monarch Butterfly Conservation Plan 2019-2069) • Xerces <ul style="list-style-type: none"> ○ Managing for Monarchs in the West ○ Protecting CAs Overwintering Groves ○ State of Monarch Overwintering Sites in CA
H-3: Promote monarch-conservation on public and private rights-of-way and other utilities in partnership with the Rights of Way as Habitat Working Group and other stakeholders	a) Encourage and incentivize roadside management authorities, utilities, and surrounding landowners to employ monarch friendly habitat installation and management practices, such as integrated pest management.	High	<ul style="list-style-type: none"> • Baum and Sharber (2012) • CTIP: Roadside Revegetation – An Integrated Approach to Establishing Native Plants • EPRI: Power-in-Pollinators Initiative • ERC: <ul style="list-style-type: none"> ○ Rights-of-Way as Habitat Working Group ○ Rights-of-Way Candidate Conservation Agreement with Assurances • FHA: Resources for Pollinator-Friendly Practices • Fischer et al. (2015) • IVM Partners • MJV <ul style="list-style-type: none"> ○ Downloads and Links: Rights of Way section ○ Downloadable signs and displays
	b) Improve communication of BMPs for habitat development to all levels of ROW and utility decision makers, ensuring BMPs take into consideration limitations that managers face and the stage of the construction project when relevant.	High	
	c) Promote and share information and case studies regarding using integrated vegetation management to assess and control invasive species in ROW and utility areas. (See E-2, E-4)	High	

d) Support and expand collaborations between industry, conservation groups, and other stakeholders. (See P-2)	High	<ul style="list-style-type: none"> ○ Mowing: Best Practices for Monarchs handout ○ Webinar: Designing and Creating Outdoor Signs for Monarch Waystations and Pollinator Gardens ○ Webinar: Enhancing existing landscapes for monarchs and native pollinators ○ Webinar: Monarchs and Roadsides ○ Webinar: MCSP Desktop and Online Planning Tools ○ Webinar: Solar with Monarch Habitat – a win-win in the land of milkweed and honey ● “Monarch Highway Partnership: I-35 State DOTs and other agencies ● Monarchs in a Changing World: Biology and Conservation of an Iconic Butterfly, (2015), Chapter 17 ● P2: <ul style="list-style-type: none"> ○ Ecoregional Plant Guides ○ Monarch Habitat Development Manuals ○ NAPPCC Pollinator Roadside Management Award ○ Roadside Technical Manuals ○ ROW downloadable Brochure ○ Utility Land Manager Technical Manual ○ Webinars - Monarch Habitat Creation & Management Series ● SCF: Partnerships with Rural Electric Co-ops ● TPC: <ul style="list-style-type: none"> ○ Hydroseeding Survey of IRVM Counties in Iowa ○ Integrated Roadside Vegetation Management ● WAFWA: Monarch Conservation Plan (2019-2069) ● Xerces: <ul style="list-style-type: none"> ○ Pollinators and Roadsides web page ○ FHA Literature Review
e) Encourage inclusion of pollinator gardens or natural areas with interpretive displays and educational opportunities at rest areas and other high visibility public areas. (See E-4)	Med	
f) Create a ROW vegetation 101 curricula and talking points based on established BMPs for ROW management for pollinators. Develop training materials (power points, webinars, etc.) that can be adapted to ecoregion-state-local level as well as tailored for managers, staff, contractors as well as public who engage with rights of way. Include content on herbicide use, mowing, plant identification, monitoring, and more.	High	
g) Work with high-level decision makers within ROW entities to expand policies allowing for increased conservation practices in ROW and utility areas. (See E-7)	Med	
h) Highlight success stories both internally and to the public. (See E-2, E-4)	Med	

H-4: Increase habitat planting, monitoring, and maintenance in developed areas (urban, suburban, exurban)	a) Create and maintain habitat and in various urban landscapes. Provide resources and guidance to support this work, including emphasis on the importance of reducing pesticide use and of long-term maintenance plans and engagement strategies. (See E-1, E-4 and E-8)	High	<ul style="list-style-type: none"> • Audubon International, EDF: Monarchs in the Rough • NPSOT: Garden Grants • MAG: Pollinator Habitat Grants • Monarch Lab: Schoolyard Garden Grants • MJV: <ul style="list-style-type: none"> ○ Gardening for Monarchs ○ Schoolyard Butterfly Gardens ○ Webinar: Conserving Monarchs in an Urban Setting ○ Webinar: Designing and Creating Outdoor Signs for Monarch Waystations and Pollinator Gardens ○ Webinar: Monarch Gardens & Community Action • Monarch Watch: Waystation Brochure • NABA: Butterfly Garden and Habitat Program • NPGN: Million Pollinator Garden Challenge • NWF: <ul style="list-style-type: none"> ○ Garden for Wildlife ○ Mayors' Monarch Pledge ○ Monarch Conservation in America's Cities Guide • P2: <ul style="list-style-type: none"> ○ Gardening Learning Center ○ Monarch Habitat Development Manuals for Corporate Lands ○ Protecting Monarchs Brochure ○ S.H.A.R.E ○ Ecoregional Plant Guides • SWMS: Monarch Waystation information and Southwest Regional Guides • The Field Museum: <ul style="list-style-type: none"> ○ Urban Monarch Conservation ○ Urban Monarch Guidebook • Wildlife Habitat Council
	b) Connect municipalities to existing urban monarch programs and present options for funding local initiatives. (See P-3)	High	
	c) Engage diverse urban residents in habitat creation, outreach and monitoring efforts. (See E-2, E-10, R-16)	High	
	d) Provide customizable, template resources to facilitate outreach by local groups to municipality leaders encouraging them to adopt monarch friendly practices, especially direct habitat conservation projects. (See Education Objective 1)	Med	

	e) Support community-wide habitat development through outreach to municipalities, urban land managers or landscapers, and relevant businesses, corporate campuses or associations such as homeowners associations. (See Education Objective 3)	Med	<ul style="list-style-type: none"> • WO: Wild for Monarchs Brochure • Xerces: <ul style="list-style-type: none"> ◦ Bring Back the Pollinators ◦ Reducing pesticides
	f) Engage social science and policy professionals to design a policy playbook that articulates opportunities to connect existing community priorities to local monarch habitat conservation. (See E-2)	Med	
H-5: Increase monarch habitat across agricultural land uses, including conventional and organic farms, pastures and rangelands, and others.	a) Implement voluntary monarch-friendly habitat installation, maintenance and practices on working lands.	High	<ul style="list-style-type: none"> • CEC: Monarch Conservation Toolbox • BBHF: NextGen Habitat Project • EDF: Monarch Habitat Exchange • EFC Systems: AgSolver • Keystone Monarch Collaborative • Farmers for Monarchs • MJV: <ul style="list-style-type: none"> ◦ Monarch Habitat on Farms ◦ Breeding Habitat Assessment Tool ◦ Risks of Neonicotinoid Use to Pollinators ◦ Webinar: Habitat Restoration Fundamentals ◦ Webinar: Enhancing existing landscapes for monarchs and native pollinators • NRCS: <ul style="list-style-type: none"> ◦ Local Service Centers ◦ Monarch Habitat Development Project ◦ Monarch WHEGs ◦ Using Farm Bill Programs for Pollinator Conservation ◦ Working Lands for Wildlife: Monarch Butterfly • P2:
	b) Develop recommendations for targeting habitat placement, taking into consideration potential for exposure to pesticides. (See R-12 and R-19)	High	
	c) Identify and promote existing and potential agricultural production systems compatible with monarch and other monarch-compatible wildlife habitat.	High	
	d) Raise awareness of and improve incentive programs to increase landowner participation in monarch conservation.	High	
	e) Investigate and promote practices that enhance existing habitat, including nectar sources (e.g. prescribed grazing, prescribed fire, hedgerows, cover crops, grazing management, prairie hay, delayed haying) on rangelands	High	

