

# SD Monarch Conservation and Management Strategic Plan

## Executive Summary

In response to concerns about threats to native pollinators and specifically the potential need to protect the monarch butterfly under the authority of the federal Endangered Species Act (ESA), the Midwest Association of Fish and Wildlife Agencies (MAFWA) committed to coordinating with MAFWA-member states and other partners to address this situation. In addition to a 20-year MAFWA Conservation Strategy, individual states have gathered existing and potential partners to plan for the needs of the monarch butterfly and other native pollinators at state levels.

South Dakota began its monarch planning effort with a South Dakota Monarch Summit in October 2017, which helped South Dakota Game, Fish and Parks (SDGFP) structure a Plan Steering Committee to develop a state monarch strategic plan. The Planning Committee met 5 times to discuss national and state-level issues and ways for South Dakota to realistically contribute to monarch conservation and management needs. This document reflects input gathered at the South Dakota Monarch Summit and additional discussions with Planning Committee members who represented wildlife, public and private land stewardship, extension, research, agriculture, education, and certain road rights-of-ways.

This document presents background information on the monarch's status and conservation challenges, including this plan's context within MAFWA's Conservation Strategy. As with other multi-state efforts, all states must participate at appropriate levels to improve the species' status such that listing under the ESA is unnecessary. As part of that shared commitment, South Dakota's habitat goal is to provide an additional 68 million milkweed stems within a landscape with suitable nectar sources. The origin and information limitations of this goal are described in the plan.

Planning categories for this strategic plan are: general public and private habitat conservation and management; public and private rights-of-way habitat enhancement; urban and municipal lands habitat enhancement; education and outreach; research, monitoring, and data management; and plan assessment. As additional resources are available, this plan will transition to include specific implementation activities with associated deadlines and responsible parties. SDGFP will continue its coordination role in this effort and hopes to benefit from the knowledge of partners with expertise in rural and urban land management, education and outreach, and land management practices compatible with sustainable land use.

## **Acronyms and Abbreviations:**

ACEP – Agricultural Conservation Easement Program  
BMP – best management practice  
CEC – Commission for Environmental Cooperation  
CRP – Conservation Reserve Program  
CSP – Conservation Stewardship Program  
EQIP – Environmental Quality Incentives Program  
ESA – Endangered Species Act  
GIS – geographic information system  
JV – Joint Venture  
MAFWA – Midwest Association of Fish and Wildlife Agencies  
MCSP – Monarch Conservation Science Partnership  
NRCS – Natural Resources Conservation Service  
PECE – Policy for Evaluation of Conservation Efforts  
PFW –Partners for Wildlife (U.S. Fish and Wildlife Service)  
SDGFP – South Dakota Game, Fish and Parks  
SDSU – South Dakota State University  
Service – U.S. Fish and Wildlife Service  
spp. – >1 species; typically refers to all species in a given genus

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## Plan Background

Although the plight of pollinators in North America has caused widespread concern and reiterated the economic and ecological importance of pollinators, two trends have caused recent specific and urgent planning and action. Losses of honeybee hives due to a still uncertain combination of factors have generated grave concern among those who benefit directly and indirectly from this introduced pollinator. Sharp declines in honeybees following introduction of a parasitic mite in 1987 and first reports of a phenomenon called Colony Collapse Disorder in 2006 helped prioritize this issue for a national strategy under President Obama (Pollinator Health Task Force 2015). South Dakota beekeepers produced more than 12% of the U.S. honey crop in 2016 alone, with an economic contribution of more than \$34 million in the same year (SD Dept. of Agriculture 2017).

Declines in pollinators native to North America have caused equal alarm (National Research Council 2007). The identity and variety of pollinating bees, wasps, ants, butterflies, and moths is a mystery to many, but not so with the monarch butterfly. Most people have long known this familiar butterfly, whether we experienced an urban or rural upbringing. Huge migrating concentrations were a familiar sight in South Dakota in recent memory, including the fall of 2018 in portions of the state. Contrast that experience with the review being conducted by the U.S. Fish and Wildlife Service (Service) to potentially add the monarch to the list of species that need protection under the federal ESA.

In 2014, the Service received a petition to list the eastern subspecies of the monarch (*Danaus plexippus plexippus*) as a threatened species under the ESA. This subspecies lives east of the Rocky Mountains, with the western subspecies ranging from west of the Rockies to the Pacific Coast. The Service concluded the petition presented ample justification for a status review prior to the Service issuing its listing determination by June of 2019. Although many dedicated conservationists and scientists have monitored and studied the monarch for decades, the potential federal listing galvanized state agriculture and wildlife agencies, in particular, to prioritize this species for increased attention.

The importance of Midwestern states to monarch reproduction and migration caused MAFWA to assume a key coordination role in voluntary monarch planning activities by the 13 MAFWA states, in cooperation with several states in the Southern Great Plains and northeastern U.S. In addition to facilitating coordination of state wildlife agency efforts, MAFWA is working with other national leaders in pollinator conservation, including the Monarch Joint Venture (JV), National Wildlife Federation, Pheasants Forever/Quail Forever, National Fish and Wildlife Foundation, Monarch Watch and the U.S. Geological Survey. MAFWA recently released the “Mid-America Monarch Conservation Strategy,” a 20-year blueprint to improve the status of the eastern monarch population in its midcontinental range (MAFWA 2018; Figure 1): ([http://www.mafwa.org/wp-content/uploads/2018/07/MAMCS\\_June2018\\_Final.pdf](http://www.mafwa.org/wp-content/uploads/2018/07/MAMCS_June2018_Final.pdf)).

# Monarch Conservation Geographic Priorities and Mid-American Monarch Conservation Strategy Geography



**Figure 1.** MAFWA Monarch Planning Geographies. Source: [http://www.mafwa.org/?page\\_id=2347](http://www.mafwa.org/?page_id=2347)

Although MAFWA has provided important oversight and coordination, monarch planning and program delivery will happen primarily at the local and state levels. Most MAFWA states have hosted Monarch Summits and produced or are developing state monarch (or native pollinator) plans. SDGFP organized a Monarch Summit, held in Mitchell, South Dakota, in October 2017. A variety of groups representing critical partners and industries were invited to a facilitated meeting that included presentations by experts on monarch life history and conservation challenges and offered participants the opportunity to brainstorm strategies to jumpstart the more formal state monarch planning effort (Appendix A). The South Dakota Monarch Conservation and Management Plan provides a strategic framework that will transition to an implementation plan where partners can contribute to completing specific tasks and fulfilling commitments. Input gathered during the South Dakota Monarch Summit will continue to provide valuable information for planning and implementation.

Based on participant willingness to assist with monarch plan development, SDGFP formed a South Dakota Monarch Plan Steering Committee (Appendix B). SDGFP is committed to helping MAFWA meet regional monarch goals, but effective voluntary delivery within the state will depend on involvement of partner agencies, organizations, and individuals, such as educators, gardeners, private organizations, and local communities as well as government entities.

Many potential listing stories have a familiar theme – a species needs a particular habitat that is now rare because of conversion for other uses and/or remaining habitat is degraded because of invasive species or lack of historical disturbance regimes, such as grazing or periodic fires. Female monarchs lay their eggs on various species of milkweed plants (mainly *Asclepias* spp.), and the larvae feed exclusively

on these species The prevailing hypothesis among scientists that is most relevant to South Dakota is that milkweed abundance declines have contributed to monarch population declines since the 1990s. The good news for enhancing monarchs on the breeding ground is that milkweeds often thrive on disturbance and are not typically found in pristine habitats that must be set aside or undergo sophisticated management. When coupled with appropriate nectar sources, this scenario presents many opportunities for enhancement in a variety of ways and places.

### **Plan Purpose and Scope**

South Dakota's monarch plan is designed to work toward long-term sustainability of the monarch butterfly and other native pollinator species by providing a strategic framework for existing and planned conservation activities; by raising awareness of pollinator values to agriculture, ecological processes and quality of life; by providing a platform for information on plant diversity, plant selection and appropriate management tools to meet the needs of all pollinators; and by participating in the MAFWA regional strategy to help restore the eastern monarch population and avoid listing of the monarch butterfly under the federal ESA.

Although efforts to enhance native pollinators are encouraged throughout South Dakota, the emphasis of this plan is on eastern South Dakota or the area east of the Missouri River (eastriver). We consider this area more likely to contribute to conservation goals being established for the North Core Monarch Butterfly Conservation Unit (MAFWA 2018, page 25). Rather than adopting the specific counties outlined in the conservation unit map for emphasis, we have chosen eastern South Dakota as a management emphasis boundary because it is more relevant to the state's geography and related land uses.

This plan is not a standalone source of information on the monarch's life history and conservation challenges. Where appropriate, the reader will be directed to more comprehensive information sources to keep this document concise and state focused. In many cases, these references are websites that are more dynamic than a static plan in the flexibility to incorporate new information. Unless we have state-specific data to offer, we have chosen not to rehash general topics that are explained in detail in numerous regional, national, and international sources.

### **Relevance of Plan to Potential Listing of Monarch**

As mentioned earlier, MAFWA has led state wildlife agencies and other partners in raising awareness of the plight of the monarch to facilitate monarch population recovery and in the process potentially help avoid the regulatory burden of listing under the ESA. The Service will apply its Policy for the Evaluation of Conservation Efforts (PECE) (U.S. Dept. of Interior 2003) to evaluate conservation actions and commitments, such as plans or agreements, for their certainty of implementation and potential effectiveness in removing threats to the monarch. During the listing evaluation process as guided by PECE, the Service will consider regional coordination efforts, individual state plan commitments, and related actions to monitor the species and improve habitat availability. A specific tool for documenting new habitat is a Monarch Conservation Database, developed by the Service, to allow partners to enter habitat practices completed since 2014 and relationship of practices to applicable conservation plans.

