Kansas Monarch Conservation Plan

Prepared through a collaborative effort of the Kansas Monarch Taskforce Working Groups

September 2019

Suggested Citation:

Kansas Monarch Taskforce. 2019. *Kansas Monarch Conservation Plan*. Kansas Monarch Taskforce Working Groups and Kansas Department of Wildlife, Parks and Tourism.

EXECUTIVE SUMMARY

The Kansas Monarch Conservation Plan serves as a guiding document to support ongoing efforts or new conservation actions, recognizing it will take a multi-sector approach to reach the monarch conservation goals set herein. This plan focuses on goals, practices, and actions voluntarily conducted in Kansas.

The Kansas Monarch Conservation Plan is centered on a 20-year objective to conserve, enhance, establish and create pollinator habitat on private, public, and urban lands through non-regulatory, voluntary efforts and actions across the state. All elements of this plan are intended to support this objective with an initial two-year period from July 2018 – May 2020 to create and establish an implementation plan of core conservation priorities. This plan is intended to serve as a guiding document for use by any individual or entity planning, implementing or funding monarch conservation activities in Kansas.

Kansas is a national stronghold for monarch conservation and is uniquely positioned to conserve and enhance large acreage and landscapes for monarch migratory and breeding habitat. Kansas ranchers maintain expansive, intact landscapes of native grass rangelands that monarchs evolved with, and Kansas farmers are strongly invested in improving and creating habitat in cropland settings. Rights-of-way, municipalities, industry, and citizens work effectively and invest substantial resources to provide migratory and breeding habitat, education, and citizen science in areas where resources are lacking. Agriculture and conservation organizations, agencies, industry, and academia provide significant financial, technical, and science-based assistance.

On June 8-9, 2017, individuals from ranching and farming organizations, conservation organizations, industry, agencies, academia, and tribal nations convened to initiate the process of collaborating across sectors and organizations to set voluntary goals for the conservation of monarchs and other native pollinators in the State of Kansas. From this summit, the Kansas Monarch Taskforce was formed, which set the task to collaboratively create the Kansas Monarch Conservation Plan.

The major sectors represented in the Task Force, and the focal areas for conservation in the Kansas Monarch Conservation Plan are:

1. Grasslands
2. Croplands
3. Rights-of-Way
4. Urban and Outreach
5. Research and Monitoring

Kansas's reputation as a state that gets conservation implemented on the ground is evidenced by the fact that 105 individuals representing 68 organizations across all sectors that impact monarch conservation are active members of the Kansas Monarch Task Force (Appendix 1). This large collaboration of organizations is critical to the success of monarch conservation because no one group, agency, state, or nation is responsible for the conservation of monarchs or their habitat and resource needs. If monarch conservation is going to be maintained, enhanced, and created within and between state and federal boundaries, many players are needed.

This conservation plan is a living document that will be updated as additional resources, research, or other relevant details are presented. The habitat, actions, and outreach goals are voluntary and are not intended to be mandatory nor are the resources intended to be comprehensive at this time.

TABLE OF CONTENTS

ACRONYMS AND PLANNING TERMS:

AOK	- Audubon of Kansas
BMP	- Best Management Practice
CP##	- Conservation Practice - CP followed by a number indicates a specific practice within the Conservation Reserve Program
CRP	- Conservation Reserve Program
CSP	- Conservation Stewardship Program
DoD	- Department of Defense
EQIP	- Environmental Quality Incentive Program
FSA	- Farm Service Agency (agency of the United States Department of Agriculture)
KDWPT	- Kansas Department of Wildlife, Parks and Tourism
KS	- Kansas
NABA	- North American Butterfly Association
NGO	- Non-Governmental Organization
NPS	- National Park Service (agency of the United States Department of Interior)
NRCS	- Natural Resources Conservation Service (agency of the United States Department of Agriculture)
NRI	- Natural Resources Inventory
NWR	- National Wildlife Refuge
PEM	- Presidential Executive Memorandum
RCPP	- Regional Conservation Partnership Program
RoW	- Right(s)-of-Way
SWAP	- State Wildlife Action Plan
TNC	- The Nature Conservancy
U.S.	- United States
USDA	- United States Department of Agriculture
USFWS	- United States Fish and Wildlife Service (agency of the United State Department of Interior)

ACKNOWLEDGEMENTS

The Kansas Monarch Conservation Plan was made possible by the Kansas Monarch Taskforce Working Groups, associated organizations and their staff through dedicating time and effort to planning, writing, and editing the document. Thank you to the following members and organizations for serving as sector group co-leads and steering committee members for the plan:

- Ag Innovations (Brooking Gatewood)
- Kansas Department of Transportation (Melissa Davidson)
- Kansas Department of Wildlife, Parks and Tourism (Matt Smith, Daren Riedle, Zac Eddy, Chris Berens)
- Kansas Farm Bureau (Mark Nelson)
- Kansas Rural Center (Joanna Voigt)
- Kansas State University, Southwest Area Extension Center (Sarah Zukoff)
- Pheasants Forever/Quail Forever (Chris McLeland)
- Shelly Wiggam
- U.S. Fish and Wildlife Service (Kelley Meyers)
- U.S. Fish and Wildlife Service (Mike Disney)
- Westar Energy (Pam Tennison-Rindt)

Thank you to the following organizations for your participation in the plan development and serving as active members of the Kansas Monarch Task Force;

- Ag Innovations
- Audubon of Kansas
- Clean Line Energy
- Dow AgriSciences
- DuPont Pioneer
- Emporia State University
- Grassland Heritage Foundation
- Heartland Conservation Alliance
- ITC Great Plains
- Kansas Agricultural Aviation Association
- Kansas Association of Conservation Districts
- Kansas City Native Plant Initiative
- Kansas Cooperative Council
- Kansas Corn Growers Association
- Kansas County Highway Association
- Kansas Department of Agriculture
- Kansas Department of Transportation
- Kansas Department of Wildlife, Parks and Tourism
- Kansas Electric Power Cooperatives
- Kansas Farm Bureau
- Kansas Forest Service
- Kansas Grain Sorghum Commission
- Kansas Grazers Association
- Kansas Grazing Lands Coalition
- Kansas Livestock Association
- Kansas Native Plant Society
- Kansas Rural Center
- Kansas Sierra Club
- Kansas Soybean Commission
- Kansas State Research and Extension
- Kansas Wheat Commission
- Kansas Wildlife Federation
- Monarch Watch
- Monsanto
- National Wild Turkey Federation
- Northern Natural Gas
- No-till on the Plains
- Oneok
- Pheasants Forever/Quail Forever
- Prairie Band of Potawatomi Nation
- Southeast Kansas Audubon Society
- The Nature Conservancy
- Topeka Zoo
- U.S. Army Corps of Engineers
- U.S. Department of Agriculture (USDA)
- U.S. Department of Defense
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. National Parks Service
- USDA Farm Service Agency
- USDA Natural Resources Conservation Service
- Westar Energy
- Xerces Society for Invertebrate Conservation

Special thanks to Shelly Wiggam for all her work in pulling together the cumulative workings of the collaborative and putting it into the plan format provide herein. Also, special thanks to Brooking Gatewood, Ag Innovations, for her professional facilitation and organizational skills during the Kansas Monarch Summit and her efforts during the plan development.