	and other working lands, and emphasize the additional benefits of these practices to farm operations.		<ul style="list-style-type: none"> ○ Monarch Habitat Development Manuals ○ Bee Friendly Farming ○ Farm Land Managers Technical Guide ○ Protecting Pollinators: Training Module for Certified Pesticide Applicators, Pesticide and Crop Advisors, and Agricultural Producers ○ Farmer/Rancher Learning Center ○ Webinars - Monarch Habitat Creation & Management Series ○ Ecoregional Plant Guides
	f) Engage with ag and crop advisors to promote monarch habitat creation and enhancement of existing habitat to landowners. (See Education Priorities)	High	
	g) Use precision agriculture and return on investment analysis tools to engage producers in habitat conservation. Work with industry, leaders in the community, advisors and technical providers to identify opportunities for expanding use of these tools for greater conservation and productivity.	High	<ul style="list-style-type: none"> ● Paper: Crop production costs, profits, and ecosystem stewardship with precision agriculture (Schimmelpfennig, 2018) ● Paper: Precision conservation: A geospatial decision support tool for optimizing conservation and profitability in agricultural landscapes (McConnell and Burger, 2011) ● Paper: Precision conservation meets precision agriculture: A case study from southern Ontario (Capmourteres et al, 2018) ● Paper: Precision Conservation to Enhance Wildlife Benefits in Agricultural Landscapes (McConnell and Burger, 2016) ● Paper: Subfield profitability analysis reveals an economic case for cropland diversification (Brandes et al, 2016) ● PF: <ul style="list-style-type: none"> ○ Conservation Cover CRP mixes ○ Find A Biologist resource ○ Precision Agriculture ● SCF: Incentives for Crop Consultants ● Prairie Resto: Guidelines for Establishing a Prairie ● TPC: <ul style="list-style-type: none"> ○ Prairie on Farms
	h) Create and utilize demonstration sites in agricultural areas to encourage habitat installation and enhancement on or near farms and ranches. (See E-9).	High	
	i) Disseminate habitat planning, installation and maintenance guidelines for working and non-working lands. Maintain, expand and promote the Farmers for Monarchs website as an information center for agricultural resources. (See E-1-3, E-8)	High	
	j) Increase capacity for those working with landowners or land managers to promote and utilize existing pollinator-friendly conservation programs or practices.	High	
	k) Improve technical expertise of landowner consultants through continuing education and work towards institutionalizing pollinator conservation in their work. (See E-11)	High	

	l) Investigate policies, standards and programs, and make recommendations to enhance opportunities for and quality of habitat creation, especially through the Farm Bill and NRCS Conservation Practice Standards. (See E-7)	High	<ul style="list-style-type: none"> ○ Prairie Reconstruction Tech Guides Series #6-10 ○ Iowa Prairie Seed Mix Calculator ○ Natural Selections: Source Identified Seed ● USFWS: Partners for Fish and Wildlife Program ● WAFWA: Western Monarch Butterfly Conservation Plan 2019-2069 ● Xerces: <ul style="list-style-type: none"> ○ Guidance to Protect Habitat from Pesticide Contamination ○ Monarch Nectar Guides ○ Milkweed Seed Finder ○ Pollinators in Natural Areas ○ Pollinator Habitat Installation Guides ○ Pollinator Resource Center ● Xerces and USFWS: Habitat Restoration Quick Guide for Farmers in the Central Valley, CA (to be completed Spring 2019)
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Objective 2: Develop consistent, regionally appropriate *Asclepias* and nectar resources for habitat enhancement and creation on public and private lands.

Strategy	Actions	Ranking	Resources
H-6: Increase access to milkweed and nectar plant materials	a) Increase and sustain demand for and distribution of native, local ecotype seeds and plugs. (See E-5)	High	<ul style="list-style-type: none"> BONAP: Asclepias page BLM: Seeds of Success DBG: Great Milkweed Grow Out Flora of North America HabiTally App (to be released in 2019) iNaturalist groups: <ul style="list-style-type: none"> Texas Milkweed and Monarchs: Observations Milkweed is Asclepias Milkweeds of the National Park Service Iowa Living Roadway Trust Fund LEAP: Native Plant Nursery Map for LEAP Region Million Pollinator Garden Challenge MJV <ul style="list-style-type: none"> Milkweed Seed Collection Handout (in progress) Who Are You: Nursery Owner Webinar: Growing Milkweed for Monarch Conservation Webinar: Milkweed Seed Collection Webinar: Where are the Milkweed and Monarchs? MNTaxa: The State of MN Vascular Plant Checklist Monarch Flyway: Wild Collection Monarch Watch: <ul style="list-style-type: none"> Milkweed Market Milkweed Market Plant Vendor List
	b) Improve communications about sources of commercially available plants and seeds. (See E-5)	High	
	c) Expand production of milkweed and nectar plant seed, including solicitation, receipt, seed cleaning, growing and distribution of plugs.	High	
	d) Maintain and promote native plant supplier lists of commercially reliable sources of pesticide free, native, regionally appropriate milkweed and nectar plants and seeds.	Sustain (Med)	
	e) Assess commercial availability of native, regionally sourced milkweed and nectar plants and seeds. (see R-12)	Med	
	f) Facilitate sustainable wild collection of native local ecotype seed in collaboration with producers to grow and sell the plants	Med	
	g) Update and maintain resources depicting milkweed current distribution and native range by species to guide selection of appropriate species for habitat development.	Sustain (Low)	
H-7: Promote and engage commercial native seed and plant industry	a) Engage seed producers and associations to learn about how they select species for production decisions and encourage the production and marketing of monarch friendly species.	High	
	b) Increase communication and dissemination of information throughout the industry and seed supply chain.	High	
	c) Improve the ability of regional seed suppliers to address the demand for native plant materials by building capacity in plant materials development and botany.	Med	

	d) Promote best practices for propagation of milkweed and nectar plants.	Med	<ul style="list-style-type: none"> • MWfM: Monarch Recovery from a Milkweed's Point of View • National Pollinator Garden Network • National Seed Strategy • Ohio Pollinator Habitat Initiative • P2: <ul style="list-style-type: none"> ○ Seed Collection Webinars and Training ○ Project Wingspan • Paper: Luna and Dumroese (2013) • SEINet (Arizona Chapter): Data Portal (historic data) • SWMS: List of Southwest Nurseries • TPC: <ul style="list-style-type: none"> ○ Assessing the Milkweed Seed Marketplace in IA ○ Iowa Seed Calculator ○ Native Seed Production Manual ○ Natural Selections Program ○ Plant Iowa Native website • Xerces: <ul style="list-style-type: none"> ○ Project Milkweed ○ Milkweeds: A Conservation Practitioner's Guide ○ Milkweed Seed Finder ○ Western Monarch Milkweed Mapper • USDA: PLANTS Database
	e) Provide platform for sharing milkweed and native plant propagation experiences and lessons. (See R-12)	Sustain (Med)	
H-8: Utilize regional, high quality, diverse seed mixes for habitat projects	a) Develop, test and integrate site appropriate, diverse native seed mixes that include milkweed and nectar plants into restoration projects.	High	<ul style="list-style-type: none"> • Heather Holm: Pollinators of Native Plants • LBJWC: Native Plant Information Network • MJV: <ul style="list-style-type: none"> ○ NRCS collaboration on CRP evaluation (ongoing) ○ Webinar: Designing Seed Mixes for Native Habitat • Native Plant Societies
	b) Evaluate mixes for establishment, vegetation stability, stand longevity, monarch use, commercial availability, and attractiveness to consumers and refine recommendations as research progresses. (See R-7, R-11, R-12)	High	

c) Establish and promote adoption of standards for high quality seed mixes by region and sector.	High	<ul style="list-style-type: none"> • NRCS: Seed Mix Planning Tools • P2: Ecoregional Planting Guides and Monarch Fueling Planting Guides (eastern U.S.) • TPC: <ul style="list-style-type: none"> ○ Designing Native Seed Mixes ○ Iowa Seed Mix Calculator ○ Seed mix design and establishment mowing. • USDA: <ul style="list-style-type: none"> ○ Webinar Matching Seed to Conservation Practices ○ What Are Plant Ecotypes? • Xerces: <ul style="list-style-type: none"> ○ Pollinator Conservation Resource Center ○ Monarch Nectar Guides
d) Offer increased cost share rates and financial incentives for use of high quality seed mixes.	High	
e) Work with NRCS and other agencies and NGOs to expand state seeding specifications to include broader list of available forbs (including milkweeds) for use in conservation program seed mixes. (See R-11)	High	
f) Work with large seed buyers on model bids to ensure important monarch plant species are consistently requested in order to increase production and drive down costs for those species.	High	
g) Develop or identify existing recommendations for how to choose the appropriate seed mix or mixes for a habitat project and develop answers to common questions about seed mix design.	Med	
h) Provide information on the benefits of using locally-sourced plants and seeds, local accessibility of plant materials and equipment, and local instructions for habitat installation and maintenance to inform expectations of implementing good quality habitat. (See E-5)	Med	

Objective 3: Address overwintering habitat issues in the United States.