Just as state planning is tiered from MAFWA coordination, MAFWA efforts support an international commitment to increase the eastern monarch population such that the average occupied area on the Mexican wintering grounds covers 6 hectares (Pollinator Health Task Force 2015). Several authors have attempted to translate this wintering goal to what is needed on Midwestern breeding grounds

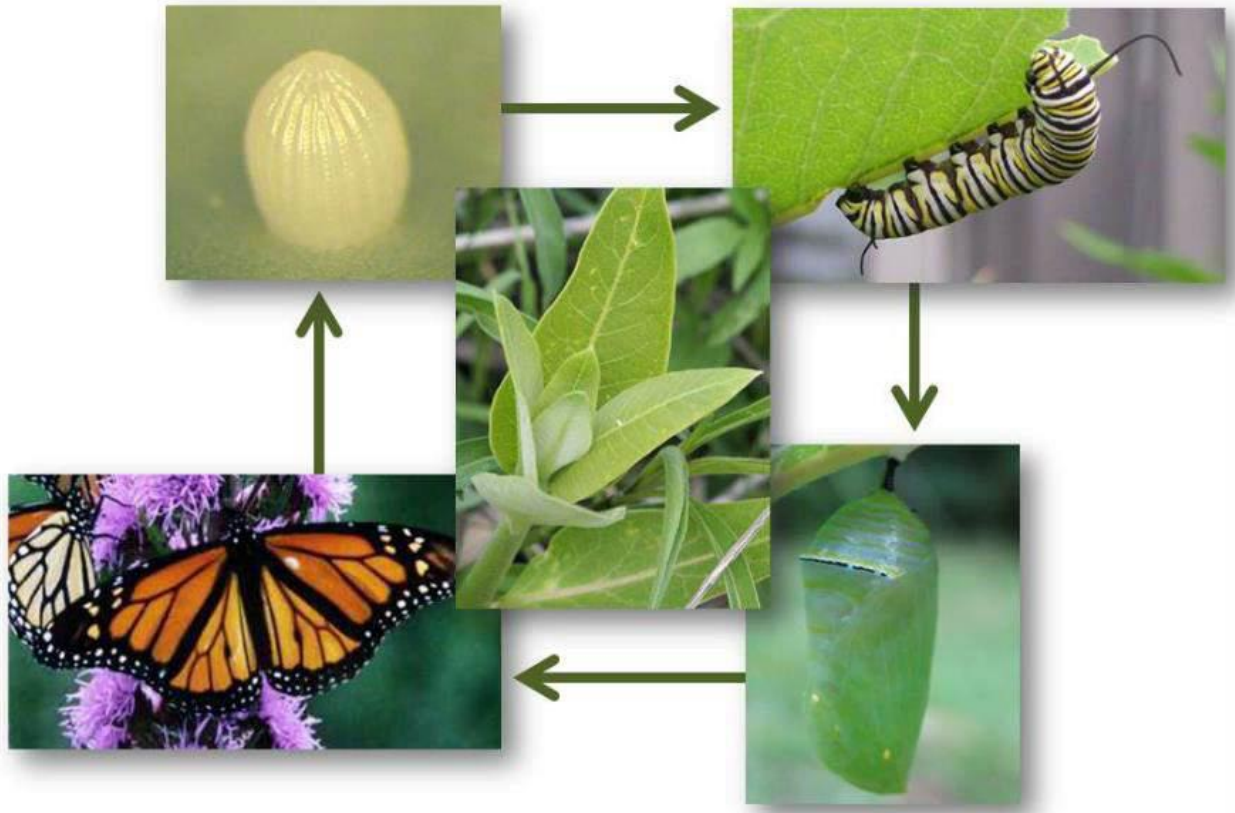
(Pleasants 2017, Thogmartin et al. 2017). While these discussions continue, MAFWA has encouraged its member states to provide specific and realistic 20-year monarch habitat acreage goals to demonstrate commitments that can be evaluated under PECE.

As part of its engagement with MAFWA, SDGFP provided a placeholder goal to add 68 million milkweed stems within a landscape with appropriate nectar sources during the next 20 years. Two numbers helped determine this goal. South Dakota's proportion of acreage within the North Core milkweed emphasis area (Figure 1) is 5.2%, and MAFWA's milkweed stem goal is 1.3 billion additional stems (MAFWA 2018). South Dakota goal's was determined by multiplying 1.3 billion by 5.2%, resulting in 68 million additional stems by 2038. At this time, we lack South Dakota-specific information on the extent of milkweed abundance, distribution across the state, and concentration by land-use types. Given these data limitations, South Dakota will revisit the milkweed stem goal commitment of 68 million additional milkweed stems in 5 years or when additional data allow a more informed estimate that continues to help fulfill South Dakota's responsibility within the broader MAFWA effort. If revised, the new milkweed stem goal will serve as the state's contribution to the overall MAFWA goal for the period ending in 2038.

### **Biological Background**

#### Life History:

The female monarch lays eggs, one at a time, only on milkweed species (*Asclepias* spp.) (Figure 2). Eggs hatch in 3-5 days. The larva (caterpillar) eats milkweed leaves during a 9-13 day development. A caterpillar then forms a chrysalis or cocoon that is attached to various surfaces and not necessarily milkweeds. Following another 8-12 days, the pupa transforms into an adult monarch, completing one generation. Development time from egg to adult can vary with temperature. The adult seeks nectar prior to starting the life cycle again. Typically the fourth generation of the summer suspends development (diapause) before beginning a southward migration to a small, specific area of the Sierra Madre Mountains in Mexico.



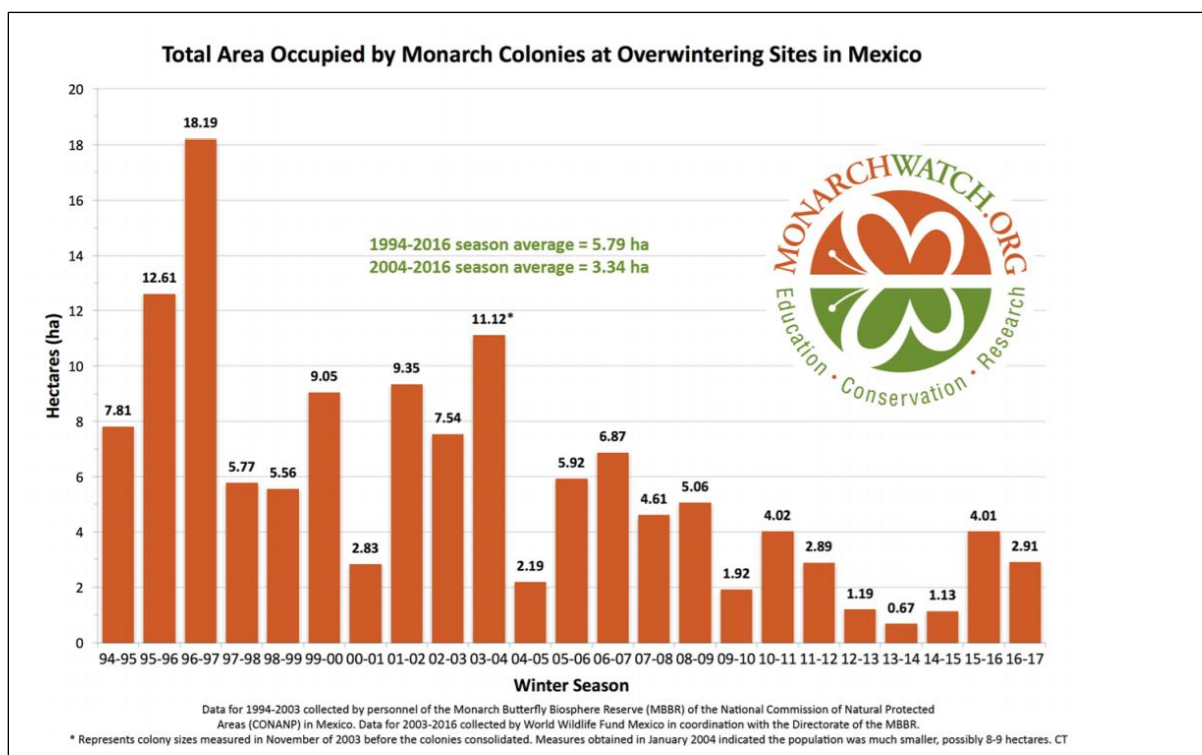
**Figure 2.** Monarch development cycle. Illustration courtesy of Wendy Caldwell, Monarch Joint Venture. Photo credits Michelle Solensky, Denny Brooks, Mary Holland, Dave Astin, and Wendy Caldwell.

Monarchs need suitable shelter and energy-rich nectar for refueling along the way. By February, overwintering monarchs in Mexico begin mating and journeying north. The northward migrants must find milkweeds for egg laying and nectar for energy. Monarchs arriving in South Dakota in the summer are several generations removed from the overwintering generation.

Monarchs rely on milkweeds because they contain toxic chemicals called cardenolides, which protect the plant against foraging by many herbivores. But monarchs can safely ingest milkweeds and in turn take on the toxic properties of the cardenolides, making them unpalatable to many predators.

The overwintering site for the vast majority of eastern monarchs was discovered more than 40 years ago in Mexico's Transvolcanic Belt in the state of Michoacan, approximately 100 miles west of Mexico City. Monarchs congregate in extremely dense concentrations in oyamel fir (*Abies religiosa*) forests found at 10,000 foot elevation. Here they find the suitable microclimate to allow them to avoid getting too cold or too warm. Many of the most critical wintering sites are contained in the Monarch Butterfly Biosphere Reserve (<https://whc.unesco.org/en/list/1290>).

This overwintering concentration phenomenon has allowed estimates of the eastern subspecies of the monarch, a process that is challenging because the concentration density may vary across sites. Wintering population estimates are a critical argument for the need to list this subspecies, as demonstrated by Figure 3.