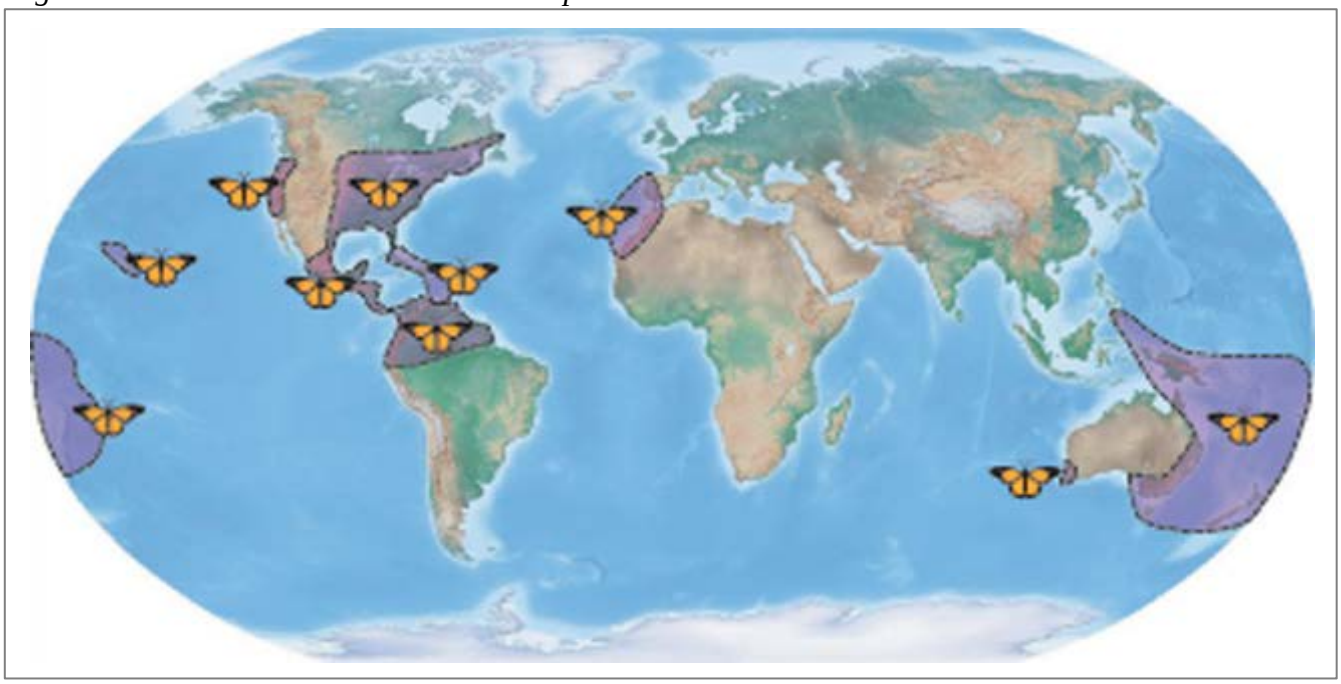
Funding for the state summit and plan development was provided through National Wildlife Federation, Kansas Wildlife Federation, Westar Energy, and Kansas Department of Wildlife, Parks and Tourism.

MONARCH BIOLOGY AND CONSERVATION STATUS

Distribution

The monarch butterfly (*Danaus plexippus*) is a species native to Kansas with a global distribution that includes much of North America and Central America through the Caribbean to South America. Monarchs have been introduced to Hawaii, Australia, Indonesia, and many other Pacific Islands. The species can also be found in the Iberian peninsula of southern Europe and its western islands as well as the northern African countries of Morocco and Algeria (Zhan et al. 2014) (Figure 1).

Figure 1. Global Monarch Distribution Map



Map courtesy Monarchs and Milkweed: A Migrating Butterfly, a Poisonous Plant, and Their Remarkable Stary of Coevolution by Anurag Agrawal, https://press.princeton.edu/titles/10944.html

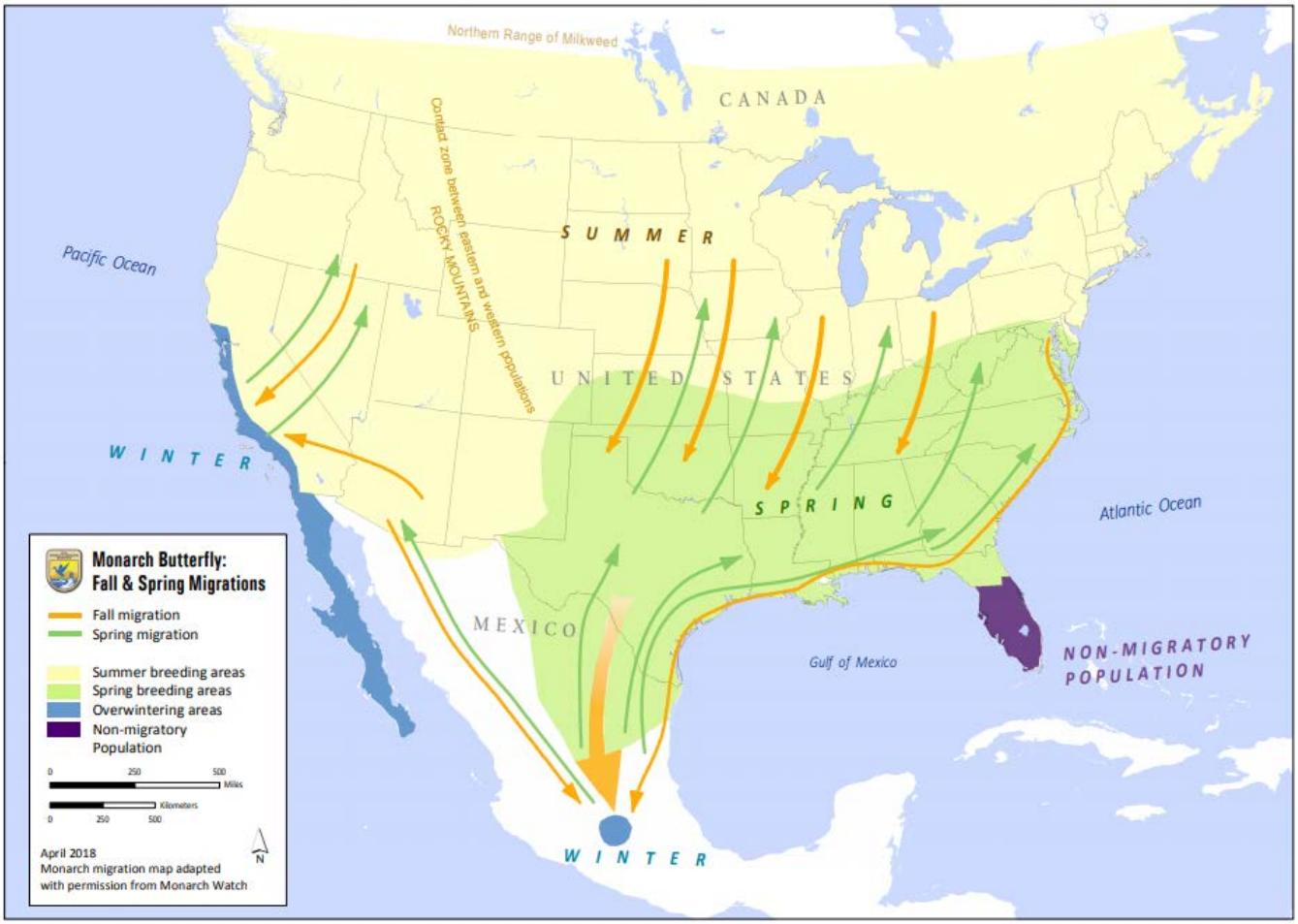
Continental North America has three distinct monarch populations – the eastern population ranging from the Great Plains to the east coast, the western population which occurs west of the Rocky Mountains, and the quasi-resident population of Florida. The eastern and western monarch populations are considered a subspecies (*Danaus plexippus plexippus*) with a geographic range that includes areas in Canada, the U.S., and Mexico, with the subspecies widespread across the U.S. Monarchs occur in a variety of landscapes including rangelands, croplands, riparian areas, deserts, prairies, meadows, open forests, woodlands, cities, gardens, and roadsides where they search for their larval host plants 0472.(*Asclepias* and *Cynanchum*) and nectar sources (Jepsen et al. 2015).