Strategy	Actions	Ranking	Resources
H-9: Assess conditions at overwintering sites in the U.S.	a) Routinely assess habitat conditions and engage conservation partners at and near overwintering sites.	Sustain (High)	<ul style="list-style-type: none"> • MJV: <ul style="list-style-type: none"> ○ Downloads and Links: Western Monarchs ○ Webinars: <ul style="list-style-type: none"> ▪ Conserving Monarchs in the Western U.S. ▪ Monarch Overwintering Biology ▪ Western Monarch Population Down by 99% - How You Can Help • Southwest Monarch Study • WAFWA: Western Monarch Butterfly Conservation Plan 2019-2069 • Xerces Society: <ul style="list-style-type: none"> ○ Protecting California's Butterfly Groves Management Guidelines for Monarch Butterfly Overwintering Habitat ○ State of the Monarch Butterfly Overwintering Sites in California ○ Western Monarch Count Resource Center ○ www.savewesternmonarchs.org
	b) Develop and implement technical guidelines and conservation plans for adaptive, site-specific management and conservation of overwintering sites. (See R-1)	High	
H-10: Protect overwintering sites in the U.S.	a) Obtain meaningful legal protection for overwintering sites in California.	High	
	b) Expand the use of easements, land use plans, and other conservation programs to protect sites by working with the variety of stakeholders involved in overwintering site ownership and management.	High	
H-11: Actively manage and monitor overwintering sites in the U.S.	a) Engage overwintering site managers to assess, develop, and implement site management plans.	High	
	b) Maintain and expand citizen science participation in monitoring the western overwintering population. (See E-10, R-1)	Sustain (High)	

Priority 2: Education to Enhance Awareness of Monarch Conservation Issues & Opportunities

Objective 1: Raise awareness to increase conservation actions and support for monarchs.

Strategy	Actions	Ranking	Resources
E-1: Utilize and promote Monarch Joint Venture as an information clearinghouse for monarch conservation in the U.S.	a) Create new and share existing web resources to increase awareness and share information about monarch conservation.	High	<ul style="list-style-type: none"> ● MJV: <ul style="list-style-type: none"> ○ Communications Plan (available upon request) ○ Downloads and Links ○ FAQs ○ Monarch Conservation Webinar Series ○ News and Events ○ MJV and partner monarch conservation projects ○ www.monarchjointventure.org ○ www.plantmilkweed.org
	b) Contribute recent and relevant research, monitoring, habitat, and education efforts, along with best practices guidelines to communicate broadly.	High	
	c) Use existing translated materials and contribute Spanish or French translations of materials for distribution; prioritize based on demand.	High	
	d) Facilitate connections to smaller scale coordination entities (i.e. state or regional, sector-based).	Sustain (High)	
	e) Share relevant monarch conservation webinars and contribute suggestions for additional material.	Med	
E-2: Engage all audiences to increase monarch conservation actions through focused education and outreach	a) Develop and utilize consistent, collaborative, science-based communications products, strategies and messaging tailored to different audiences (i.e. geography, sector, age) that reflect current monarch conservation priorities.	High	<ul style="list-style-type: none"> ● CEC: Monarch Butterfly Communication and Education ● MJV <ul style="list-style-type: none"> ○ Audience Specific Who Are You? pages ○ Communications Plan (available upon request) ○ Communications Working Group ○ Monarch Conservation Webinar Series ● Monarch Watch Waystation Program ● NWF: Butterfly Heroes ● Paper: Restoring monarch butterfly habitat in the Midwestern US: 'all hands on deck' (Thogmartin et al. 2016) ● Pheasants Forever: Youth Pollinator Habitat Program and curriculum
	b) Communicate the co-benefits of monarch conservation to engage additional conservation partners and audiences. (See E-5)	High	
	c) Use social science to identify priority audiences, approaches, and messaging for increasing monarch conservation actions. (See R-14)	High	
	d) Leverage partners and social networks to communicate conservation needs to various audiences.	High	

	e) Promote greater acceptance and broader implementation of habitat restoration in urban areas by framing natural habitats in urban areas as components of environmental resiliency, storm-water runoff, green infrastructure plan or other local environmental priorities.	High	<ul style="list-style-type: none"> ● P2: <ul style="list-style-type: none"> ○ Pollinator Partnership Awards ○ Pollinator Stewardship Certification ○ Pollinator Week ● USFWS: Monarch Conservation Evaluation Plan ● WAFWA: Western Monarch Butterfly Conservation Plan 2019-2069
	f) Conduct youth outreach to inspire future generations of conservationists.	Med	
	g) Engage local conservation organizations to support local pollinator plantings with technical and financial resources.	Med	
E-3: Engage municipality administrations in monarch conservation and habitat creation	a) Introduce administrations to the broad variety of urban programs connected to monarchs with ideas and funding.	High	<ul style="list-style-type: none"> ● MJV: <ul style="list-style-type: none"> ○ Advocacy resources ○ Handout: Monarch Conservation Talking Points ○ Local Elected and Appointed Officials audience page ○ Webinar: Conserving Monarch Butterflies in an Urban Setting ● NRPA: Pollinator Protection and Outreach Strategies: Multiple Methods that Make a Difference ● NWF: Mayors for Monarchs Pledge ● P2: Pollinator Week
	b) Document and show benefits of monarch conservation initiatives to municipalities. (See E-5)	High	
	c) Engage community leaders in monarch conservation efforts, and cultivate cooperative, inclusive relationships to foster champions at a local level.	Med	
	d) Identify, promote and create as needed incentives, rebates, and funding for implementation.	Med	
E-4: Promote toolkits and customizable templates for easy and consistent communication across sectors and topics	a) Identify and share campaigns, resources, messaging, or strategies tailored for different audiences and model them for use, replication or adaptation (i.e., signs, social media posts, graphics, etc.).	Sustain (High)	<ul style="list-style-type: none"> ● MJV: <ul style="list-style-type: none"> ○ Communications Working Group ○ Downloadable signs and displays ○ Downloads and links <ul style="list-style-type: none"> ▪ Template presentations ○ MJV website (as a platform for dissemination of these materials) ○ Monarch Communicator's Guide (in progress)
	b) Develop and promote sector specific "how-to" templates or toolkits that cover a full cycle of outreach (recruitment, engagement, follow-up) for habitat conservation, education, or research actions, integrating partner insights into easily customizable resources, tools, or displays to share broadly.	High	

	c) Create science-based toolkits or programs designed for trained specialists to teach key principles of habitat establishment and management, botany, habitat and population monitoring, and other education or outreach topics to various audiences, based on the values and experiences of those audiences. (See R-11, R-12)	Low	
	d) Create accessible, short videos to make connections between monarchs, habitat and important conservation benefits.	Low	
	e) Host easily adoptable social media campaigns that many organizations can engage with to build reach.	Low	
E-5: Mitigate negative perceptions and barriers limiting or preventing monarch conservation actions	a) Promote habitat restoration or enhancement from an ecosystem perspective by encouraging inclusion of diverse native plants, decreased pesticide use, and adoption of best management practices. (See R-13)	High	<ul style="list-style-type: none"> ● Million Pollinator Garden Challenge ● MJV: <ul style="list-style-type: none"> ○ Audience specific Who Are You? pages ○ Downloads and Links: <ul style="list-style-type: none"> ▪ Habitat Management section ▪ Milkweed section ▪ Nectar Plants section ○ Monarch Conservation Efforts Map ○ Monarch and Milkweed Misconceptions Handout ○ Risks of Neonicotinoid Use to Pollinators Handout ○ Success Stories Map ○ Webinar: Milkweed Seed Collection ○ Webinar: The Three Pillars of Habitat Management ○ Why Grow and Sell Native Milkweed? Handout ● NRPA: Pollinator awareness survey ● USFWS: Spread Milkweed Not Myths ● Wild Ones:
	i) Create sector-specific educational materials to create a vision for landowners of what pollinator habitat looks like in their own communities, and how it contributes value.	High	
	h) Use social surveying and literature review of existing research to understand real and perceived barriers to monarch conservation on an audience specific level, and work with relevant partners to address identified issues. (See R-14)	High	
	c) Raise awareness of the benefits of planting native and locally sourced seeds and plugs. (See Habitat Objective 2)	High	
	d) Communicate realistic expectations about timeline of and aesthetics during habitat establishment, requirements for maintenance, and accessibility of resources to prepare stakeholders for implementing good quality habitat. (See Habitat Objective 1)	High	