**Figure 3.** Area occupied by monarch colonies at overwintering sites in Mexico. Figure courtesy of MonarchWatch.org.

For a more detailed description of the monarch’s life cycle and habitat needs, visit the Monarch JV’s website: <https://monarchjointventure.org/monarch-biology/>

**Conservation Challenges:**

The monarch’s life cycle and migratory habits help explain some of its conservation challenges. The female must find milkweed plants on which to lay her eggs, and the host plants must remain long enough for the eggs to hatch and larvae to pupate to the chrysalis stage. Migrating monarchs need nectar sources during their journeys north and south. The fact that wintering monarchs are concentrated in a small area with a specific microclimate makes this period a particularly vulnerable time for the monarch’s eastern population.

The Commission for Environmental Cooperation (CEC; 2008) listed 5 primary categories of factors causing monarch decline:

- Breeding habitat loss and degradation;
- Wintering habitat loss and degradation;
- Disease and parasites;
- Climate change; and
- Pesticide use.

More detail on CEC’s discussion can be found here:

[https://monarchjointventure.org/images/uploads/documents/5431\\_Monarch\\_en.pdf](https://monarchjointventure.org/images/uploads/documents/5431_Monarch_en.pdf)



The Monarch JV uses a similar categorization of conservation challenges for this species, with an added category of “other anthropogenic concerns.” Additional details on the Monarch JV’s review of this topic can be viewed here: <https://monarchjointventure.org/threats>

MAFWA’s discussion of threats to the monarch centered on the five listing factors used by the Service:

- Modification or curtailment of habitat or range;
- Overutilization for commercial, recreational, scientific, or education purposes;
- Disease or predation;
- Inadequacy of existing regulatory mechanisms; and
- Other factors affecting the monarch’s continued existence (MAFWA 2018).

Following an analysis of threats, MAFWA’s conclusion was that an emphasis on increasing and improving monarch breeding habitat is the most effective role for MAFWA states.

The importance of the Corn Belt to monarch recovery is supported by recent research findings. Pleasants and Oberhauser (2013) found a strong correlation between monarch production in the Midwest and the overwintering population in Mexico. They estimated a 58% decline in milkweeds in the Midwest and an 81% decline in monarch production between 1999 and 2010, a time of increased use of glyphosate herbicides and increased planting of genetically-modified glyphosate-tolerant corn and soybeans. During 4 years of surveys, the authors found monarch egg densities on milkweeds in agricultural fields were higher than those on milkweeds in non-agricultural fields by an average factor of 3.89. The authors also found higher egg densities in smaller milkweed patches, with patch size typically smaller in agricultural fields. Following loss of milkweed habitat in agricultural fields, Pleasants and Oberhauser (2013) considered Conservation Reserve Program (CRP) habitat next most important for providing milkweed habitat.

As is true for most wildlife species, lack of information is a significant conservation challenge for managing the monarch and its habitats. Understanding and evaluating threats to wildlife species that have generally discrete breeding, migratory, and wintering habitats is challenging, particularly without specific data. In the case of the monarch’s breeding habitat, few entities have monitored milkweed abundance and distribution through time, made more difficult by the opportunistic nature of milkweed species. Similarly, monitoring monarch populations during breeding and migration is challenging, despite efforts of such citizen scientist programs as Monarch Watch (<https://www.monarchwatch.org/>), the Monarch Larva Monitoring Project ([www.mlmp.org](http://www.mlmp.org)), and Journey North (<https://journeynorth.org/monarchs>). A recent effort called the Integrated Monarch Monitoring Program is designed to monitor monarch populations and habitats in the breeding range by targeting priority monarch blocks (<https://monarchjointventure.org/get-involved/mcsp-monitoring>). Components include milkweed and blooming plant surveys, monarch eggs and larvae surveys, adult monarch surveys, and tracking parasitism and monarch survival. The success of this monitoring effort will depend on availability of agency personnel, funds to contract the work, and willingness of qualified citizen scientists to contribute time and expertise.

## **Strategic Plan Outline**

- A. General Public and Private Habitat Conservation and Management
- B. Public and Private Rights-of-way Habitat Enhancement
- C. Urban and Municipal Lands Habitat Enhancement
- D. Education and Outreach
- E. Research, Monitoring and Data Management
- F. Plan Assessment

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## A. General Public and Private Habitat Conservation and Management

Providing adequate feeding and breeding habitat for monarchs and other pollinators while in South Dakota is the primary concern and overarching desired result of this plan. Monarch butterflies and other pollinators need sufficient habitat available throughout the growing season and throughout their range to complete their life cycles and increase populations. This plan establishes objectives for restoring, enhancing, creating, and managing habitat to achieve this goal. Milkweed and other nectar plants must be added to South Dakota's landscape to meet the special needs of the monarch butterfly and other pollinators.

Excluding open water, eastern South Dakota has approximately 460,000 acres of public lands (SDGFP, unpublished data). This includes the following land ownerships:

- SDGFP game production areas and state park lands
- SD School and Public Trust Lands
- Bureau of Land Management
- U.S. Army Corps of Engineers
- National Park Service
- U.S. Fish and Wildlife Service refuges and waterfowl production areas

Public lands were purchased or designated with various associated purposes and mandates. Just as a private landowner will determine which practices and plantings are compatible with their goals and property uses, public land managers will evaluate pollinator habitat enhancement in the context of other obligations and user expectations.

**GOAL 1:** Conserve, enhance and restore habitat on public and private lands to increase populations of monarch butterflies and other pollinator species.

**Objective 1:** Conserve and manage existing monarch and pollinator habitat and restore, create, or enhance acreage needed to fulfill state milkweed stem goal, containing milkweed and other nectar sources, which support monarchs and other pollinators by 2038.

**Strategy 1:** Use gross determinations of existing milkweed habitat from existing information for initial, short-term work but refine information and scale over time to improve the impact of habitat conservation efforts.

**Strategy 2:** Assess the accuracy of existing milkweed density estimates and develop new estimates tailored to South Dakota to make the South Dakota monarch conservation strategy more efficient and improve the reliability of its outcomes.

**Strategy 3:** Provide and promote best management practices (BMPs) for management of pastures, farmland, lands primarily managed as wildlife habitat, rights-of-way, parks, yards, and gardens. Several practices that manage ground cover could be altered to improve milkweed and nectar plant production and better meet the special needs of pollinators.

**Strategy 4:** Engage communities and their residents in discussions about the role they can play in monarch and pollinator conservation. Help identify opportunities for voluntary habitat conservation and enhancement.

**Strategy 5:** Use Federal and state habitat programs to the maximum extent possible to increase milkweed and nectar plants on private lands. These include, but are not limited to:

- South Dakota Game, Fish and Parks Private Lands Habitat Program
- Farm Bill Conservation Programs
  - Conservation Reserve Program (CRP)
  - Environmental Quality Incentives Program (EQIP)
  - Agricultural Conservation Easement Program (ACEP)
  - Conservation Stewardship Program (CSP)
- USFWS - Partners for Fish and Wildlife (PFW)
- South Dakota Conservation Districts
- Other conservation organizations

**Strategy 6:** Encourage landowners to diversify grassland communities and use cover crops on farmlands to enhance ecology and economics of their operations and benefit pollinators.

**Strategy 7:** Maximize use of public lands in habitat enhancement to benefit monarchs and other pollinators. These include, but are not limited to lands owned or managed by:

- South Dakota Dept. of Game, Fish and Parks
- South Dakota Office of School and Public Lands
- SD Department of Transportation
- U.S. Fish and Wildlife Service
- U.S. Army Corps of Engineers
- U.S. Forest Service
- National Park Service
- U.S. Bureau of Reclamation
- U.S. Bureau of Land Management
- South Dakota public universities
- additional local parks, rest areas, and visitors centers

**Strategy 8:** Identify nurseries and other plant material providers for partnerships to provide appropriate pollinator planting materials.

**Objective 2:** Ensure that agronomists, biologists, and other land management professionals working with landowners are providing information about opportunities to enhance monarch and pollinator habitat. Provide educational materials that cover the benefits of healthy pollinator populations.

**Strategy 1:** Encourage use of local seed sources.

**Strategy 2:** Identify and fulfill specific information needs. Examples include suggested pollinator planting mixes tailored to plot sizes, budgets, locations within landscapes, and geographical areas within the state; seed or plug sources appropriate to the state; and suggested management regimes to establish and maintain pollinator plantings.

## **B. Public and Private Rights-of-way Habitat Enhancement**

A right-of-way is a legal right to allow passage or access through an area for various purposes. This land category includes roads, utility transmission lines, and railroad lines. This category may include lands owned or leased by public agencies, private businesses, or various levels of government. A road right-of-way is only one example of this land category.

A recent research evaluation of the potential importance of roadside habitat to monarchs included transects in east-central South Dakota (Kasten et al. 2016). The authors found milkweed, primarily common milkweed, on about 60% of roadside transects. Although roadside sites had lower mean egg and larvae per plant than relevant data from the Monarch Larva Monitoring Project, a citizen science project, these habitats can contribute to monarch recovery if managed appropriately. Consideration should be given to potential for pesticide drift from nearby agricultural fields, mortality from traffic, and vegetation management practices. The authors found adult monarchs associated with milkweed in roadsides during the breeding season, but not during migration.

Traditional grass monocultures along rights-of-way can be transitioned to pollinator habitat while accommodating human factors and traditional uses, such as diversified recreational uses, grazing and mowing practices, and public safety. Based on the National Land Cover Database of 2011 (<https://www.mrlc.gov/nlcd2011.php>), eastern South Dakota has nearly 800,000 acres in the land cover class of roads, rails, and transmission lines (SDGFP, unpublished data). This acreage is not an exact representation of roads plus associated maintained areas or specific buffer zones around railroads or utility lines.

**GOAL 2:** Use public and private rights-of-way to contribute to pollinator habitat in South Dakota.

**Objective 1:** Determine and summarize extent of current use of pollinator plantings on public and private rights-of-way in South Dakota.

**Strategy 1:** Review past and present pollinator planting plans used in this land category to identify what was effective and lessons learned from ineffective methods.

For example, Monarch JV's website includes various efforts by state departments of transportation to benefit monarchs and other pollinators: <https://monarchjointventure.org/i-am-a/departments-of-transportation>

**Strategy 2:** Identify methods of communication to reach land owners or managers of this land category at the county, township, and other local levels. Use these mailing lists, meeting opportunities, or association contacts to determine the current extent of pollinator plantings and willingness to incorporate such plantings in the future.