Life History - *Migration, Breeding, and Overwintering*

Migration

In the mid-1970s, researchers discovered that millions of adult monarch butterflies from the eastern and central United States overwintered at high-elevation sites in the mountains of Michoacán, Mexico. Each fall, monarchs from the central and eastern United States fly south to this overwintering area, where they form clusters on trees and vegetation that are estimated to include as many as 50 million butterflies per hectare. Much smaller numbers spend the winter along the Gulf Coast from Texas to Florida (Figure 2) (Commission 2008).

Figure 2: North America eastern and western monarch migratory, breeding, and overwintering movements and locations.



Map courtesy of USFWS, 2018

In the spring, after overwintering, adult butterflies fly north to northern Mexico and the southern United States where they reproduce, and the first new generation of monarchs pupates. After emergence, this first new generation continues north. Their offspring, forming the second through fourth generations, continue even further north working their way as far as south-central Canada. The fourth or fifth generation adults are the generation that migrates back to Mexico to overwinter. Sometimes a sixth generation of monarchs can be produced in southern OK and Texas on the migration south to Mexico (Chapman et al. 2014).

Breeding

Monarchs from the eastern population produce up to six generations per year. Adults take nectar from a wide variety of flowering plant species but show strong preferences for plants in Asteraceae and Apocynaceae. The summer generation adults live between two and five weeks. The late generation adults of the year are the overwintering migrants, and can live seven to nine months, without breeding and laying eggs until the following spring as they re-migrate north toward their spring and summer breeding ranges (Oberhauser and Solensky 2004).

In the United States, monarchs primarily lay their eggs on milkweed plants in the genera *Asclepias* and *Cynanchum*. Adult females lay eggs singly, secreting a glue-like substance that attaches the egg to the plant. The larvae emerge in three to five days, with shorter development times corresponding to warmer temperatures. In Kansas, monarch larvae (caterpillars) are known to feed only on leaves of *Asclepias* and *Cynanchum*, though a few in southeastern Kansas might consume leaves of another milkweed genus, *Matelea*. Larvae undergo five instars (intervals between molts) over a period of nine to 13 days. Once fifth instar larvae are fully grown, they leave their host plants to search for an elevated and usually well-hidden pupation site. The pupa stage lasts nine to 15 days under normal summer conditions. The pupal stage is the least-studied stage of monarchs, due to the difficulty in finding pupae in the wild (Commission 2008).

Overwintering Habitat

In Mexico, monarchs cluster in the rare Oyamel fir forests, occasionally taking shelter in pines and other trees (Jepsen et al. 2015). Mexico established the Monarch Butterfly Biosphere Reserve in 1980 to protect the monarch's overwintering grounds. Just over 60 miles from Mexico City, the 138,000 acre reserve is sectioned off into several sanctuaries that provide winter refuge to the millions of monarchs that migrate to Mexico each fall. From roughly late October through February, monarchs live in the forested mountains of Mexico, where temperatures are generally mild enough for survival. The habitat exists only on 12 mountaintops and is essential to the persistence of the eastern monarch population and its migration (NRCS & USFWS 2016).

While overwintering in Mexico, monarchs go through four stages:

1. Arrival
2. Establishment of overwintering colonies
3. Colony movement
4. Spring dispersal

After arrival, monarchs fly around during the day and seek out the best location for colony establishment. As temperatures drop, monarch movement decreases, and the butterflies form large, dense clusters on tree trunks and branches. By mid-December, monarchs have settled into their overwintering colonies and generally stay in a metabolic torpor state.

Serious conservation challenges exist to maintain the integrity of these overwintering areas. Significant international collaboration is continuing between the countries Canada, Mexico, and the United States to reduce threats and conserve eastern monarchs.

The primary threats to the monarch's Mexican overwintering habitat are:

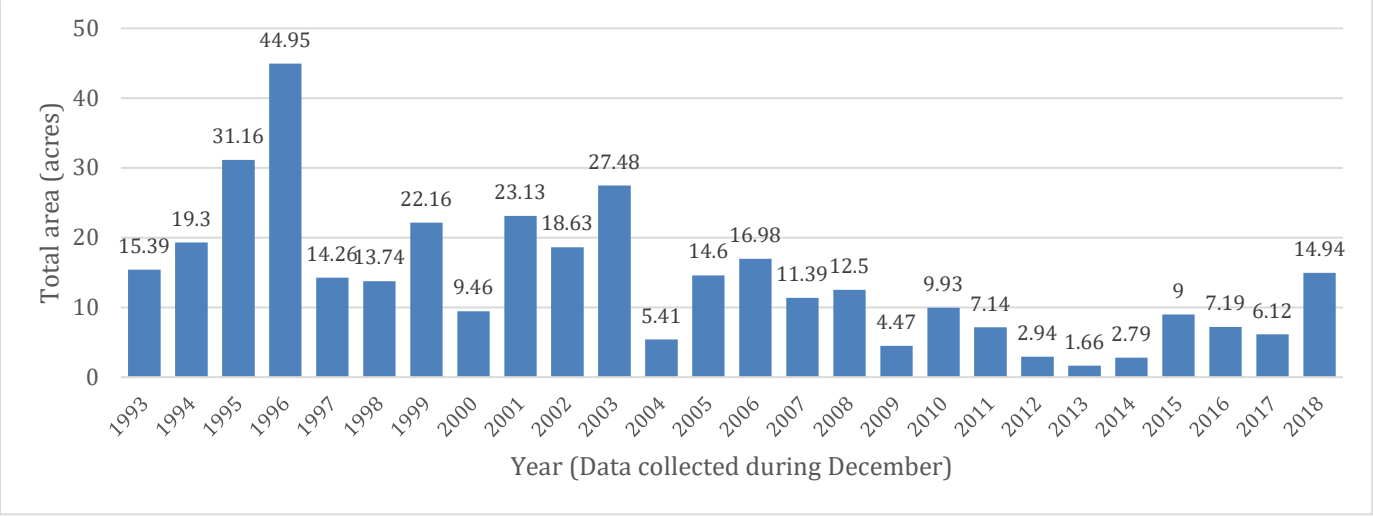
1. Illegal commodity timber harvest and clearing for avocado plantations of oak and pine forests that form a critical environmental buffer around and conversion of the Oyamel fir forests where eastern monarchs overwinter (Brower et al. 2016, Vidal et al. 2014, Barve et al. 2012)
2. Forest degradation (Brower et al. 2016, Vidal et al. 2014, Barve et al. 2012)
3. Climate change impacts on overwintering weather events (Zagorski 2016, Allende et al. 2016)
4. Lack of knowledge of the number of hectares of monarch overwintering habitat that are being harvested, converted, or degraded annually