	e) Share materials and improve messaging around milkweed to address concerns about weediness, aesthetics, and milkweed toxicity, particularly in agriculture, home and community settings.	High	<ul style="list-style-type: none"> ○ Guidelines for Selecting Native Plants – Local Ecotype Guidelines ○ Landscaping with Native Plants ● Xerces: <ul style="list-style-type: none"> ○ Pollinator Conservation Resource Center- includes Native Pollinator Plant Nurseries and Seed Companies by region ○ Reducing Pesticides
	f) Communicate the need for production and purchase of milkweed and nectar sources that are free of systemic insecticides to consumers and producers, and encourage appropriate marketing of non-treated plants. (See Habitat Objective 2)	High	
	g) Promote and facilitate peer-to-peer exchanges to encourage adoption of monarch-friendly practices by landowners and land managers across sectors.	Med	
	h) Encourage small conservation improvements as a starting point and promote direct benefits that are of high interest to different stakeholders.	Med	
	i) Identify and promote success stories of monarch conservation projects in different sectors, including background research, resources, and messaging that can be adapted for different situations. (See E-4)	Med	
	j) Work to remove milkweed and other native plants from noxious weed and restricted plant lists at the county, city and local association level. (See E-5-f)	Low	
E-6: Expand outreach at conferences and meetings	a) Grow diversity of stakeholders present and participating in monarch conservation oriented meetings.	High	<ul style="list-style-type: none"> ● MJV: <ul style="list-style-type: none"> ○ Communications Plan (available upon request) ○ Who Are You? Audience Pages ○ Monarch Conservation Efforts Map ● Volunteer educators: Monarch Watch Conservation Specialists
	b) Engage with different stakeholders through stakeholder-hosted events.	Med	
	c) Maintain inventory of events, meetings, or other opportunities to engage various audiences.	Med	
	d) Maintain a geographic list of presenters, educators, or monarch conservation ambassadors to broaden reach.	Sustain (Med)	

E-7: Improve outreach to media and elected officials	a) Provide and share current press releases, interviews, targeted articles and science-based recommendations for distribution to media outlets and elected officials.	High	<ul style="list-style-type: none"> • MJV partner press releases, reports and resources • MJV: <ul style="list-style-type: none"> ○ News ○ Partner Memos ○ Advocacy resources ○ Advocate Get Involved page ○ Who Are You? Audience Pages ○ Monarch Communicator's Guide (in progress) • P2: Pollinator Week
	b) Encourage greater publicity for monarch conservation activities and partnerships across scales and sectors.	High	
	c) Keep messaging up to date and easily accessible, with regional specifications or considerations. (See E-2)	Sustain (Med)	
E-8: Improve accessibility of scientific information to partners and the public	a) Translate scientific research for various audiences to highlight key takeaways and encourage appropriate action based on scientific findings.	High	<ul style="list-style-type: none"> • MCSP • MJV News • MJV Partner Memos • MonarchNet
	b) Distribute regionally appropriate key messages from scientific research to conservation stakeholders. (See H-5)	High	

Objective 2: Increase learning about monarchs and their habitat in formal and informal settings.

Strategy	Actions	Ranking	Resources
E-9: Provide monarch education for both formal and informal audiences	a) Identify, evaluate, and promote existing, curricula or educational activities for different age groups, applying current standards and integrating core curricula into monarch education when relevant.	High	<ul style="list-style-type: none"> • Ba's Relief, LLC • JN: <ul style="list-style-type: none"> ○ Symbolic Migration ○ Informational lessons • MJV: <ul style="list-style-type: none"> ○ Downloads and Links: Education section ○ MJV/NCTC Monarch Conservation Webinars • Monarch Lab: <ul style="list-style-type: none"> ○ Monarchs and More Curriculum ○ Schoolyard Ecology Explorations Curriculum ○ Driven to Discover Monarch Curriculum ○ North American Monarch Institute • Monarch Live! A Distance Learning Adventure • Monarch Teacher Network of Canada • Monarchs Across Georgia • NWF: School Case Studies and Funding Resources and Lego's Monarch Mission curriculum • P2: <ul style="list-style-type: none"> ○ Pollinator Stewardship Certification ○ Education Learning Center ○ Bee Smart School Garden Kit • SCF: Resources for Science and Agriculture Educators • Sustainable Agriculture Research & Education Farmer Field Day Toolkit • TWA Youth On-Demand Webinar The Magic of Monarchs • USDA NRCS Field Offices
	b) Leverage existing monarch curricula with local school districts to inquire about and aid planners in including relevant lessons into their basic curriculum.	High	
	c) Host, participate in, or support monarch conservation educational events or celebrations for the public (i.e. youth groups, garden clubs, plant sales, monarch festivals, etc.)	Med	
	d) Provide training, technical assistance and resources to teachers and informal educators. Expand and evaluate collaborative teacher and environmental education workshops (train-the-trainer) to strengthen monarch learning networks. (See E-11)	High	
	e) Develop and evaluate methods to train contractors, producers, partners and individuals on the value, proper establishment and maintenance of habitat.	High	
	f) Across sectors, use habitat demonstration plots and field events in collaboration with audience-trusted partners to promote greater adoption by target audience. Develop and encourage best practices and accessible resources (i.e. information and potential speakers) for hosting field events. (See H-5, E-11)	High	
	g) Share "proof-of-concept" case studies to demonstrate conservation strategies that are low risk and cost competitive, especially in risk-adverse sectors.	High	

	h) Incorporate monarch and pollinator content into continuing education programs.	High	<ul style="list-style-type: none"> • USFWS: Schoolyard Habitat Program • Pheasants Forever: Upland Pollinator Habitat Program
E-10: Promote participation in and accessibility of monarch citizen science with broad audiences. (See R-3)	a) Integrate monarch citizen science into education efforts. (See Monarch Lab curricula resources for E-9).	High	<ul style="list-style-type: none"> • MJV: <ul style="list-style-type: none"> ○ Lists of Monarch Citizen science programs: <ul style="list-style-type: none"> ▪ Handout: Monarch Citizen Science ▪ Web version - Get Involved: Study Monarchs
	b) Ensure citizen science data are accessible to conservation partners, citizen scientists and researchers, and that they are used to inform future conservation strategies.	High	
	c) Ensure readability of citizen science methods and resources for the layperson and provide translations of methods and other resources for greater reach.	High	
	d) Develop guidance to promote citizen science program participation based on interest and thresholds of those looking to participate.	Med	

Objective 3: Foster networking between stakeholders involved in monarch conservation.

Strategy	Actions	Ranking	Resources
E-11: Expand and connect network of specialists to support monarch conservation	a) Provide communication, networking, and relationship building opportunities for monarch and conservation specialist groups to share resources (i.e. toolkits) (See E-4)	Sustain (High)	<ul style="list-style-type: none"> ● MJV: <ul style="list-style-type: none"> ○ Communications Working Group ○ Downloads and Links: MJV Handouts section ○ Who Are You? Audience Pages ○ Habitat Working Group ● Monarch Lab: Monarch Ambassadors ● MLMP: Training Network ● Monarch Watch: Conservation Specialist Group ● Adopt a Highway program ● Garden clubs ● Master Gardener and Naturalist groups ● P2: NAPPCC Monarch Task Force ● Wild Ones ● Pheasants Forever: Youth Pollinator Habitat Program ● Scouts, 4-H youth groups and their leaders
	b) Provide support materials to specialists to aid in education/outreach efforts.	Med	
	c) Create and maintain a searchable directory of monarch presenters and associated topics of expertise to improve local outreach potential. (See E-9)	Med	
	d) Engage local groups who can take possession of the projects in their community using an 'adopt a...' model.	Low	
E-12: Facilitate information sharing and transparent tracking of conservation efforts	a) Effectively catalogue and communicate monarch conservation efforts, research, resources, and potential partners or opportunities. Connect individuals and organizations with relevant projects or opportunities across sectors, agencies and geographies.	Sustain (High)	<ul style="list-style-type: none"> ● MJV: <ul style="list-style-type: none"> ○ Information Clearinghouse website: https://monarchjointventure.org/ ○ Partner Directory (in progress) ○ Monarch Conservation Efforts Map ● CEC: <ul style="list-style-type: none"> ○ Engaging Farmers and Other Landowners to Support Monarch Butterfly and Pollinator Conservation ○ Monarch Conservation Toolbox ○ North American Monarch Conservation Plan ● Listservs <ul style="list-style-type: none"> ○ DPLEX ○ Western Monarchs
	b) Facilitate or encourage continued communication and cooperation between U.S., Canada, and Mexico. Actively address geographic differences in conservation actions and education messages between nations and regions.	Sustain (High)	

			<ul style="list-style-type: none">○ Pollinator Partnership○ MJV Partners● Trilateral Working Group for Communications● USFWS: Monarch Conservation Database
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Priority 3: Research and Monitoring to Inform Monarch Conservation Efforts

*Strategies that have trinationl considerations are indicated with **.*

Objective 1: Study monarch habitat and population status.