**Strategy 3:** Survey land owners, managers, and administrators responsible for habitat maintenance on railroads and utility line corridors to determine their experience with pollinator plantings and willingness to transition to such plantings.

**Objective 2:** Provide recommendations and related best management practices for habitat development and maintenance for this land category.

**Strategy 1:** Identify the most appropriate mowing practices and pollinator planting seed mixes suitable for the various rights-of-way and utility corridor habitats in South Dakota. Determine additional information needs for this land category, such as practices to address weed competition during planting establishment and invasive species issues.

For example, the Monarch JV developed the following guidance: “Mowing: Best Practices for Monarchs”

(<https://monarchjointventure.org/images/uploads/documents/MowingForMonarchs.pdf>)

**Strategy 2:** Identify the most appropriate communication method for this user group to help link them with sources of information and to seek their feedback on methods that have or have not worked for their lands.

**Objective 3:** Identify focal areas for pollinator planting enhancement in this land category, including both high-use areas and other sites spread across the state.

**Strategy 1:** Determine funding needs for new establishment of focal areas and identify potential partners or funding opportunities to address these needs.

**Strategy 2:** Determine suitability of pollinator planting focal areas to serve as seed sources for additional sites.

### C. Urban and municipal lands habitat enhancement

Monarch enhancement presents an opportunity for nearly every land use class to contribute, including urban lands, both large and small. Based on the National Land Cover Database of 2011 (<https://www.mrlc.gov/nlcd2011.php>), eastern South Dakota has 486,000 acres in the “developed” land cover class (SDGFP, unpublished data). Areas in this land cover class range from open space within cities or towns, such as parks and golf courses, to areas with varying combinations of developed area and vegetation.

**GOAL 3:** Use urban and municipal areas to contribute to pollinator habitat in South Dakota.

**Objective 1:** Identify the most effective means of communicating with homeowners to most efficiently target backyard habitats for pollinator plantings.

**Strategy 1:** Identify where and how urban and suburban homeowners are most likely to obtain information for gardening design, plant material sources, and pesticide practices.

**Strategy 2:** Publicize availability of regional gardening guidelines for pollinators until state-specific species lists and guidelines are available.

Example: Xerces Society Monarch Nectar Plants – Northern Great Plains:

[http://www.xerces.org/wp-content/uploads/2016/10/NPlains\\_Monarch\\_Plant\\_List\\_PRINT.pdf](http://www.xerces.org/wp-content/uploads/2016/10/NPlains_Monarch_Plant_List_PRINT.pdf)

**Strategy 3:** Avoid information overload on the topic of plant selection by developing suggested planting mixtures based on readily available plant material sources, likelihood of success, and in combinations that will accommodate pollinator needs through multiple seasons.

**Strategy 4:** Determine the best use of local Master Gardeners and garden clubs, entities that receive many requests each year for a variety of gardening and extension needs.

**Strategy 5:** Work with local gardening centers and arboretums to facilitate sharing of credible information on pollinators and their habitat needs. Assist with plant selection or guidance, if requested.

**Strategy 6:** Share relevant information regarding impacts of excessive annual mowing to monarchs.

**Objective 2:** Identify the most effective means of communicating with owners and managers of city and municipal park lands, bike trails, zoos, school grounds, and other open spaces to encourage pollinator plantings.

**Strategy 1:** Obtain funding for competitive grants to establish demonstration sites on these lands, including follow up maintenance by successful applicants and appropriate interpretive signage and recognition. Encourage use of successful plantings for seed collection for additional sites.

**Strategy 2:** Use free seed pack distribution sparingly to avoid unrealistic expectations.

**Strategy 3:** Establish communication with local leaders, recreation departments, school boards, and community associations to spread the word about pollinator needs and the importance of partnerships.

**Strategy 4:** Publicize the National Wildlife Federation's Mayors' Monarch Pledge:  
<https://www.nwf.org/Garden-For-Wildlife/About/National-Initiatives/Mayors-Monarch-Pledge.aspx>

**Objective 3:** Maximize higher populations in urban areas to recruit citizen scientists to contribute data to projects that monitor pollinators and pollinator plants.

**Strategy 1:** Link teachers with relevant lesson plans on monarchs and pollinators in general. Refine existing curricula that are not relevant to South Dakota.

**Strategy 2:** In addition to established monitoring programs, encourage data collection and reporting on local topics, such as pollinator phenology, pollinator planting successes or failures, and other lessons learned.

**Strategy 3:** Identify and facilitate training and information needs.



## D. Education and Outreach

**GOAL 4:** Use enhanced awareness to increase conservation actions and support for monarchs and other pollinators

**Objective 1:** Identify specific methods matched with user groups to raise awareness about monarchs and other pollinators and their habitats

**Strategy 1** – Use social media, including partner’s web pages, printed materials, television and radio broadcasts to inform the public about monarch population and habitat declines and related topics.

**Strategy 2** – Increase public awareness about the following topics through a variety of media, such as radio, mailers/brochures, social media, newspaper and more through existing partnerships (SD GFP, SDSU Extension 4-H, Pheasants Forever, etc.) to be distributed in late winter early spring each year for 5 years:

- a. Insecticide use around the home - unintended consequences
- b. Establishing waystations and species mixes and considerations
- c. Techniques for the novice gardener (written with master gardeners)

**Strategy 3** – Develop a landing page on the GF&P web site with “near real-time” information (from Monarch JV web site, etc.) with breaking information on population status estimates, etc., and that partners can link their web sites to.

**Objective 2** – Provide farmers and ranchers with accurate technical information on the potential consequences of pollinator species being listed under the ESA, and on conserving and enhancing pollinator habitat.

**Strategy 1** – Develop or distribute existing suitable fact sheets and other printed reference materials and conduct workshops for producers on:

- a. Habitat needs of monarchs and other pollinators
- b. Means of minimizing impacts of pest control on monarchs and other pollinators
- c. Government programs that support pollinator habitat restoration and enhancement
- d. Holistic management techniques for farm and ranch lands that increase plant diversity and pollinator habitat health
- e. Mentors/resources for interested producers

**Strategy 2** – Host public meetings and help sponsor partner education events on means of enhancing and creating pollinator habitat quarterly or bi-annually for two years and upon request after two years.

**Strategy 3** – Work with NRCS, SDSU Extension, and the agribusiness community to develop and promote pollinator friendly cover crop mixes, and economic information on how to use these mixes in crop rotations to meet the annual needs of pollinators and improve soil health.

**Strategy 4** – Develop website content tailored to producers with information on at risk pollinators to be particularly concerned about in their area, means of enhancing pollinator habitat including holistic ranch and farm management, modified pest management strategies

(chemicals to use, application rates, application methods, to minimize adverse impacts, and other items listed above, including available information on economic impacts of alternative management practices). Link website content to appropriate existing websites.

**Objective 3** – Ensure that agronomists, biologists, and other land management professionals working with landowners are providing information about opportunities to enhance monarch and pollinator habitat. Provide educational materials that cover the benefits of healthy pollinator populations.

**Strategy 1** – Host workshops for conservation and agribusiness professionals

**Objective 4** – Work with appropriate partners to produce, disseminate and implement the above information.

**Strategy 1** – Reach out to the agribusiness industry for financial support on education and communication, and to encourage the development of pollinator-friendly products.

**Objective 5:** Identify and use networks of state agencies, federal agencies and other stakeholders (public, private, academic, etc.) more effectively to further monarch/pollinator conservation.

**Strategy 1:** Encourage use of Monarch Conservation Database to share habitat project information and outlets such as iNaturalist and other citizen science data bases by including the information on the education brochures, social media, and other venues listed in Objective 1.

**Strategy 2:** Promote and acknowledge the efforts of all participating agencies/groups by using their logos on materials produced.

**Strategy 3:** Improve and expand citizen science efforts (monarch tagging, milkweed tracking, butterfly and milkweed surveys) by including the information in all new monarch materials produced.

**Strategy 4:** Involve educational entities, such as the SD Dept. of Education and the South Dakota Science Teachers Association to encourage relevancy and compliance with state education standards.

**Objective 6:** Use interpretive displays to promote pollinator conservation at sites with extensive public visitation, such as university campuses, SDGFP Outdoor Campus East and Outdoor Campus West, public rest areas, and other high public-use areas.

**Strategy 1:** Use pollinator plantings at areas with extensive public visitation as focal points for sharing educational messages about pollinator habitat needs.

**Strategy 2:** Incorporate materials that are easy to download or link to, including appropriate social media methods.

## **E. Research, Monitoring and Data Management**

Despite the monarch's widespread distribution and familiarity to many people, wildlife agencies lack important information needed to better understand and enhance the species and its habitats. Research and evaluation prescribed under Goal 5 should be conducted in coordination with other MAFWA states that have habitats similar to South Dakota to increase the reliability and utility of outcomes. See Objective 5 for potential South Dakota-specific tasks that could contribute to a broader, regional evaluation of research needs.

**GOAL 5:** Use the best biological information to enhance monarchs and associated habitats in South Dakota.

**Objective 1:** Estimate current milkweed acreage in South Dakota (see Goal 1, Objective 1, Strategy 2)

**Strategy 1:** Form a subgroup of botanists, land managers, and GIS specialists to evaluate potential milkweed acreage estimation methods.

**Strategy 2:** Test potential acreage estimation methods, including components that relate milkweed stems to land types, such as rangeland, cropland, rights-of-way, etc. and known disturbance patterns.