Threats arising from deforestation and habitat degradation can exacerbate the detrimental effects of severe weather events on the overwintering grounds by lessening the microclimatic benefits the Oyamel forest has historically had for monarchs. This combination has been revealed during the severe weather events of 2002 and 2016. A storm affecting two overwintering colonies in 2004 is estimated to have resulted in the mortality of 74% and 81% in each of the colonies. In 2016, another winter storm affected another two colonies, killing approximately 30-40% of the population (Brower et al. 2004, Brower et al. 2017).

Trends

Globally, monarchs are a secure species and are not in danger of extinction (Jepsen et al. 2008). However, the eastern and western migratory populations of the subspecies *Danaus plexippus plexippu*s have steadily declined in the last twenty years (Figure 3). Eastern monarch overwintering numbers in Central Mexico have steadily declined since the 2004-2005 wintering count, as have the western population that overwinters on the coast of California and Baja Mexico. The quasi-resident population found in the peninsula of Florida is considered stable, as is the Caribbean subspecies, *Danaus plexippus portorricensis*.

Figure 3: Area of Forest Occupied by Monarch Butterflies Hibernating in Mexico



Monarch population monitoring projects use various methodologies to track trends. However, population estimates obtained at breeding sites or during migration are not necessarily congruent with overwintering population numbers. Due to the complex nature of assessing population trends, and

comparing data collected using differing monitoring techniques, the best estimate for annual eastern monarch population size is the number of individuals at overwintering sites in Central Mexico. Since the winter of 2004-05, the World Wildlife Fund Telcel Alliance, in conjunction with the Mexican National Commission on Protected Natural Areas (CONANP) Monarch Reserve Office under Semarnat, has monitored butterfly torpor colonies in Central Mexico (NRCS & USFWS 2016).

Semmens, et al. (2016) established a quasi-extinction risk (extinction of the migrating portion of monarchs) and population target model for the eastern monarch butterfly and concluded that the population has a significant probability of quasi-extinction from 11% to 57% over 20 years. They acknowledge these estimates have a large uncertainty. Their modeling technique used area of overwintering habitat as a proxy for population size and did not account for density dependence. The authors concluded that their quasi-extinction risk estimates are robust, given that the population is in decline and has fluctuated widely from year-to-year.

Legal Status

Beginning in the 1980s, researchers in the United States and Mexico began tracking the size of the overwintering populations of monarchs in Mexico. The range of monarch colony sizes includes a peak of 44 acres (21 hectares) during the winter of 1996-1997 and a low of 1.66 acres (0.67 hectares) in the winter of 2013-2014 (Figure 3). Specifically, this 2013-2014 low prompted high-level action from the President of the United States in the form of a Presidential Executive Memorandum mandating conservation actions to conserve the migratory populations of this species, as well as a petition by conservation organizations to list the species as “Threatened” under the U.S. Endangered Species Act (Presidential Memorandum 2014). These actions and responses have, in turn, led to new activities by numerous agriculture and conservation organizations, state agencies, industry, and academia via voluntary, non-regulatory approaches to conserve this species and other declining pollinators.

In 2014, a United States of America Presidential Executive Memorandum (PEM) was issued to create a federal strategy to promote the health of native pollinators and honey bees, including the monarch butterfly (Presidential Memorandum 2014). The PEM was issued because of the breadth, severity, and persistence of pollinator losses and recognized the value of expanding U.S. federal agency efforts to reverse pollinator losses and help restore populations to healthy levels. The PEM identified specific outcomes expected from the participating federal agencies, including new public-private partnerships, increased citizen engagement, and pollinator conservation actions. The PEM established a National Pollinator Health Task Force that issued the *National Strategy to Promote the Health of Honey Bees and Other Pollinators* in May of 2015. Two of the three overarching goals in the strategy are related to monarch and other pollinator populations and resource needs, including:

1. Increase the eastern monarch population to 225 million butterflies through domestic and international actions and public-private partnerships by 2020. This number of butterflies would cover an area of approximately 15 acres (6 hectares) at the overwintering grounds in Mexico.

2. Restore or enhance 7 million acres of land for pollinators over the next 5 years through Federal actions and public/private partnerships.

Federal Status

In 2014, the USFWS was petitioned to protect the monarch migratory subspecies (*D. plexippus plexippus*) under the Endangered Species Act (Center for Biological Diversity et al. 2014). In summary, the petitioners requested the Service list the subspecies as "Threatened" while also issuing a 4(d) rule, which would allow for protection of the monarch but also permit activities to continue promoting the conservation of the species, such as scientific research and monitoring, citizen monitoring and tagging, and non-commercial classroom and household rearing of monarchs for educational purposes. Based on information in the petition, the USFWS determined that federally protecting the monarch (*D. plexippus plexippus*) may be warranted. USFWS published a 90-day "substantial" finding in the Federal Register on December 31, 2014. Publication of the 90-day finding also announced that the USFWS would conduct a thorough assessment to determine if the monarch butterfly needs Endangered Species Act protection. The USFWS is now conducting the assessment using the Species Status Assessment framework (US Fish and Wildlife Service 2018).

State Status

The Kansas Department of Wildlife, Parks and Tourism has regulatory oversight of wildlife within the state. This includes insects and other invertebrates. However, *Danaus plexippus plexippus* is not listed under the authorities granted to KDWPT by K.S.A. 32-961 and K.A.R. 115-15-3 to meet the requirements of the *Kansas Nongame and Endangered Species Conservation Act* of 1975, K.S.A. 32-957 to 963, 32-1009 to 1012, and 32-1033. Likewise, the species has not been petitioned for listing in the future. Still, the monarch is listed as a Species of Greatest Conservation Need (SGCN) within the Kansas State Wildlife Action Plan (SWAP) (Rohweder 2015). Many of the actions suggested to address conservation priorities within the SWAP would likely have a corresponding positive effect on monarchs and monarch habitat availability within Kansas.