Strategy	Actions	Ranking	Resources
R-1: Improve overwintering site assessment and monitoring in the U.S. (See Habitat Objective 3)	a) Support continued monitoring of the western monarch population and habitat at current and historic overwintering sites in California; use findings to identify priority sites for restoration or enhancement.	Sustain (High)	<ul style="list-style-type: none"> • Xerces: <ul style="list-style-type: none"> ◦ Western Monarch Count Resource Center ◦ Overwintering Site Habitat Assessment Form • CalPoly and USFWS Overwintering Monarch Within Grove Habitat Selection Project (in progress as of Dec 2018) • CalPoly microclimate study (in progress)
	b) Define metrics to assess the effectiveness of site management and restoration of overwintering sites.	Med	
	c) Identify microclimate requirements of overwintering monarchs in California.	Med	
R-2: Assess risks and inform habitat and population targets **	a) Update population and habitat models with new information as it becomes available, considering potential exchange between populations.	High	<ul style="list-style-type: none"> • Ongoing NSF grant to address R-2-d by Cheryl Schultz (WSU), Elizabeth Crone (Tufts), Marm Kilpatrick (UC-Santa Cruz), and Xerces Society. • MCSP Publications • MonarchNet Library • Paper: A trans-national monarch butterfly population model and implications for regional conservation priorities (Oberhauser et al. 2016) • Paper: Can roadside habitat lead monarchs on a route to recovery? (Kasten et al. 2016)
	b) Utilize existing Population Viability Analyses to construct biological target(s) and inform conservation strategies.	High	
	c) Assess parameters for obtaining increased precision of stage-based demographic model, including migration success, fecundity of overwintered females, and immature survival in eastern and western populations, taking into account geographic differences.	High	

	d) Validate and improve monarch movement models by measuring monarch recruitment to areas of known and varied milkweed distribution.	Med	<ul style="list-style-type: none"> • Paper: Citizen science monitoring demonstrates dramatic declines of monarch butterflies in western North America (Schultz et al. 2017) • Paper: Local and cross-seasonal effects of climate and land-use on breeding abundances of a migratory species (Saunders et al. 2017) • Paper: Monarch butterfly population decline in North America: identifying the threatening processes (Thogmartin et al. 2017) • Paper: Anthropogenic Impacts on Mortality and Population Viability of the Monarch Butterfly (Malcolm 2018) • Paper: An evaluation of studies on the potential threats contributing to the decline of eastern migratory North American monarch butterflies (<i>Danaus plexippus</i>). Wilcox et al. In press: <i>Frontiers in Ecology & Evolution</i>
R-3: Document known monarch breeding areas and migratory pathways **	a) Improve documentation and visualization of potential breeding locations across the range, especially early Spring when monarchs depart overwintering groves.	High	<ul style="list-style-type: none"> • iNaturalista (Mexico) • Integrated Monarch Monitoring Program • International Monarch Monitoring Blitz • MJV <ul style="list-style-type: none"> ○ Breeding Habitat Assessment Tool ○ Webinars: <ul style="list-style-type: none"> ▪ Southwestern Monarchs ▪ There and Back Again: the compasses monarchs use to get to and return from Mexico. ▪ Where are the Monarchs and Milkweeds? Crowd-sourcing, modeling, and surveying across the West
	b) Develop and encourage standard protocol for geo-referencing tagging data.	High	
	c) Build on western habitat suitability model through site monitoring and research into habitat preferences.	Med	

	d) Support ongoing tagging efforts and analyses to improve knowledge of monarch movement within and across regions and land uses. (See E-10)	Sustain (Med)	<ul style="list-style-type: none"> • Mission Monarch (Canada) • MLMP • MonarchNet Library • Monarch Watch Tagging Program (Eastern monarchs) • Monarch Alert Tagging Program (CA) • Southwest Monarch Study Tagging Program (AZ, NV, NM, CA deserts, UT, CO) • Washington State University Tagging Program (Pacific Northwest) • NPS: Southwest Exotic Plant Management Team developing monarch/milkweed mapping project in southwestern U.S. • P2: Monarch Wings Across California (MWAC) • Xerces and USFWS: <ul style="list-style-type: none"> ○ Western Monarch Milkweed Mapper ○ Western Monarch and Milkweed Habitat Suitability Model Project (with University of Nevada-Reno, based on the WMMM data. Publication in review.) • Xerces: database of western monarch tag recoveries
R-4: Develop, validate, and improve breeding habitat assessment tools for use in planted habitat	a) Coordinate, standardize, and validate monarch habitat assessment or evaluation tools.	High	<ul style="list-style-type: none"> • EDF: Habitat Quantification Tool for Habitat Exchange • Integrated Monarch Monitoring Program • MJV: <ul style="list-style-type: none"> ○ Breeding Habitat Assessment Tool ○ Roadside Habitat for Monarchs Rapid Assessment Tool (Cariveau et al. in review), ○ Breeding Habitat Assessment Tool, ○ Habitat evaluation on working lands for wildlife project areas (with NRCS, ongoing) • NRCS: Monarch Wildlife Habitat Evaluation Guides • Xerces: Pollinator Habitat Assessment Form and Guide • USGS: Monarch Conservation Planning Tools
	b) Contribute site assessment data to ongoing monitoring or tracking efforts. (See also R-5 and R-7).	Sustain (Med)	
	c) Identify existing habitat assessment tools and make connections to integrate conservation actions that benefit multiple species.	Low	

R-5: Use records of habitat availability, monarch conservation efforts, and monarch use to inform habitat conservation targets.	a) Estimate existing habitat available in different landscapes and land use sectors.	High	<ul style="list-style-type: none"> ● MJV: <ul style="list-style-type: none"> ○ IMMP ○ Monarch Conservation Efforts Map ○ Partner Directory (in progress) ● Paper: Can roadside habitat lead monarchs on a route to recovery? (Kasten et al. 2016) ● Paper: Monitoring monarch habitat in conservation sites. (Lukens et al. in review) ● USFWS: Monarch Conservation Database ● USFWS Monarch Conservation Evaluation Plan ● The Field Museum: Urban Monarch Conservation Tools ● ROW as Habitats Working Group conservation efforts database for utilities and others to track accomplishments
	b) Develop strategies for state level effort tracking to document progress towards state plan goals and objectives. Integrate reporting with the USFWS MCD and Integrated Monarch Monitoring Program.	High	
	c) Facilitate continuous updating of records for habitat and other efforts to ensure they are thorough and current. Encourage inclusion of efforts not intended for monarchs, but still benefiting monarchs and integrate that into current models.	Sustain (High)	
	d) Track and evaluate monarch conservation education, outreach, and research activities broadly through time to gauge impact of those efforts.	Sustain (Med)	
R-6: Determine areas of highest monarch overwintering contributions **	a) Analyze tagging data to provide yearly estimates of monarch migratory success from different regions.	High	<ul style="list-style-type: none"> ● Paper: Citizen Scientist Tagging Reveals Destinations of Migrating Monarch Butterflies, <i>Danaus plexippus</i> (L.) from the Pacific Northwest (James et al. 2018) ● Paper: Divergent Migration Destinations and Multiple Overwintering Strategies of <i>Danaus plexippus</i> in the Southwest United States, Morris et al (in progress) ● Paper: Density estimates of monarch butterflies overwintering in central Mexico (Thogmartin et al. 2017) ● Paper: Intra-population variation in the natal origins and wing morphology of overwintering western monarch butterflies <i>Danaus plexippus</i> (Yang et al 2015) ● Paper: Regional climate on the breeding grounds predicts variation in the natal origin of monarch butterflies overwintering in Mexico over 38 years (Flockhart et al. 2017) ● MJV Webinars:
	b) Repeat isotope or similar study to determine variation in relative importance of different breeding regions.	Med	
	c) Study interchange of eastern and western monarchs, and determine proportion of western monarchs that overwinter in Mexico using stable isotopes and cardenolide fingerprinting via non-lethal methods.	Med	

			<ul style="list-style-type: none"> o Conservation of Monarchs in the Western U.S. o Monarch Overwintering Biology o Southwestern Monarchs o Where are the Monarchs and Milkweed? • Monarch Alert • Monarch Watch • Morris et al. (2015) • Southwest Monarch Study • Strontium isotope study (Flockhart et al., in progress) • Washington State University Tagging Project • Western Monarch Milkweed Mapper
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Objective 2: Expand citizen science and other monitoring, data exchange, and data analyses to inform conservation efforts.