**Strategy 3:** Implement chosen acreage estimation method to determine baseline acreage in eastern South Dakota.

**Objective 2:** Determine the most appropriate monitoring protocols for breeding monarchs and associated habitats in South Dakota based on cost and likelihood of implementation

**Strategy 1:** Consult with species and habitat experts, statisticians, and personnel in other states to determine potential monitoring protocols based on information needs

**Strategy 2:** Consult with GIS specialists to determine potential remote sensing options for habitat monitoring

**Strategy 3:** Test and evaluate potential monitoring protocols, including the Integrated Monarch Monitoring Program

**Objective 3:** Implement the selected monitoring protocols for breeding monarchs and associated habitats

**Strategy 1:** Identify funding sources to implement monitoring

**Strategy 2:** Solicit assistance of citizen scientists and/or suitable consultants

**Strategy 3:** Prepare data collection protocols and conduct necessary in-person training or a suitable remote alternative

**Strategy 4:** Establish data management systems for data entry or customize an existing citizen science program such as iNaturalist

**Strategy 5:** Evaluate whether the US Fish and Wildlife Service’s Monarch Conservation Database is a suitable tool for keeping track of new monarch/pollinator habitat; if not, create an alternative for South Dakota

**Strategy 5:** Conduct monitoring protocols for monarchs and habitats for a 5-year cycle, evaluate, reassess feasibility and make needed adjustments

**Objective 4:** Monitor monarch migration in South Dakota

**Strategy 1:** Encourage participation in Journey North/Monarch Watch reporting and increased number of Monarch Waystations

**Strategy 2:** Identify and address shortcomings in existing citizen science opportunities, such as gaps in coverage within the state

**Strategy 3:** Develop convenient reporting method for monarch concentrations for people who choose not to participate in an established citizen science program

**Strategy 4:** Evaluate whether to promote increased emphasis on tagging and tracking monarchs in the state

**Objective 5:** Identify and prioritize a list of research priorities for the monarch and its habitats in South Dakota to meet short-term and long-term information needs

**Strategy 1:** Compile pertinent scientific literature related to monarchs and milkweed in the Northern Great Plains

**Strategy 2:** Convene a subgroup of researchers and naturalists to brainstorm South Dakota-specific research needs for the monarch

**Strategy 3:** Consult with botanists; private, public and tribal land management specialists; and master gardeners to determine South Dakota-specific research needs for milkweed species and pollinator habitat enhancement

**Strategy 4:** Determine system for prioritizing research needs for monarch and milkweed; match highest priorities with potential funding sources and partners

**Strategy 5:** Regularly revisit list of research priorities as research is conducted in South Dakota or in other applicable geographical areas

**Strategy 6:** Ensure that pertinent research findings are publicized and shared appropriately

**Strategy 7:** Evaluate through use of expert opinion or field research whether existing best management practices for land management are applicable to South Dakota

## **F. Plan Assessment**

**GOAL 6:** Allocate necessary resources for plan coordination to allow meaningful assessment and appropriate course corrections

**Objective 1:** Identify a monarch plan coordinator for the first 5 years of plan implementation

**Strategy 1:** Identify potential funding sources and partners to fund plan coordinator. Example: State Wildlife Grant funds available to SDGFP with nonfederal partners assisting with the required match to fund a native pollinator planning coordinator for a five-year term

**Strategy 2:** Refine partner and public engagement through this consistent individual/presence

**Strategy 3:** Provide annual updates on monarch/pollinator activities through the established website, including a running list of accomplishments sorted by plan objectives and strategies

**Strategy 4:** Conduct a five-year evaluation of plan progress resulting in a cumulative accomplishments report and revised plan reflecting accomplishments and new or revised priorities

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**Appendix A. South Dakota Monarch Summit Materials, including agenda, participant list, highlights, and notes from brainstorming sessions**

**AGENDA**

**South Dakota Monarch Summit - October 18-19, 2017**

*Highland Conference Center (2000 Highland Way, Mitchell, South Dakota, 57301)*

**Day 1, Wednesday October 18th**

**8:00**     *Registration Opens*

**8:30**     **Welcome** (Tom Kirschenmann, SDGFP)

**Introductions**

**Monarch Science & Conservation Status Overview**

- **Wendy Caldwell** (Coordinator, Monarch Joint Venture)
- **Claire Beck**, Monarch Technical Coordinator, Midwest Association of Fish and Wildlife Agencies

**10:00**     *BREAK*

**10:10**     **Local Conservation Landscape Highlights: programs, projects, partnerships**

- NRCS (Jeff Zimprich)
- Pheasants Forever / Quail Forever (Matt Morlock)
- Game, Fish and Parks (Mark Norton)

**Circling Back** (Eileen Dowd Stukel, SDGFP); identifying roles in state monarch planning

**Mapping the Territory: Existing South Dakota Monarch Habitat Projects & New Opportunities** (*opportunity for all participants to briefly share on relevant work*)

**12:00**     *LUNCH (on your own)*

**1:30**     **Envisioning Success: What's Our Cover Story?**

**2:45**     *BREAK*

**3:00**     **Path Assessment: How do we move from here to there?**

**5:00**     **Reception** (ends at 7:00)

**Day 2, Thursday October 19th**

**8:00**     *COFFEE*

**8:30**     **Welcome & Morning Reflections**

**State Strategy Development: Sector Group Break Outs**

**10:15**     *BREAK*

**State Strategy Development: Implementation Support Break Outs**

**Next Steps & Closing Reflections**

**1:00**     *END*

South Dakota Monarch Summit Participant List; October 18-19, 2017

Group category	Organization	Group Representative
wildlife conservation	Midwest Assoc. of Fish & Wildlife Agencies	Claire Beck
wildlife conservation	Monarch Joint Venture	Wendy Caldwell
wildlife conservation	Pheasants Forever	Matt Morlock
wildlife conservation	Pheasants Forever	<b>Isaac Full*</b>
wildlife conservation	SD Wildlife Federation	<b>Chris Hesla*</b>
wildlife conservation	The Nature Conservancy	<b>Joe Blastick*</b>
wildlife conservation	U.S. Fish and Wildlife Service	Jesse Lisburg
wildlife conservation	U.S. Fish and Wildlife Service	<b>Charlene Bessen*</b>
wildlife conservation	U.S. Fish and Wildlife Service, refuges	Connie Mueller
wildlife conservation	USFWS, wetland mgt. district	Kyle Kelsey
wildlife conservation	Natural Resource Conservation Service (NRCS)	<b>Jeff Zimprich*</b>
wildlife conservation	NRCS	Jeff VanderWilt
wildlife conservation	NRCS	Karl Anderson
wildlife conservation	SD Game, Fish and Parks (SDGFP)	Thea Ryan
wildlife conservation	Outdoor Campus	Kathy Anderson
wildlife conservation	SDGFP Outdoor Campus	Mark Norton
wildlife conservation	SDGFP	Casey Heimerl
wildlife conservation	SDGFP	<b>Eileen Dowd Stukel*</b>
wildlife conservation	SDGFP	Tom Kirschenmann
wildlife conservation	SDGFP	Jen Nuncio
wildlife conservation	SDGFP	Chris Goldade
wildlife conservation	SDGFP	Carey Egeland
wildlife conservation	SDGFP	Josh Cleveland
wildlife conservation	SDGFP	Paul Coughlin
wildlife conservation	SDGFP	Jordan Purinton
wildlife conservation	SDGFP	Emmett Keyser
wildlife conservation	SDGFP	Adam Sedivy
wildlife conservation	SDGFP	Brad Schutt
wildlife conservation	Great Plains Zoo	Amanda Cronberg
wildlife conservation	Great Plains Zoo	Lisa Smith
wildlife conservation	Blue Dasher Farm	Sarah Bond
wildlife conservation	Audubon Dakota	Josh Lefers
wildlife conservation	Audubon Dakota	Sarah Hewitt
gardening/beautification	SD Master Gardeners Assn.	Arlene Brandt-Jenson
gardening/beautification	SD Master Gardener	Gloria Bauske



gardening/beautification	SD Master Gardener	Deb Johnson
gardening/beautification	SD Master Gardener	Bonnie Lynch
gardening/beautification	SD Master Gardener	Glenda Heckenlaible
gardening/beautification	SD Horticulture Society	Sharon Rex
gardening/beautification	SD Horticulture Society	Glenda Oakley
gardening/beautification	SD Dept. of Transportation	<b>Craig Olawsky*</b>
private and tribal lands	Sisseton Wahpeton Oyate	Sean Core
	Lower Brule Sioux Tribe	Joel Bich
public lands	U.S. Forest Service	Dan Svingen
agriculture	SD Dept. of Agriculture	Ann Juette
agriculture	SD Dept. of Agriculture	Tom Gere
	SD State University	<b>Pete</b>
agriculture	(SDSU) Extension	<b>Bauman/grasslands*</b>
		<b>Amanda</b>
agriculture	SDSU Extension	<b>Bachmann/entomology*</b>
		Pat Wagner/range
agriculture	SDSU Extension	entomology
agriculture	SD Farm Bureau	<b>Lowell Mesman*</b>
	SD Specialty Producers Assn.	Kim Brannen
agriculture	SD Association of Conservation Districts	<b>Jack Majeres*</b>
agriculture	SD Cattlemen's Assn.	Shirley Thompson
agriculture	SD Grassland Coalition	Rex Johnson
agriculture	SD Agri-Business Assn	<b>Kathy Zander*</b>
agriculture	SD Agri-Business Assn	Paul Luetjen
		Jeff Cleveland, board member
agriculture	SD Agri-Business Assn	Mari Biehl (registered but unable to attend)
K-12 education	SD Science Teachers Assn.	
	naturalist/educator/319 project coordinator	Dennis Skadsen
Other		
*Summit Steering Committee member		

## South Dakota Monarch Summit Highlights

SDGFP began coordinating a South Dakota Monarch Summit in August 2016 by inviting other partners to participate on a Summit Planning Team (see table below). The summit was sponsored in part by the National Wildlife Federation and built on experiences from other state monarch/pollinator summits. The desired number of participants was a maximum of 75.