Threats

Monarchs face many risks that have resulted in declining population trends in both the eastern and western portions of their North American range. The largest impacts come from the conversion, fragmentation, mismanagement, and degradation of overwintering, breeding, and migratory habitat and feeding resources throughout their range (Pleasants 2015; Pleasants 2017). In addition, pesticides that are used to control insects and unwanted vegetation can have harmful, unintended consequences for monarchs and other pollinators (Oberhauser et al. 2006; Pleasants & Oberhauser 2012).

Unlike the Northern Core area, lack of milkweed within the Southern Core has not been suggested as a limiting factor for monarch migration and breeding (Pleasants 2017; Thogmartin et al. 2017). However, the adverse changes to migratory habitat and resources, as well as climate during the fall migration may be affecting survival rates (e.g. loss of nectar sources, habitat fragmentation, the integrity of the overwintering site, and climate change impacts). These may also be important drivers of monarch population dynamics. The authors of two key studies evaluated the status of monarch butterflies using multiple datasets that covered 22 years of monarch monitoring programs across North America. With these data, they modeled population dynamics in different regions to identify life stages and regions contributing to the recent population declines (Inamine et al. 2016; Davis & Dyer 2015).

Using count data reported to the North American Butterfly Association (NABA) and other citizen scientist data, Inamine et al. (2016) analyzed the relationships between butterfly population indices at

successive stages of the annual migratory cycle to assess demographic connections and to address the roles of migrant population size versus temporal trends that reflect changes in habitat or resource quality. They found a sharp annual population decline in the first breeding generation in the southern United States, driven by the progressively smaller numbers of spring migrants from the overwintering ground in Mexico, with monarch populations building regionally during summer generations.

Inamine et al. (2016) did not find statistically significant temporal trends in stage-to-stage population relationships in the Great Plains, mid-western, or northeastern USA. In contrast, there are statistically significant negative temporal trends at the overwintering grounds in Mexico, indicating that monarch success during the fall migration and spring re-establishment strongly contributes to the butterfly decline. Davis and Dyer (2015) also conducted a meta-analysis of population data and concluded that there had been no decline over the past two decades in summer breeding numbers for the eastern North America population.

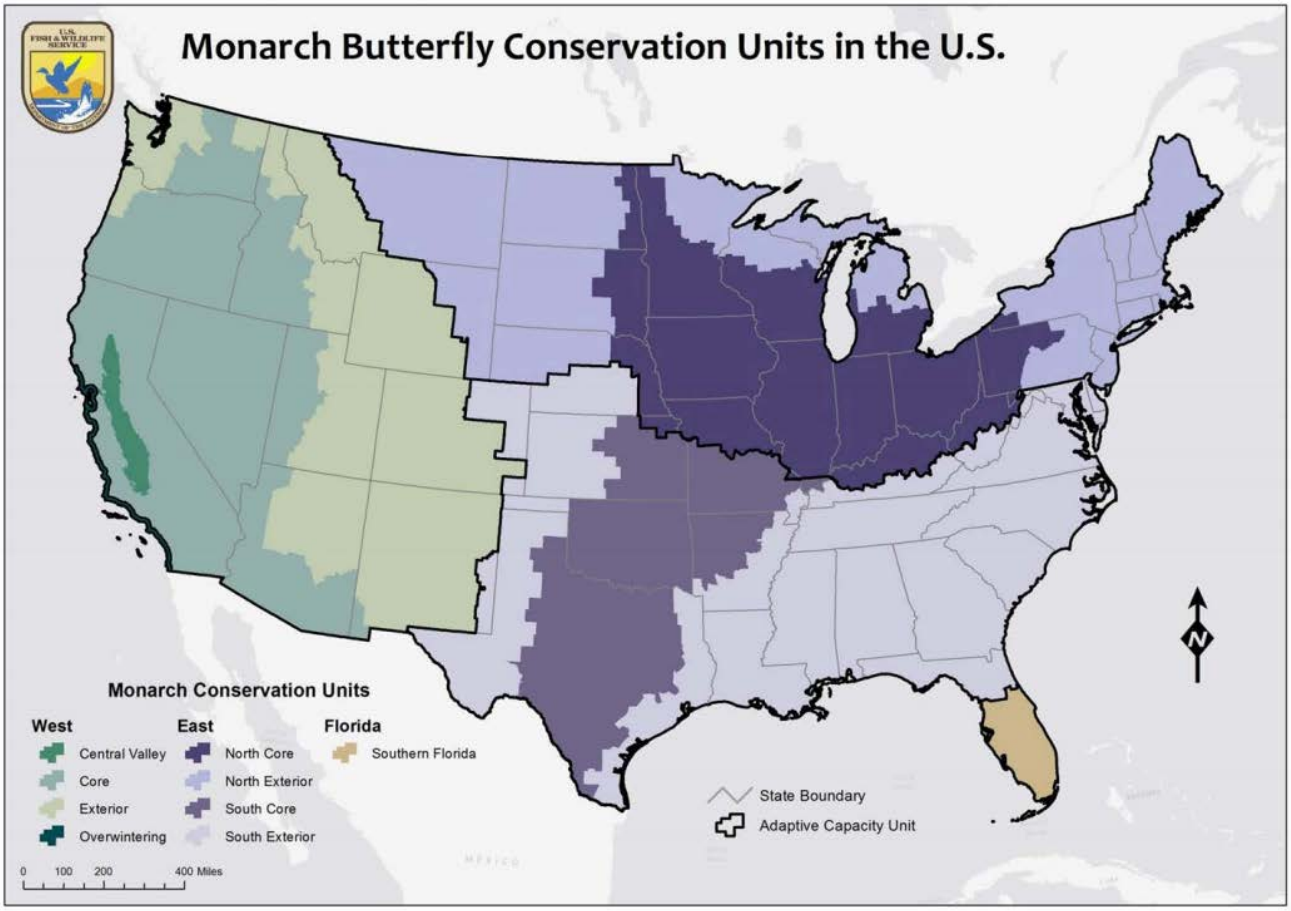
In contrast to the Southern Core states, there has been an observed decline in milkweeds in the croplands of the Northern Core states of the eastern monarch migratory range, as well as cropland expansion into the grasslands (Pleasants and Oberhauser 2013; Flockhart et al. 2015; Oberhauser et al. 2016). During the period of 2008-2012, Lark et al. (2015) found that cropland expansion occurred most rapidly on existing Conservation Reserve Program (CRP) lands, with up to 42% of the recent cropland expansion into grasslands coming from lands exiting the CRP, and the remaining coming from pasture and rangeland conversion. Since 2012, this trend has continued, resulting in more land converting from CRP cover in to row crop agriculture. According to the Farm Service Agency compiled data, all 10 states within the USFWS Eastern Monarch Core Conservation Units are seeing continued decreases in total enrolled CRP acreage for the period of 2012-2017. Kansas has seen a decrease from 2,522,888 enrolled CRP acres in 2012 to 2,068,269 enrolled acres in January 2018.