Strategy	Actions	Ranking	Resources
R-7: Implement Integrated Monarch Monitoring Program to address data gaps and fulfill stakeholder information needs **	a) Depict temporal and spatial information needs and train surveyors (see E-9) to gather data to inform reliable estimates of habitat and population trends.	High	<ul style="list-style-type: none"> ● MJV: <ul style="list-style-type: none"> ○ Handout: Monarch Citizen Science ○ Integrated Monarch Monitoring Program ○ Get Involved: Citizen Science Opportunities ○ Webinar: Contributions of Monarch Citizen Science and Program Overviews ● MLMP: Training resources ● Paper: The Integrated Monarch Monitoring Program: from design to implementation (Cariveau et al. in review) ● Xerces, USFWS, IDFG, WDFW: Western Monarch Milkweed Mapper ● Trinational Monarch Science Partnership: <ul style="list-style-type: none"> ○ “Monarch Butterfly and Pollinator Conservation” Commission for Environmental Cooperation (CEC) ○ Trinational Monarch Knowledge Network (Bird Studies Canada)
	b) Use and share appropriate and consistent evaluation tools to improve training program delivery and content.	High	
	c) Connect standard monitoring protocols and data with current research studies and existing citizen science programs to expand potential uses and statistical power.	High	
	d) Leverage compatible information needs to draw data from a variety of biological monitoring efforts.	High	
	e) Promote involvement in IMMP habitat and monarch use monitoring across sectors and tailor monitoring approaches to contribute beneficial data while accounting for sector information needs or resource limitations.	High	
	f) Ensure program data are accessible through public summaries and visualizations, accessible to stakeholders for their own lands, and available for broader studies that will inform future conservation targets and strategies. (see E-10)	High	
	g) Provide print, online, and in-person training resources or materials relevant to program participation to maximize data quality.	Sustain (High)	
	h) Expand participation by volunteers and conservation stakeholders, and provide strategic planning to tailor monitoring approaches according to a group’s expertise,	High	

	information needs, or resources available to conduct monitoring.		
	i) Expand to national scale implementation of the IMMP.	High	
	j) Coordinate the establishment of monitoring protocols with similar efforts in Canada and Mexico as part of the Monarch Knowledge Network	Med	
R-8: Analyze data across scales to detect habitat and population trends **	a) Aggregate and standardize existing data and coordinate analyses, incorporating programs that monitor monarch breeding, migrating and overwintering numbers and survival, as well as habitat attributes.	High	<ul style="list-style-type: none"> ● Integrated Monarch Monitoring Program ● MonarchNet ● The Monarch Knowledge Network (beta website) ● Western Monarch Milkweed Mapper
	b) Improve access to existing data.	Med	
R-9: Improve monitoring apps to increase data collection	a) Develop or improve user-friendly mobile device apps for monarch and habitat monitoring programs, encourage collaborative reporting when possible, and integrate with Integrated Monarch Monitoring Program.	High	<ul style="list-style-type: none"> ● iNaturalist ● JN mobile app ● Monarch Migration mobile app ● Naturedigger: Monarch SOS for iOS ● Unified butterfly recorder (Reiman Botanical Garden (IA) ● USFWS/MJV data entry app for MCSP IMMP ● P2: Insight Citizen Science
R-10: Maintain western overwintering site data collection and dissemination of findings	a) Improve western count database to address data sensitivity issues, improve information sharing, allow third-party data entry, and track habitat assessments.	Med	<ul style="list-style-type: none"> ● Monarch Alert ● Xerces: <ul style="list-style-type: none"> ○ Western Monarch Count Resource Center ○ State of the Monarch Butterfly Overwintering Sites in CA ○ Protecting California's Butterfly Groves ● P2: Monarch Wings Across California (MWAC)
	b) Continue to publish and share resources to get important information into hands of land managers.	Sustain (High)	

Objective 3: Research to improve creation or enhancement of monarch breeding and migrating habitats on different scales.

Strategy	Actions	Ranking	Resources
R-11: Increase understanding of relative habitat quality at the patch and landscape scales using monitoring data	a) On the landscape scale, establish regionally appropriate targets for the spatial distribution and scale of monarch habitat.	High	<ul style="list-style-type: none"> • Tyler Grant/Steve Bradbury (ISU) are looking at monarch movement to build on Zalucki papers (see references). • Desert Botanical Garden: use of monarch habitat by other beneficial species in the Southwest. • IMMP • MJV/Monarch Lab: NRCS and Prairie Restorations Inc. collaboration to research contributions of CRP lands and reconstructed prairies for monarchs (in review) • Paper: Asclepias syriaca (Common Milkweed) flowering date shift in response to climate change (Howard 2018) • TPC: Pollinator habitat evaluation projects • Xerces: Xerces Nectar Plant Guides • Xerces and USFWS Habitat Restoration Quick Guide for Central Valley Farmers (will be completed Spring 2019)
	b) Determine how milkweed and nectar plant diversity, abundance and distribution affect monarch reproduction, survival, and movement at patch and landscape scales.	High	
	c) Assess pesticide exposure risk and effects on monarch performance in different landscape types (e.g. agricultural, rangelands, urban, rights of way, etc.).	High	
	d) Validate assumptions regarding milkweed density in a variety of landscapes or land use types and ensure this information is easily accessible to support land managers in planning.	High	
	e) At landscape and patch scales, document and study use of monarch habitat by other beneficial species.	Med	
	f) Improve understanding of regionally appropriate milkweed and nectar plant species optimal for monarchs.	Low	
R-12: Increase understanding of milkweed propagation and cost-effective habitat establishment	a) Develop regional and sector-based tools to inform when, how, and what resources are needed to best improve existing habitat vs. restore habitat from scratch.	High	<ul style="list-style-type: none"> • ISU research • Monarch Watch, MJV: Growing Milkweed for Monarch Conservation • Monarch Watch: Milkweed Market • TPC studies and resources • USFWS Monarch Conservation Database • Xerces: <ul style="list-style-type: none"> ○ Milkweeds: A Conservation Practitioner's Guide;
	b) At the patch level, study site preparation, seed mix design, planting practices and stand management. Identify practices tailored to regions and habitat types that achieve a) successful establishment, stability, and long-term persistence of patches, and b) optimum milkweed density and nectar source diversity.	High	

	c) Determine best management practices for newly seeded habitat to maximize the rate of milkweed establishment and vigor.	Med	<ul style="list-style-type: none"> ○ Native Milkweed in California: Planting and Establishment
	d) Determine the effects of using plugs vs. seeds regionally, especially for higher cost seeds.	Med	
	e) Identify natural factors that limit milkweed distribution (i.e. elevation, soil, light, latitude, temperature, precipitation) to inform region- and site-specific species lists. For sites that lack milkweed entirely, determine what barriers exist to natural colonization (e.g., lack of local seed source, competition, inadequate soil moisture, or disturbance). Tailor interventions to fit the situation.	Med	
R-13: Leverage benefits of monarch conservation for other issues (See E-5)	a) Identify geographic and human interest overlap with other social and environmental issues and find opportunities to work together for multiple issues in those areas. (See E-5.)	High	<ul style="list-style-type: none"> • Ducks Unlimited: Waterfowl Habitat – The benefits of two key waterfowl habitat types • MJV: <ul style="list-style-type: none"> ○ Conserving More than Monarchs ○ Communications Working Group/NAPPC Monarch Taskforce campaign: More than Monarchs (in progress) • Paper: Pest control and pollination cost – benefit analysis of hedgerow restoration in a simplified agricultural landscape, (Morandin, Long & Kremen 2016) • Paper: Pollinators provide economic incentive to preserve natural land in agroecosystems (Morandin & Winston 2006) • Paper: Regenerative agriculture: merging farming and natural resource conservation profitably (LaCanne & Lundgren 2018) • Paper: Urban Green Space and the Pursuit of Health Equity in Parts of the United States (Jennings et al. 2017) • Paper: Value of urban green spaces in promoting healthy living and wellbeing: prospects for planning (Chee King Lee et al. 2015)
	b) Identify opportunities to integrate monarch efforts with other pollinators and wildlife, water and soil quality, climate change, energy development, and access to nature.	High	