<b>entity</b>	<b>representative</b>
SD Wildlife Federation	Chris Hesla
SD Dept. of Agriculture	Jodi Bechard
SD Game, Fish and Parks	Eileen Dowd Stukel
US Fish and Wildlife Service	Charlene (Charlie) Bessken
SD Dept. of Transportation	Tom Lehmkuhl Craig Olawsky
Pheasants Forever	Isaac Full
SD Assoc. of Conservation Districts	Jack Majeres
South Dakota State University	Amanda Bachmann
South Dakota State University	Pete Baumann
The Nature Conservancy	Joe Blastick
NRCS	Jeff Zimprich
SD Farm Bureau	Lowell Mesman
SD Agri-Business Association	Kathy Zander

An invitation list was drafted following a brainstorming session by a subset of the Summit Steering Committee. The list included potential participants representing wildlife conservation, agriculture, gardening and beautification, private and tribal lands, public lands, K-12 education, and a miscellaneous category. Sixty individuals and 2 invited speakers participated in the summit, which followed a similar format as others facilitated by Brooking Gatewood of Ag Innovations.

### Meeting Objectives:

1. Build a shared understanding of what success is for the collaboration.
2. Learn about latest science and existing recovery efforts in Midwest/SD.
3. Refine understanding of scientific gaps and habitat challenges faced in the state.
4. Set priority actions and timelines for monarch recovery efforts in SD.
5. Lay the foundations for a holistic coordinated statewide plan for supporting monarchs and other pollinators.

Presentations by Wendy Caldwell, Monarch JV and Claire Beck, MAFWA, laid the biological foundation for understanding the monarch's current situation. A panel of representatives from NRCS, Pheasants Forever and SDGFP described current pollinator activities by these entities and included a discussion of related challenges: importance of Farm Bill engagement related to crop insurance and CRP, bringing grazing into soil regeneration strategies on marginal lands, and managing invasive species, such as Canada thistle.

Group exercises included "What Monarchs can learn from elephants" and "Mapping the Territory," where participants indicated what monarch-related work is already happening in the state, sorted by sectors. The next group exercise was to collectively brainstorm a "cover story" describing what South Dakota monarch success looks like. Cover story themes and key priorities:

- Monarchs as keystone/flagship species
- Collaboration
- Double-consequences/win-wins
- Increased native habitat key to solution

- Land use diversification
- Improving Mgmt. re: spraying, rotation...
- Landowner education, key partners – benefit to land profitability
- Interactive/engaged education/training; bridging rural-urban gap, education for ALL
- Increased tourism
- Voluntary efforts
- Reframing how we view milkweed (not weed)
- Monitoring as essential (monarchs, habitat, effort effectiveness); insect expertise
- Testing assumptions in our plan – adaptive plan
- Financial support for habitat
- Long-term commitment

#### South Dakota Monarch Conservation Priorities:

Recognizing that monarchs serve as a keystone and flagship species for the preservation and expansion of habitat for pollinators and other critters, we have the following draft strategic priorities for Monarch conservation in the state of South Dakota:

1. We prioritize protecting and enhancing monarch & pollinator habitat in ways that are:
  - a) Voluntary
  - b) Collaborative
  - c) Multi-benefit 'win-win's for monarchs / other key stakeholders (farmers/ranchers, tourism...)
  - d) Integrating incentive-based land management options where possible (utilizing both government programs and financially sustainable management options for working lands)
  
2. All age, all-sector, interactive education and culture change efforts that:
  - a) Shift how milkweed is seen and managed to benefit both pollinators and landowners
  - b) Showcases the shared value of ecological services / benefit to this work (quality of life!) (what are / value of pollinators)
  - c) Spread management practices that bolster land use diversification and native habitat
  - d) Helps increase awareness and action on this issue and expands our network of advocates
  
3. Monitoring and adaptive management planning for long-term success:
  - a) Bring in expertise / best research/practice
  - b) Track changes in monarch habitat and other implementation activities
  - c) Continually test assumptions and adjust course as new information is available

The remainder of the summit included breakout strategy groups by sector and support groups. Sector groups were agriculture and rural private lands, public and protected lands, utilities/rights of way, and urban and municipal lands. Support groups were outreach and education, monitoring and data management, collaboration and governance, and funding and implementation. Each category had short term and longer term priorities generated by these breakout sessions.

The summit ended with each participant leaving a note indicating their interest in participating in work groups and ideas for additional entities that should be included in or informed of this effort.

## **Additional input generated at South Dakota Monarch Summit, October 2017, Regarding State Strategy Development Using Sector and Support Group Breakouts**

Small-group brainstorming was done for 4 sector groups and 4 supporting groups.

Sector groups:

1. Ag & rural private lands
2. Public and protected lands
3. Transportation & utilities rights-of-way
4. Urban/municipal

Questions for each sector group:

1. What are the low hanging fruit easy actions/quick wins to increase habitat in the state?
2. What are some of the more difficult but crucial actions that we should plan to achieve?
3. What other goals are important but lower probability and/or not crucial for success?

Support groups:

1. Research, monitoring & data management
2. Outreach and education
3. Collaboration & governance
4. Fundraising and implementation

Questions for support groups are found at the beginning of each group's transcribed notes.

Instructions from facilitator:

For each group, in addition to the questions below, close with a discussion of the following:

Timeline. What are the key support actions and next steps (1 year)? The longer term actions (2-5+ yrs.?)

Work Groups. Who might be a good person(s) to lead working groups to work on finalizing and implementing this section of the plan? Who else might we invite to participate?

These notes were transcribed as they were offered at the summit, with a few exceptions where the recorder's handwriting could not be deciphered.

## **AG. AND RURAL LANDS SECTOR GROUP**

### **1<sup>st</sup> year actions:**

- spraying; management practices – need more data regarding usage
- mowing practices? Better guidance on timing
- EQIP/CSP – cover crop guidance to help pollinator support
- buffer strip law? Dept. of Revenue

### **Outreach**

- ag. commodity groups state meetings (Nov-Feb)
- WIIFM
- conservation groups: \$\$, quality of life, soil health
- policy changes/additions
- ESA awareness – keep it off; voluntary action
- specific communications – target pollinator-specific habitat information
- NRCS – Voices for Soil Health
- Define what is your role; highlight success stories; have a champion; demo what they have done, how to make those changes; partner and respectfully communicate actions
- Grassland Coalition – taking advantage of current tours with pollinator addition
- science gap needs to be filled; habitat/specificity of milkweed species
- NRCS resources for pollinators/monarchs
- collaboration between agencies reduces siloing of information/activities
- clearing house for information and activities
- state-specific local information/contact
- online access, but best practices in hard copy
- specific contact person
- Grassland Coalition partner for monarch themed commercial
- focus on non-producing crop areas/riparian; integrate into existing species; grazing enhancements
- Farm Bill – funding for seed-habitat

### **2-5+ year goals and actions:**

- Iowa Candidate Conservation Agreement with Assurances – exemption for actions already taken if species is listed under ESA
- clarifying practical habitat ideas (small acreages, schools, etc.)
  - # of plants
  - type
  - closeness
  - which variety is the best for plantings
  - biological control/physical control
- need a pollinator specialist with Board of Regents; need lobbying for position
- reliable and affordable seed source; need to manage expenses
- secure grant or funding; ex: from MBCF, National Fish and Wildlife Foundation; Prairie Resource Center
- ensure that monarch is not listed under ESA
- monitoring – collecting data on how monarchs are using habitat; which habitats are the most successful within ag. systems

### **Work groups:**

- SDSU
- chemical companies
- commodities
- grazing
- government groups

**Other key partners:**

- local ag. retailers
- Grasslands Coalition
- Ag. Retailers Association
- SD Cattlemen's Association
- Farm Bureau
- Corn/Beans/Wheat/Sunflowers
- reps. for ag. products/crop consulting agencies
- Carter Johnson – SDSU
- Todd Mortenson, Hayes, SD
- NRCS – Voices of Soil Health
- GFP; government agencies

**Other notes:**

- acreage goal – 5-year goal in stems – 1.5 million enhance acres
- over 20 years – no net loss of milkweed-rich habitat
- enhance current 1.5 million acres to facilitate pollinators

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## **PUBLIC AND PROTECTED LANDS SECTOR GROUP**

### **1<sup>st</sup> year actions:**

- encourage not mowing existing monarch habitat areas until after Sept. 1
- educating state parks about developing new pollinator habitat (milkweed)
- outreach & education for encouraging “spot spraying”
- encourage interseeding of monocultural grass stands
- start a campaign to collect milkweed seeds
- let a field go fallow
- public education on public lands “change”
- educate other parks and public levels of government (ex: city parks, county fairgrounds)
- encourage more milkweed into pollinator plots
- catalog existing monarch habitat sites
- educate seasonals better on weed control
- define monarch/pollinator habitat (native? annual?)
- collaborate/visit with SD School and Public Lands

### **2-5+ year goals and actions:**

- monarch information billboard (I-90 and I-29) about milkweed and pollinators
- secure dedicated funding
- identify and maintain pollinator habitat
- encourage biocontrol
- work with legislators to redefine noxious weed law
- double acres of pollinators in public land
- timely field trips and programs for legislators to pollinator plots and native/diverse native prairie
- identify a strategic monarch habitat area/corridor; South Dakota “Monarch Highway”
- monitor existing monarch/milkweed habitat for eggs/caterpillar usage
- active management of existing public lands (burning, enhancement, etc.)