Land use change from rangelands and pasturelands to row crops has important implications to other pollinators, as well. For example, Koh et al. (2016) modeled wild bee abundance in the United States between 2008 and 2013, estimating that bee abundance declined across 23% of the US land area. Most of the areas of modeled decreases occurred in the agricultural regions of the Midwestern and Great Plains state and in the Mississippi river valley, with eleven states – including all states within the USFWS Core Conservation Units collectively accounting for 60% of the predicted decrease in wild bee abundance.

Severe weather events can have deleterious effects on local populations and may be exacerbated on overwintering sites when populations are the most densely concentrated (Brower et al. 2004, Brower et al. 2017). Studies have indicated disjunct phenologies between southern and northern migratory latitudes can cause monarchs to arrive at summer breeding grounds when climatic conditions are unfavorable and nectar resource availability is minimal which may lead to lower fitness or mortality (Zipkin et al. 2012). Finally, the changing climate and resulting weather patterns may be making some habitat less suitable, forcing changes in migratory patterns particularly as eastern monarchs migrate south in the fall (Lemoine 2015).

KANSAS AND THE SOUTHERN GREAT PLAINS

Figure 4. USFWS Monarch Core Conservation Units in the U.S.



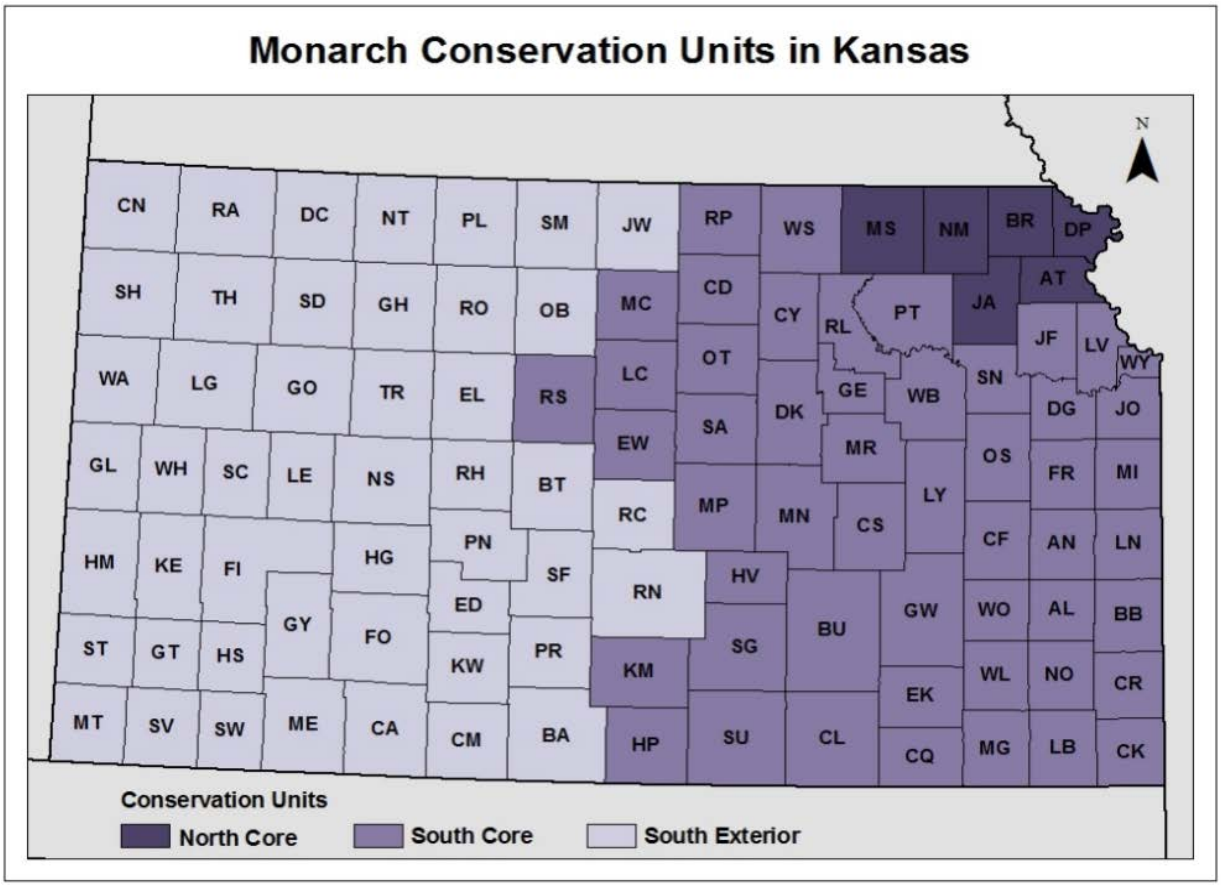
Map courtesy of USFWS

The USFWS has identified the migratory corridor from Texas to the upper Midwest as a key region for monarch habitat efforts. Conservation Units include a Northern Core and Southern Core, which USFWS considers the core migratory (Southern Core) and breeding (Northern Core) ranges of the eastern Monarch population in the United States. Adjacent to the Core areas are the Northern Exterior and Southern Exterior Areas (Figure 4). Six counties in northeast Kansas (Marshall, Nemaha, Brown, Doniphan, Jackson, and Atchison) are included in the Northern Core unit. The rest of eastern Kansas is within the Southern Core, and western Kansas is considered part of the Southern Exterior conservation unit (Figure 5).

The USFWS North Core Conservation Unit includes all or part of the following states; North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, Missouri, Wisconsin, Illinois, Michigan, Indiana, Kentucky, Ohio, West Virginia, Pennsylvania, and New York. The South Core Conservation Units includes portions of Kansas, Missouri, Oklahoma, Arkansas, and Texas. The Southern Great Plains (within the South Core and South Exterior) play a significant role in the spring and fall migrations of eastern monarchs (Miller et al. 2012), as well as their spring, summer, and fall reproduction. There has been limited research on threats and habitat/resource use by monarchs in the South Core and South Exterior units. However, there are significant differences in the landscapes that monarchs encounter in

the Southern Core States during their life cycle as compared to the Northern Core States. The Northern Core area has a much higher proportion of cultivated lands as compared to remaining grasslands in the Southern Core and Exterior conservation units. (Figure 6).

Figure 5. Counties in each Monarch Conservation Unit in Kansas. County names abbreviated.