			<ul style="list-style-type: none"> • PF: <ul style="list-style-type: none"> ◦ Saving the Monarch ◦ Upland Habitat Basics • USFS: Grassland Ecosystem Services • WWF: Grassland songbird populations pressured by the plow, 2017
R-14: Improve understanding of social factors influencing monarch conservation. (See E-2 and E-4)	a) Conduct stakeholder analyses, assessing the effectiveness of efforts to engage them.	High	<ul style="list-style-type: none"> • Field Museum Urban Monarch Conservation Guidebook • MCSP: Monarch Conservation Planning Tools • Paper: Restoring monarch butterfly habitat in the Midwestern US: 'all hands on deck' (Thogmartin et al. 2017) • USFWS: USFWS Monarch Conservation Evaluation Plan
	b) Use social research to understand current and achievable adoption rates of habitat conservation action by sector.	Med	
	c) Identify social science research topics relevant to monarch conservation. Focus study in areas where concern is highest and where habitat is needed most.	Low	
	d) Assess organizational structure and processes to determine the most effective methods for collaboration.	Low	
R-15: Establish methods for prioritizing and evaluating sector specific management practices	a) Use GIS modeling to represent suitability of locations (i.e. in ROW areas) for monarch/pollinator habitat on an eco-regional basis, and based on biotic and industry- or sector-influenced factors.	High	<ul style="list-style-type: none"> • EDF: Monarch Butterfly Habitat Exchange • Monarch Highway initiative • Monarch Joint Venture: <ul style="list-style-type: none"> ◦ National Cooperative Highway Research Program grant, Evaluating the Suitability of Roadway Corridors for use by Monarch Butterflies ◦ Rapid assessment of roadsides as potential habitat for monarchs and other pollinators (Cariveau et al. in review) • Paper: Patterns and causes of oviposition in monarch butterflies: implications for milkweed restoration (Pitman et al. 2018)
	b) Compile information needs and research objectives of land management organizations by sector and region and use it to facilitate advancement of those objectives.	High	
	c) Develop research-based cost-benefit analyses for both initial planting and modified maintenance of monarch habitat to support organizational leadership in decision-making.	Med	

	d) Develop and promote regional and sector specific management recommendations (i.e. mowing) for inclusion in habitat management plans to ensure long-term success of habitat projects.	Sustain (Med)	<ul style="list-style-type: none"> • Rights of Way as Habitat Working Group • Farmers for Monarchs and Keystone Monarch Collaborative • Field Museum urban monarch conservation
	e) Work with agricultural universities and rangeland scientists to develop research on rangelands management practices and how they impact monarchs, milkweed, and nectar plants.	Med	

Objective 4: Study the effects of diseases, non-native species, and changing environment on monarchs and their habitat.

Strategy	Actions	Ranking	Resources
R-16: Improve understanding of winter breeding in the U.S., leveraging the support of citizen science volunteers (See E-10)	a) Determine status of non-migratory populations in the U.S. and monitor whether non-migratory behavior is becoming more common and increasing prevalence of <i>Ophryocystis elektroscirrha</i> (O.e.) in those areas.	High	<ul style="list-style-type: none"> ● Monarch Alert ● Monarch Health: Latest Research ● MJV: <ul style="list-style-type: none"> ○ Potential Risks of Growing Exotic Milkweed for Monarchs ○ Webinar: Assessment of Exotic Milkweed and the Spread of Disease in Monarchs ● Paper: Do Some Fall Migrants from the Pacific Northwest Augment Winter Breeding Populations of Monarch Butterflies in Southern California? (James et al. 2018) ● P2: Ecoregion Guides ● USFWS project in southern California to explore non-migratory behavior, contact Samantha Marcum. ● Xerces Society: Nectar Plant Guides
	d) Develop management recommendations to limit year-round breeding of monarchs in CA and the southern U.S., encouraging gardeners and growers not to grow <i>Asclepias curassavica</i> , and promoting diverse nectar plants as an alternative.	High	
	c) Continue to measure the prevalence, species, and management of milkweed in areas where it has potential to grow year-round, particularly in areas near overwintering sites	Sustain (Med)	
	b) Assess the diapause status and condition of migrating monarchs and develop standard, repeatable, non-disruptive protocols.	Low	
R-17: Assess effects of plant pests and diseases, herbivory and non-native species on monarchs and habitat and provide	a) Assess effects of fire ants and fire ant control on monarchs.	High	<ul style="list-style-type: none"> ● MJV Handout: Invasive Species Alert ● MLMP Aphid Activity
	b) Determine impacts of and possible solutions to insect pests and tree diseases, and evaluate qualities of different tree species in overwintering habitats.	High	
	c) Assess impacts, occurrence, spread, and use of different habitats by herbivores (e.g. <i>Aphis nerii</i>) that negatively influence milkweeds.	Low	
	d) Assess <i>Vincetoxicum</i> spp. (e.g. <i>Cynanchum louisea</i> , <i>Cynanchum rossicum</i>) abundance, attempted use by monarchs and possible control methods.	Low	

management guidance	e) Assess impacts of invasive plant species on monarch habitat and disseminate information to the public.	Low	
	f) Assess the extent and impacts of milkweed diseases and provide recommendations for management.	Low	
R-18: Assess impact of weather and climate conditions on monarchs and their habitat **	a) Explore the influence of climate change and other environmental factors on monarchs and their habitat across scales.	Med	<ul style="list-style-type: none"> • MJV: <ul style="list-style-type: none"> ○ Threats – climate change ○ Webinar: Monarchs and Climate Change • Monarch Net: Library – search ‘climate’ • Morris et al. (2015) • University of Texas at San Antonio Biodiversity and Ecological Sustainability Laboratory • WWF: Climate Vulnerability Report • Zipkin, Ries, Oberhauser study of resources and climate under climate change scenarios (in progress)
	b) Design a research program to determine the influence of topography, weather, wind, microclimate, soil moisture, and other abiotic factors on monarch populations and movements in the context of varying land management approaches.	Med	
R-19: Assess effects of chemical additions to habitat on monarchs	a) Use typical timing of application and monarch presence to prioritize research on various chemical effects on monarchs.	High	<ul style="list-style-type: none"> • ISU project studying neonicotinoid use and monarchs, Steve Bradbury. • MJV: <ul style="list-style-type: none"> ○ Risks of Neonicotinoid Use to Pollinators handout ○ Threats: Pesticides webpage • NAPPCC: Vector borne disease control effects on pollinators paper (Ginsberg et al, 2017) • Purdue University project to assess toxicity levels of common agricultural pesticides and other agricultural chemicals on monarch larvae, contact Ian Kaplan • P2: pesticide application training • University of Minnesota Emilie Snell-Rood research on road salts and heavy metals. • U.S. EPA regulations
	b) Study effects of road salt, insecticides, fungicides, herbicides, and fertilizers on monarchs and milkweed (including associations with mycorrhizal fungi) and develop and distribute recommendations for mitigating risks, especially to key stakeholders (pesticide applicators, ROWs, etc.).	High	
	c) Review existing literature on impacts to other similar taxa to determine potential impact of chemical inputs.	High	
	b) Determine exposure level risks based on various factors such as chemicals used, timing and application technique, other environmental factors, etc. and establish recommended buffer distances between habitat and pesticide application based on findings.	High	

R-20: Assess effects of pathogens and natural enemies on monarchs, leveraging the support of citizen science volunteers (see E-10)	a) Track monarch interactions with predators and parasitoids to determine the effects of other natural enemies on population dynamics, and encourage further participation from citizen scientists and partners.	Sustain (Med)	<ul style="list-style-type: none"> ● MJV Webinars: <ul style="list-style-type: none"> ○ Monarch Parasitoids ○ Assessment of Exotic Milkweed and the Spread of Disease in Monarchs ● MLMP: Activity 3 ● Monarch Lab: Publications ● Paper: Migratory monarchs that encounter resident monarchs show life-history differences and higher rates of parasite infection (Satterfield et al. 2018) ● Project Monarch Health
	c) Continue to assess the prevalence of O.e. in monarchs throughout the year, and provide recommendations to minimize spread based on findings.	Sustain (Med)	
	b) Study the prevalence and transmission of monarch pathogens.	Low	
R-21: Assess effects of captive rearing on monarchs	a) Compare the prevalence of disease in wild and captive-reared monarchs.	Med	<ul style="list-style-type: none"> ● Captive Breeding and Releasing Monarchs white paper ● MLMP ● MJV: <ul style="list-style-type: none"> ○ Raising Monarchs: Why or Why Not? ○ Potential Risks of Growing Exotic Milkweeds for Monarchs Project Monarch Health
	b) Support data collection through existing monarch citizen science programs that collect long-term data on disease and parasitism trends.	Sustain (Med)	
	c) Evaluate the effects of captive rearing on monarch fitness (e.g. size, number of eggs laid, flight ability).	Med	
	d) Broadly survey to collect information about the motivation and context for captive rearing, average number of monarchs raised, and rearing conditions.	Low	