### **Other notes:**

- goal for milkweed (1.3 billion total for U.S.)
- strategically double pollinator habitat in eastern South Dakota on public lands within 20 years
- we feel we cannot set a “stem” goal

### **Work groups:**

- legislators
- SD park naturalists
- SD Parks and Recreation Association
- tribes
- U.S. Fish and Wildlife Service
- The Nature Conservancy
- GFP
- NRCS
- USDA
- SDSU Extension

### **Other key partners:**

- Monsanto
- fish and game clubs
- Master Gardeners
- Pheasants Forever
- NGOs
- public/community supper

- landowners
- SD School and Public Lands

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## TRANSPORTATION & UTILITIES RIGHTS-OF-WAY SECTOR GROUP

- different types of rights-of-way
  - interstate highways
  - state highways
  - utilities
  - pipelines
  - county rights-of-ways
  - weed/pest board
  - rest areas
  - rural water systems
  - wind farms
  - cell towers
- other key partners:
  - SD Beekeepers
  - seed companies (like Millborn)
  - Dakota Lakes Research
  - 2 people at DOR decide seed mix (erosion control office)
  - county commissioners
  - RTC
  - REC
  - Western Area Power Administration
  - wind farms
  - cell towers
- Education – what knowledge gaps and perceived barriers to changing how ROWs are managed
- Need to reach out to different states
  - check w/IRUM staff in Iowa so we learn from their mistakes & don't reinvent the wheel
- work within legal restraints

### **1<sup>st</sup> year actions:**

- develop species lists (plant heights, native, flowering times) for specific applications (roadside vs. pipeline)
- native and nonnative (alfalfa)
- meetings with ROW agencies
- what did Iowa experience?
- link with existing habitat group (Rights-of-way as Habitat – Chicago)
- change some laws
  - start conservation
  - Governor's habitat group
  - mowing date
  - noxious weed law
  - tax laws for ROWs
- test plots – results and monitoring
- annual meeting of county commissioners
- investigate roadside parks - management

### **2-5+ year goals and actions:**

- develop program to establish pollinator buffer zones in riparian areas
- tax abatement for ROWs
- fill in knowledge gaps
  - best species
  - value of species
  - overcome preconceptions on ROW management

- repurpose Weed/Pest Board
- continue to change laws
- every rest area will have a pollinator plot
- Governor's decree
- some areas are suitable for some species (i.e. height, drought)
- DOT test plots
- Lady Bird Highway Project (how did that work?)
- Safety and haying
  - snow drifting – True? Check with Illinois ROW group
  - wildlife
  - mow in October
- old roadside parks
- milkweed varies across the states
- milkweed acres
- nectar plant acres

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## URBAN/MUNICIPAL SECTOR GROUP

### 1<sup>st</sup> year actions:

- Mayor's Monarch Pledge and monarch waystation participation (new and existing gardens)
- approach every city council in SD about waystations; identify funding opportunities
- ask city to include PPE into mosquito control
- Living Landscapes update
  - garden & pollinator info.
  - copies for events
  - management best practices
- awareness of value of urban conservation
- management practices changes along waterways in cities
- monarch lesson plans for teachers
- calendar of events and get booths there
- local PSA marketing

### 2-5+ year goals and actions:

- changes to city ordinances to be monarch habitat friendly
- area-wide mosquito control issues
  - education
  - location of habitat vs. spray areas
- change culture around insects and native plants
- marketing campaign that indicates monarch attractive plants
- monarch tagging classes & events
- conversion of private green spaces to habitat

### Other notes:

- seed giveaways with native seed & education
  - Outdoor Campus
  - city parks, farm and home shows
- reaching big box stores
- education all the time
  - print, social media, event, TV/radio
  - kids teaching parents
  - need volunteers
  - greenhouses, etc.

### Partners:

- city councils/commissions
- garden clubs
- GFP
- zoos and nature centers
- university campuses

## **RESEARCH, MONITORING & DATA MANAGEMENT SUPPORTING GROUP**

- A. What are the key support actions & next steps (1 year)? The longer term actions (2-5+ yrs.?)
- B. How will we move forward with the work despite the many important unknowns in monarch science?
- C. How will we do collaborative monitoring and data management?
- D. How will we work with sector groups to collect and share data?

### **Key local research questions and how to act without perfect information (questions A&B)**

- habitat – need botanists; smaller scale/harder and larger scale (less need for ID, diversity list)
- butterflies – eggs, larvae, adults
- local plant preferences (nectar)
- definition of what we want to see
  - milkweed species & density
  - what is good quality
  - what's in bloom when
  - quantify habitat enhancement through management
- management – BMPs (apply to monarchs; relate to other species people are managing for)
- impacts to other species
- diversity patches (site vs. state)
- pesticides (need more information, timeline)
- burning & mowing impacts
- tracking relative progress by sector
  - iGrow as sharing point
  - what is happening at that site (i.e. management)
  - size of acreage, quality, longevity
  - double counting

### **Collaborative data collection & monitoring; management strategies/actions (questions C&D)**

- lots of data = lots of people (old guys drinking coffee – they know!)
- training – zero sites for egg/larval monitoring in SD – let's get more!
- milkweed diversity
  - susceptibility issues?
  - where to invest
  - preference
- pesticides
  - neonics, dust – How far does it go? How to mitigate it?
  - What life stage are insects most vulnerable?
- adjacent land use (how are these utilized differently?)
  - sought after by monarchs?
  - corridors – connectivity
  - feasibility of improvement – where are opportunities?
  - placement on landscape (i.e. pastures, buffers, fencelines, hedgerows)
- mowing – milkweed response & timing; mostly roadways – need more emphasis on roadways
- research committee to make sure we know what is happening (new information)

### **Baseline habitat & goals estimate for state? How to measure?**

- Where to strategically put habitat?
- Monarchs are flashy – use this to affect broader conservation practices
- drive by \$\$ available
- “flutterway”
- baseline habitat – What do we have? Quantify. What is quality?
- sink/source analysis at large scale
- other stressors:

- pesticides
- diseases/parasites/predators
- nutrition
- weather
- perennial vs. annual – mix of both?
- native vs. nonnative – monitor both? Slippery slope – ecological cost and functional aspect (cost)
- Iowa modeling – connectivity – support/leverage
- research questions: balance cost, establishment, maintenance while maintaining benefit to monarchs/pollinators
- Monarch Joint Venture – national monitoring strategy to ensure our data collection aligns; okay to vary based on what our state needs
- research committee for the state that ties into what other states & nation are doing
  - MCSP (Monarch Conservation Science Partnership)/Monarch JV
  - universities
  - citizen science programs and volunteers
  - everyone here

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## **OUTREACH AND EDUCATION SUPPORTING GROUP**

- E. How can we coordinate and streamline existing outreach & education efforts?
- F. What are the key audiences we want to engage, and how can we best engage them?
- G. What key partners might we need to bring in?
- H. How will we mobilize a volunteer base for implementation work?

### **How to coordinate/streamline?**

- Parks naturalists
- list-serv
- identify what we want people to know
- know what resources we have now
- key messages by group
- collaborate on new documents (don't duplicate)
- visual – YouTube, TV
- schedule regular meetings to stay in touch
- come up with a logo/brand
- coordinate with all pollinators + wildlife (“Monarchs and More”)

### **Key partners:**

- GFP
- FWS
- Governor and wife
- legislators
- executive directors for commodity group
- SDSU and other universities
- NRCS
- honeybee folks
- zoos
- US Forest Service
- seed companies
- Master Gardeners and clubs
- public libraries
- school/teachers
- FFA
- 4H
- scouts – pollinator badge
- State Fair, Dakotafest and other fairs
- nurseries, greenhouses, Nurserymens Association
- Pheasantfest
- websites
- publications
- monarch app (points to find one; Pokemon Go)
- Monarch Joint Venture
- South Dakota Magazine
- billboards
- “Landowners Matter” newsletter
- iGrow (SDSU Extension)
- workshops (SD Grassland Coalition, pasture improvement)
- butterfly festival
- Project Wild
- chemical companies

### **Audiences**

- youth

- millennials
- adults
- landowners
- non-operating landowners
- park employees & all agencies
- sportsmen and women
- farmers/ranchers/grazing managers
- urban center
- acreage owners
- crop consultants
- chemical companies
- SDSU Regional Centers
- tourists
- hunting lodges

**Volunteer engagement?**

- generate interest
- Master Gardener education requirements
- service projects/civic groups/planting and collecting seed
- citizen science
- training trainers
- demonstration plots
- xeriscaping
- giving out seed

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## **COLLABORATION & GOVERNANCE SUPPORTING GROUP**

- A. How will we meaningfully engage and communicate with the wide array of stakeholders in this work?
  - B. How will we organize decision-making?
  - C. What are our core “collaboration principles” we want to abide by? (i.e. what would make this a best practice collaborative effort?)
  - D. Where will we most want to coordinate with other states to leverage resources and address local capacity gaps?
  - E. How will we adapt this approach as the work unfolds?
- Communication with stakeholders
    - commissioners and legislators
    - ag. associations
    - engage state departments at higher levels
    - list serv/website
  - stakeholders
    - NRCS
    - SD Dept. of Agriculture
    - DOT
    - GFP
    - conservation districts
    - conservation groups
    - honeybee industry

### **Decision-making/governance structure**

- advisory group to GFP
  - what level? local and/or state
  - broaden out by discipline/area (ag., urban)
  - state steering committee under Monarch Joint Venture
- lobby for partnership funded coordinator
- Use sage-grouse model
- interstate communication – MN, IA, NE, ND
- pollinator plan coordination – honeybee producer engagement
- joint plan creation; implementation of plan by coordinator; avoid micromanaging



## **FUNDING & IMPLEMENTATION SUPPORTING GROUP**

- F. How will we fund the development of the statewide plan?
- G. How will we fund ongoing implementation needs? Are there specific policy actions we might want to advocate to help fund or otherwise support the work?
- H. What are the key roles, contractors, and resources we need to do the work?
- I. Where will we most want to coordinate with other states to leverage resources and address local capacity gaps?
- J. How will we adapt this approach as the work unfolds?