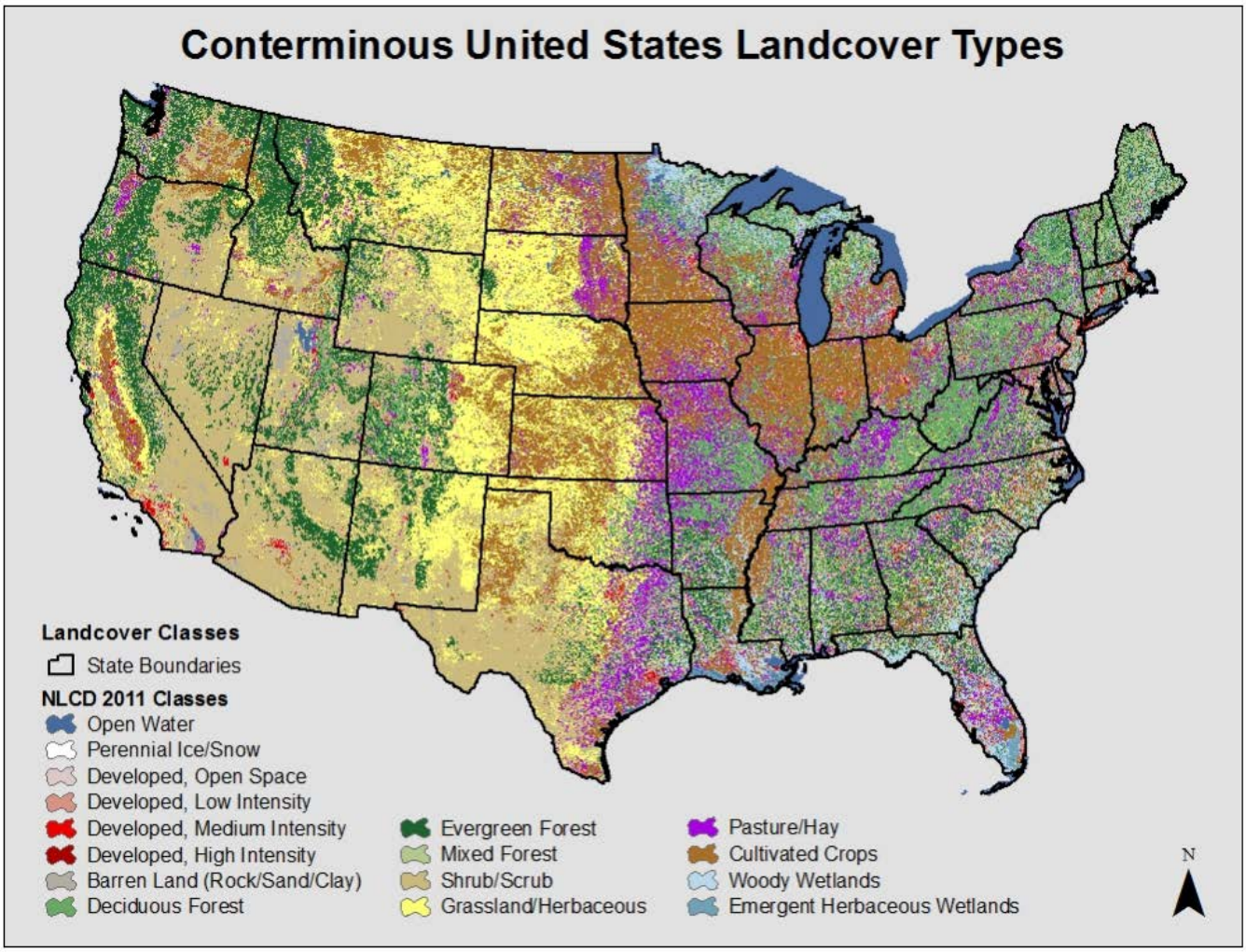
County and state boundary data courtesy U.S. Dept. of Commerce, U.S. Census Bureau.

In the Northern Core, loss of milkweed within row crop agriculture is believed to be a primary threat to monarch reproduction (Pleasants 2015, Pleasants and Oberhauser 2012). This is an issue which has gotten wide attention in the past few years, though recent research indicates declines in monarchs and milkweed have been an ongoing, long-term trend—beginning around 1950 (Boyle et al. 2018). In contrast, the Southern Great Plains has maintained a higher proportion of native rangelands; anecosystem monarch evolved with over time. These native rangelands still contain nectaring and breeding resources monarchs require to complete their life cycle in this portion of their range (Lessard 2017).

Pollinators and other wildlife native to the Southern Great Plains evolved with local, regional, and continental scale habitat heterogeneity that was driven by fire, grazing, climate, and weather patterns (Fuhlendorf and Engle 2009 & 2001, Knapp et al. 1998). The U.S. Fish and Wildlife Service has named the loss of milkweed in the Northern Core breeding areas to be the primary threat to eastern monarchs (Pleasants & Oberhauser 2013; Pleasants 2017).

Though there was not a specific primary threat to the species identified by USFWS within the southern portion of its range in the United States, conversion of native prairie to cropland (Lark et al. 2015) and the potential for mismanagement of remnant rangelands is cause for concern. Native ecosystems within the Southern Great Plains are often not managed in a way that reflects the historical disturbances which helped shape them. In particular, human-altered fire regimes and grazing management regimes which manage for uniform grazing distribution and forage consumption may promote similar vegetation structure and composition across the landscape lacking the plant diversity needed by monarchs. Managing vast grassland landscapes to have similar vegetation structure and plant species composition, selects against many native pollinators and wildlife species, while also reducing rangeland/soil health, aboveground production, and resiliency (i.e. drought mitigation, wildfire & grazing recovery) for livestock/land managers (Fuhlendorf & Engle 2001).

Figure 6. Landcover type differences in the conterminous U.S.



National Land Cover Dataset, 2011 courtesy U.S. Geological Survey
State Boundaries courtesy U.S. Dept. of Commerce, U.S. Census Bureau

Historically, the Northern Core states were considered to produce a high percentage of the population of eastern monarchs that migrate to the overwintering grounds in Mexico in the fall. However, there is increasing evidence that the Southern Core states are important to contributing to overwintering

population numbers. Thus, the Southern Core states are now emphasized as important for spring, summer, and fall reproduction that contributes to the overwintering population, as well as providing critical nectaring habitat for migration both in the spring and the fall (Flockhart et al. 2013, Miller et al. 2012). Kansas specifically plays a major role in monarch reproduction because it serves as the breeding grounds to the first and second generations of monarchs migrating north, as well as summer and fall migration breeding.

KANSAS MONARCH CONSERVATION PLAN MISSION AND VISION

Mission
Monarch conservation that serves all Kansans, its landscapes, ecosystems, and wildlife.

Vision
Recognizing our unique wealth of grassland habitat and milkweed, Kansans will voluntarily protect, enhance, and establish monarch and pollinator habitat through diverse, cross-sector, collaborative conservation efforts.

Kansas Monarch Conservation Plan Priorities

a. Prevent the loss of native grassland and wetland acres in rangeland ecosystems. Focus will be on limiting and/or reversing woody and non-native herbaceous plant encroachment, as well as conversion of native rangelands to croplands or other less desirable landcovers.
b. Support and encourage the enhancement of existing public and private grasslands (rangeland, pasture and hay meadows) for improved nectaring and breeding resources.
c. Establish, enhance, and maintain pollinator habitat in cropland settings. Facilitate re-enrollment of expiring CRP acreage, target new CRP acreage in pollinator focal areas, and work to encourage all new CRP acreage in the state to include pollinator friendly plantings and practices.
d. Maintain existing native grasslands in rights-of-way, as well as create best management practices and guidance to help refine roadside mowing and herbicide application practices by local and state entities.
e. Promote urban and greenscape gardening, which encourages environmentally friendly and cost-efficient solution for landscaping.