Priority 4: Partnerships and collaboration to advance monarch conservation

Strategy	Actions	Ranking	Resources
P-1: Increase available funds for monarch conservation	a) Identify and pursue funding opportunities for priority conservation projects by pairing opportunities with relevant partners and collaborating to develop grant proposals or other funding requests.	High	<ul style="list-style-type: none"> • MJV funded projects • National Fish and Wildlife Foundation – Monarch Butterfly and Pollinators Conservation Fund
	b) Pursue traditional and non-traditional funding opportunities for monarch conservation.	High	
	c) Develop specific project goals, outcomes, and funding needs across Implementation Plan priorities to aid in asking for funding support for those initiatives.	High	
P-2: Expand and leverage partnerships	a) Develop and implement a communication strategy to engage and disseminate information to leaders and key stakeholders not currently active in the monarch conservation community.	High	<ul style="list-style-type: none"> • Keystone Monarch Collaborative: Farmers for Monarchs • MAFWA Mid-America Monarch Conservation Strategy • Monarch Joint Venture • P2: NAPPC Monarch Task Force • Rights-of-Way as Habitat Working Group • WAFWA: Western Monarch Butterfly Conservation Plan 2019-2069
	b) Expand outreach to invite collaboration and partnership with organizations that can contribute to monarch conservation.	High	
	c) Identify underrepresented sectors and audiences in conservation partnerships and cultivate those relationships.	High	
P-3: Improve communications to raise awareness	a) Maintain sector or topic-based working groups or committees to improve coordination and engagement of monarch conservation stakeholders.	High	<ul style="list-style-type: none"> • AFWA Monarch Working Groups • Keystone Monarch Collaborative: Farmers for Monarchs • Monarch Joint Venture: Communications Working Group

and understanding of existing efforts and resources	b) Encourage communications and information sharing between conservation stakeholders to share relevant monarch conservation activities and opportunities for collaboration. (See Education Objectives)	High	<ul style="list-style-type: none"> ● P2: NAPPC Monarch Task Force ● Rights-of-Way as Habitat Working Group
P-4: Quantify and track accomplishments	a) Ensure monarch conservation initiatives are tracked and recorded locally, at the state-level, and nationally through existing tools (i.e. Monarch Conservation Database; Monarch Joint Venture).	High	<ul style="list-style-type: none"> ● MJV Partner Directory (in development) ● HabiTally app ● USFWS: Monarch Conservation Database ● WAFWA: West-wide Crucial Habitat Assessment Tool
	b) Build and maintain a MJV partner directory where efforts can be tracked and shared among the monarch conservation community.	In progress (High)	
	c) Determine standard metrics that are measurable for effort tracking.	Med	
	d) Create incentives and celebrations of accomplishments to not only track progress, but also motivate participation in tracking.	Low	
P-5: Convene efficient, connected and action-oriented meetings to build investment in and partnership around conservation	a) Align meetings with existing plans and efforts to avoid duplicating conversations and efforts.	High	<ul style="list-style-type: none"> ● Monarch Joint Venture annual partnership meetings ● Monarch Conservation Science Partnership (national and tri-national with Western Science Team) ● Sector-based meetings (i.e. ROW as Habitat Working Group, Keystone Monarch Collaborative) ● State and regional planning summits
	b) Bring together diverse stakeholders at a variety of different forums (i.e. conservation conferences, sector-specific meetings, meetings with geographic emphasis (local, state, regional, national)).	High	
P-6: Encourage specific, ongoing	a) Circulate models or examples for conservation commitments by organizations or groups.	High	<ul style="list-style-type: none"> ● Arkansas Monarch Conservation Partnership ● Illinois Monarch Project

and measureable commitments to implement priorities as identified in conservation plans	b) Identify leaders to convene stakeholders or working groups to discuss commitments, barriers, and resource needs to conduct priority activities.	High	<ul style="list-style-type: none"> • Iowa Monarch Conservation Consortium • MAFWA: Mid America Monarch Conservation Strategy • Missourians for Monarchs • Nebraska Monarch and Pollinator Conservation Plan • Ohio Pollinator Habitat Initiative • Okies for Monarchs • TPWD: Texas Monarch Native Pollinator Conservation Plan • WAFWA: <ul style="list-style-type: none"> ○ Western Monarch Butterfly Conservation Plan 2019-2069 ○ West-wide Crucial Habitat Assessment Tool • Wisconsin Monarch Collaborative
	c) Encourage participation and engagement across all levels of decision makers within an organization.	High	
	d) Identify missing voices or perspectives from existing planning efforts and work to meaningfully engage those partners.	High	
	e) Encourage sectors to host meetings that will further engage their stakeholders in participating in monarch conservation. Highlight local champions to share their stories, motivations, and benefits they have experienced through this work.	High	
	f) Establish forums for discussing success stories, and progress towards goals across scales.	Med	
	g) Encourage inclusion of monarch and pollinator work in position descriptions for new hires, and build in monarch/pollinator responsibilities into existing positions.	Med	
P-7: Encourage collaboration with monarch conservation efforts in Canada and Mexico.	a) Participate in trilateral forums for monarch conservation, such as the Trilateral Committee for Wildlife and Ecosystem Conservation and Management, with Canada and Mexico.	Med	<ul style="list-style-type: none"> • Trilateral Committee for Wildlife and Ecosystem Conservation and Management • MJV Partners who work with government agencies, NGOs, citizen scientists, and academia in Canada and Mexico
	b) As appropriate, support collaborative projects that work with Canadian and Mexican counterparts in multiple sectors in the areas of habitat, education, and science.	Med	

Resource Abbreviations

Abbreviation	Organization	Abbreviation	Organization
AFWA	Association of Fish and Wildlife Agencies	Monarch Lab	University of Minnesota Monarch Lab
BBHF	Bee and Butterfly Habitat Fund	MWfM	Make Way for Monarchs
BLM	Bureau of Land Management	NABA	North American Butterfly Association
BMP	Best management practice(s)	NCTC	National Conservation Training Center
BONAP	Biota of North America Plant Atlas	NPGN	National Pollinator Garden Network
CDFW	California Department of Fish and Wildlife	NPS	National Park Service
CEC	Commission for Environmental Cooperation	NPSoT	Native Plant Society of Texas
DBG	Desert Botanical Garden	NRCS	Natural Resources Conservation Service
DoD	Department of Defense	NWF	National Wildlife Federation
DOT	Department of Transportation	O.e.	<i>Ophryocystis elektroscirrha</i>
EDF	Environmental Defense Fund	P2	Pollinator Partnership
EPRI	Electric Power Research Institute	PCA	Plant Conservation Alliance
ERC	Energy Resource Center	PF	Pheasants Forever
EWCL	Emerging Wildlife Conservation Leaders	Prairie Resto	Prairie Restorations, Inc.
FHA	Federal Highway Administration	SWCD	Soil and Water Conservation District
Field Museum	Chicago Field Museum	SWMS	Southwest Monarch Study
IDFG	Idaho Department of Fish and Game	TPC	Tallgrass Prairie Center
IMMP	Integrated Monarch Monitoring Program	TWA	Texas Wildlife Association
IRVM	Integrated Roadside Vegetation Management	USDA	United States Department of Agriculture
ISU	Iowa State University	USFS	United States Forest Service
IVM	Integrated Vegetation Management	USFWS	United States Fish and Wildlife Service
JN	Journey North	USGS	United States Geological Survey
LBJWC	Lady Bird Johnson Wildflower Center	WAFWA	Western Association of Fish and Wildlife Agencies
MAFWA	Midwest Association of Fish & Wildlife Agencies	WDFW	Washington Department of Fish and Wildlife
MAG	Monarchs Across Georgia	WHEG	Wildlife Habitat Evaluation Guide
MCD	Monarch Conservation Database	WMMM	Western Monarch Milkweed Mapper
MCSP	Monarch Conservation Science Partnership	WO	Wild Ones: Native Plants Natural Landscapes
MJV	Monarch Joint Venture	WSU	Washington State University
MLMP	Monarch Larva Monitoring Project	Xerces	The Xerces Society for Invertebrate Conservation

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