- financial sponsors
  - Monsanto
  - Bass Pro
  - Scheels
  - Sanford
  - Ted Turner
- lands/cooperator participation as match source/challenge
- Northern Prairies Land Trust
- support funding for Blue Ribbon Panel on wildlife funding
- Farm Bill engagement – SD State Tech. Committee + national priorities
- find nonfederal match for CREP
- change national formulas for seed mixes and management practices
- grants
- State Wildlife Grants/SD Wildlife Action Plan
- focused conservation practices in Farm Bill
- Regional Conservation Partnership Program (RCP) approx. 50:50 match
- enhance existing CRP acres for pollinators
- Monarch SAFE program
- food plot rotation
- link to other priorities – responsible use/mgmt. of natural resources
- tap into pheasant hunters
- pollinator habitat stamp – nonresident hunters?
- SD Office of Tourism/chambers of commerce
- adopt an acre

### **Funding needs (questions F&G)**

- for plan development:
  - Iowa example; hired coordinator, compiled volunteer contributions
  - Missouri River example – same practice
  - need coordinator (contractor?)
    - Missouri example – several partners contributed to Missouri Monarch/Pollinator contractor & plan writer (although there are different skill sets for these 2 roles)
- for implementation:
  - more than coordinator needed for this
  - grants (opportunistic)
  - habitat exchanges (Bee/Butterfly; Env. Defense Fund, Pheasants Forever)
  - operation within some state agencies (DOT, GFP)
  - continue incorporating into landowner programs
  - corporate sponsors
  - Pheasants Forever (Sage Grouse Initiative Model)

### **Roles (questions H&I)**

- group engagement may be easier long term with broader pollinator theme
- use funds strategically (expand current areas)
  - monitoring of habitat and monarchs/pollinators

- any effort targeting national sources (example: Walmart)

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## **Additional input generated at South Dakota Monarch Summit, October, 2018, Regarding Existing Efforts, Challenges and Strategies, and Collaborative Opportunities**

Participants brainstormed three additional subject areas:

- supporting existing efforts
- challenges and strategies
- key collaborative opportunities

Specific questions for each topic are included at the beginning of that section.

### **Breakout Group 1. Supporting existing efforts:**

1. Thinking back on yesterday's mapping the territory exercise
    - a) What activities are already in process that can help us move toward our target?
    - b) Where are there gaps we will need to fill?
    - c) What stands out as low-hanging fruit?
- cover crops
  - continue brood plots
  - continue monarch tagging
  - sustainable livestock grazing
  - crop rotations
  - fund urban milkweed seed giveaways
  - continue/add diversity in plan communities/redefine diversity
  - continue education
  - continue pesticide research
  - conservation program delivery
  - partnerships for pollinator habitat delivery
  - evolve/continue to offer increased conservation programs to reflect new knowledge & issues

### **Gaps:**

- enhanced education focused on various user groups & appropriate messages (farmer, rancher, gardener)
- research/need SDSU pollinator specialist
- fall-seeded pollinator crops & management recommendations
- expanded citizen scientists
- lack of feedback on existing pollinator education products
- expanded Extension staff
- better targeting of pesticide information
- expand use of Integrated Pest Management
- sufficient seed source? Will cost change as pollinator habitat is planted?
- demonstrate demand to greenhouses
- lack of local seed sources
- work w/SD DOT re: roadside management program (also at county, state and federal levels); opportunities in federal highway bill for roadside work
- roadside haying (adjacent landowner right) based on their paying taxes to the middle of the road
- understanding of risks of leaving roadsides unmowed (snow removal, duff removal, wildlife dangers)
- use greenhouses as educational resources
- better retail understanding of fertilizers/pesticides for home and garden use
- expand plant giveaways/Master Gardeners; expand school participants (ex: habitat plantings on school grounds)
- focus on food production systems to make them functional and profitable

**What gaps need addressing and how?**

- involve electric/utilities/corridor interests
- habitat gaps between existing projects (as the monarch flies); can roadsides be the connection?
- county/township road partners
- roadside and urban spraying impacts
- expanded no-spray zones
- knowledge re: invasive species control (ex: smooth brome, annual bromes, leafy spurge, etc.)
- expand grazing systems
- incentivize expansion of existing habitat diversity
- spraying mindset/traditions
- better spraying methods/timing
- move to >2 crop rotation (encourage use of pollinator-friendly plants)

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## Breakout Group 2. Challenges and strategies

### 2. Challenges and strategies:

- a) What challenges do we know we will face?
- b) What are some strategies to address them pro-actively?
- c) What stands out as low-hanging fruit?

- loss of grassland habitat
- money/Farm Bill; existing CRP support; planting proper CRP mix, working lands approach
- habitat funding incentives
- ability to engage with partners
- coordination system available and accessible to partners
- pesticide use and cost of us
- landowner education and awareness of monarchs in ag. community
- urban disconnect with agriculture production
- monarch appreciation across generations
- pride in the landscape
- getting over the opposition to change
- neighbor relations; support to early adopters, maintaining network
- time needed for landscape-level projects
- profitability to landowner; has to be profitable to be sustainable
- roadside mowing – deadlines, cost
- agencies offering management support
- bring and market sound science to landowners
- increase awareness of resources/agencies
- events to bring urban & rural together; ag. appreciation
- grassland habitat benefits (clean water, quality of life)
- contact list of ag. commodity execs. and grower groups to distribute monarch and conservation information; ask them to identify challenges and strategies to conservation
- listing of monarch will add mgmt. challenges
- use ESA threat to encourage habitat; safe harbor agreements
- include ag. groups early in discussion
- peer-to-peer education with case studies - early adopters
- demonstration events (Habitat Pays – GFP)
- differing definitions/perspectives on “good stewards”
- long-term life of conservation program – will they exist in 2038?
- use crisis to drive changing practices
- change subsidy/crop insurance programs
- ag. consolidation: operations are very profit driven
- sod saver
- actual land use taxation (studied for 2 years and tabled)
- this is all from a conservation perspective – find common ground/compromise with ag.
- local and affordable seed sources
- city land use in parks/green spaces (Hilger’s Gulch effect; changes to local ordinances around plant height)

### Breakout Group 3. Key collaborative opportunities

#### 3. What opportunities do we see that we can only capitalize on through working collaboratively?

##### a) What stands out as low-hanging fruit?

- farmers - diversify practices, need info., be good stewards
- private landowners – large and small; in-state and out-of-state owners)
- federal funding source
- integrate existing program (CRP, Pheasants Forever)
- university; monitoring, ag. conservation, info. distribution, how to help, training, entomology, research
- K-12 – citizen science
- take hard look at land management; be more open minded; inclusive – invited!
- maintain image of partners
- one size doesn't fit all
- you will get benefits from efforts
- avoid listing (= restrictions)
- legislators (ALL) – stronger voice as a State of South Dakota
- city officials – get grants
- grass → pollinator habitat
- parks – green spaces
- Education Task Force
- “What’s the value of a species?”; urban vs. rural; win-win; commercial value of pollinators
- pheasants need insects
- partners with people “they” will listen to
- Extension program – get message out
- NGOs
- crop advisors
- other species efforts
- Farm/Home shows
- Weed & Pest Board: education, eliminate, engage
- relax noxious weed laws
- find common ground
- road manager – weed; re-veg.
- incentive to county
- West Nile spraying – need community support
- work internationally with Mexico & Canada; ecotourism (Mexico)
- federal-state-county roads and powerlines
- need commodities support
- demo plot
- educate commodities groups and farm groups/organizations; people not here need to hear the message
- we need education first
- funding
- hire a full-time coordinator (\$\$; shared)
- hunting-conservation links; make small changes; pheasant work helps monarchs
- NOLO – non-operating landowner
- expand education capacity (staff, curriculum)
- need info. from farmers and then share what we know (Why do farmers do what they do? What can we do for them?)
- research-planning assumptions
- monarch website

**Appendix B. South Dakota Monarch Plan Steering Committee**

<b>South Dakota Monarch Plan Steering Committee</b>	
<b>Entity</b>	<b>Representative</b>
SD Game, Fish and Parks (SDGFP)	Eileen Dowd Stukel
SDGFP	Mark Norton
SDGFP	Jen Nuncio
U.S. Fish and Wildlife Service	Charlene (Charlie) Bessken
South Dakota State University	Amanda Bachmann
The Nature Conservancy	Joe Blastick
Natural Resources Conservation Service (NRCS)	Jeff Vander Wilt
NRCS	Karl Anderson
SD Dept of Transportation (SD DOT)	Jason Humphrey
SD DOT	Greg Fuller
SD Corn	Jim Ristau
SD Dept. of Agriculture	Ann Juette
Pheasants Forever	Matt Morlock
SD Grassland Coalition	Jim Faulstich
SD Grassland Coalition	Rex Johnson
SD Association of Conservation Districts	Jack Majeres
Habitat Forever	Brad Schutt
SD Cattlemen's Assn.	Jodie Anderson
SD Farm Bureau	Lowell Mesman
SD Agri-Business Association	Kathy Zander

## Appendix C. South Dakota-relevant Information Sources

- Drons, D. J. 2012. An Inventory of Native Bees (Hymenoptera: Apiformes) in the Black Hills of South Dakota and Wyoming. M.S. Thesis, Plant Science, South Dakota State University, Brookings. 98 pp.
- Johnson, J. R. and G. E. Larson. 1999. Grassland plants of South Dakota and the Northern Great Plains. South Dakota State University, South Dakota Agricultural Experiment Station, B 566 (rev.), Brookings.
- Marrone, G. M. 2002. Field guide to butterflies of South Dakota. SD Dept. of Game, Fish and Parks, Pierre.
- Ode, D. J. 2015. Native milkweeds (*Asclepias*) of South Dakota. Internal reference document including 12 milkweed species, commercial sources, and species photos.
- SD Dept. of Agriculture. 2017. South Dakota Managed Pollinator Plan. SD Dept. of Agriculture, Pierre (Includes a series of best management practices for various user groups).
- SD Dept. of Agriculture, Apiary website: <http://sdda.sd.gov/ag-services/beekeeping-apiary-resources/>
- South Dakota Butterfly Checklist:  
<https://gfp.sd.gov/images/WebMaps/Viewer/WAP/Website/Checklists/SD%20Butterfly%20Checklist.pdf>
- SDSU Extension. 2016. An identification guide to common pollinators in South Dakota.  
<https://igrow.org/up/resources/03-2000-2016-booklet.pdf>
- Xerces Society. 2013. Pollinator plants of the central United States – Native milkweeds (*Asclepias* spp.)  
[https://www.nrcs.usda.gov/Internet/FSE\\_PLANTMATERIALS/publications/mopmcpu11905.pdf](https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/mopmcpu11905.pdf); accessed 16 Aug 2018.