KANSAS MONARCH CONSERVATION, MAINTENANCE, AND ENHANCEMENT

There are numerous national, regional, state, and local conservation efforts across the eastern monarch range. This Plan highlights statewide and regional conservation efforts as they pertain to Kansas. Kansans have committed substantial resources and time to proactively create, enhance, and maintain habitat beneficial to monarchs across the state from 2014-2018 (See Appendix 2).

Kansas is at the heart of the eastern monarch migratory route and breeding corridor. Portions of the state lie within the areas defined by the USFWS as the eastern monarch's Northern Core and Southern Core conservation units (Figure 4). Thus, Kansas landscapes, ecosystems, and land managers play a critical

role in monarch conservation, providing spring and fall migration habitat and resources, as well as spring, summer, and fall breeding habitat.

Approximately 98% of Kansas's land is in private ownership (U.S. Bureau of the Census 1991), with approximately 88% of these acres in agricultural production (Kansas Department of Agriculture 2006). The Kansas Monarch Taskforce believes that for conservation to be well received on these working landscapes, management practices should be voluntary and maintain or improve land manager profitability and operation functionality.

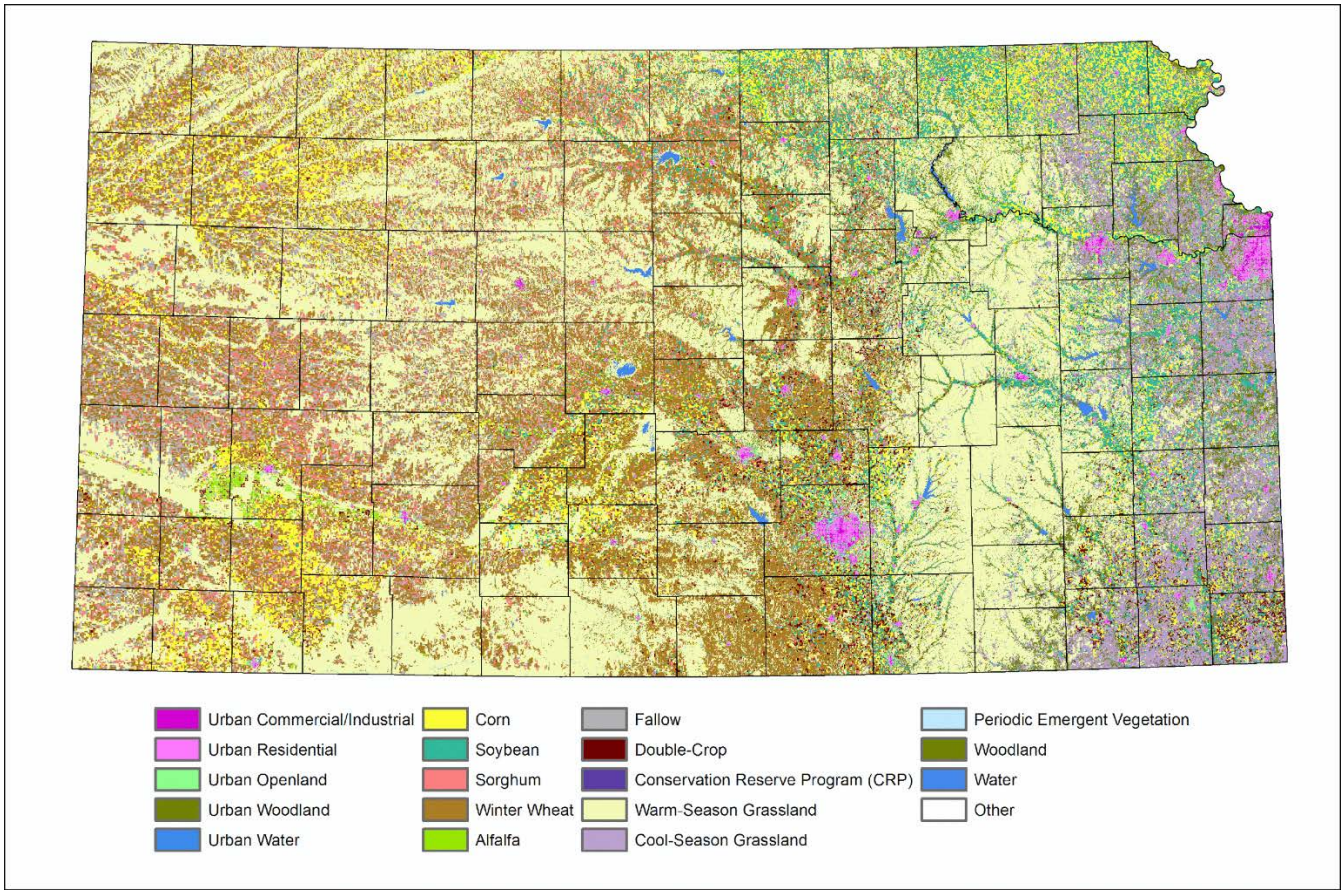
Kansas's total acreage is greater than 52,657,000 acres. The major land cover classes in Kansas include: Grasslands (including CRP lands), Croplands, Woodlands, Open Water, and Urban Developed Land (including Industrial/Commercial, Residential, Urban Openland, Urban Woodland, and Urban Water) (Figure 7) (Peterson et al. 2018). Specifically:

1. Grasslands account for ~23.75 million acres (~45%) and include: native ecosystem rangelands, CRP, and non-native pasturelands.
2. Croplands cover ~24.63 million acres (~47%) and include: wheat, corn, soybean, sorghum, alfalfa, fallow, and double crop.
3. Woodlands cover ~2.75 million acres (~5%) and includes: any wooded areas having canopy closure of 50% and greater.
4. Urban and developed areas account for ~0.97 million (~2%) including: roads, commercial and residential development, and urban open space and parks
5. Water accounts for ~0.54 million acres (~1%) includes: reservoirs, streams, and ponds

Of the state's major land cover classes, rangelands, have the greatest value to monarchs. Rangelands in Kansas include native tallgrass, mixed grass, and shortgrass prairie ecosystems, oak savannahs in the east, as well as sand sagebrush prairies in the west (Figure 8).

Eastern monarch populations evolved with these rangeland ecosystems, and they are critical to the species during their spring, summer, and fall breeding seasons in Kansas, as well as spring and fall migration periods. Data from the 2011-2016 USDA Natural Resource Inventory (NRI) indicates that Kansas has 15,808,200 acres of non-federal rangeland (Lessard 2017). The Western region has 6,144,700 acres of non-federal rangeland; the Central region 4,426,900 acres; and the Eastern region 5,236,600 acres (Figure 9). NRI data shows *Asclepias* species occur on 78% of the rangeland acres in the Eastern region of the state, 59% of the rangeland acres in the Central region and on 31% of the rangelands in the Western region of the state (Lessard 2017). In the Eastern and Central regions of the state where breeding habitat is most important, it is estimated that there are 377 million – 1.56 billion milkweed plants on non-Federal rangelands in the Eastern and Central regions of Kansas. Broken down by region these estimates include 274 million – 1.24 billion plants of milkweed in the Eastern region of the state, and 103 million – 356 million milkweed plants in the Central region of the state (Lessard 2017).

Figure 7. Kansas Land Cover Patterns, Level III (2015)



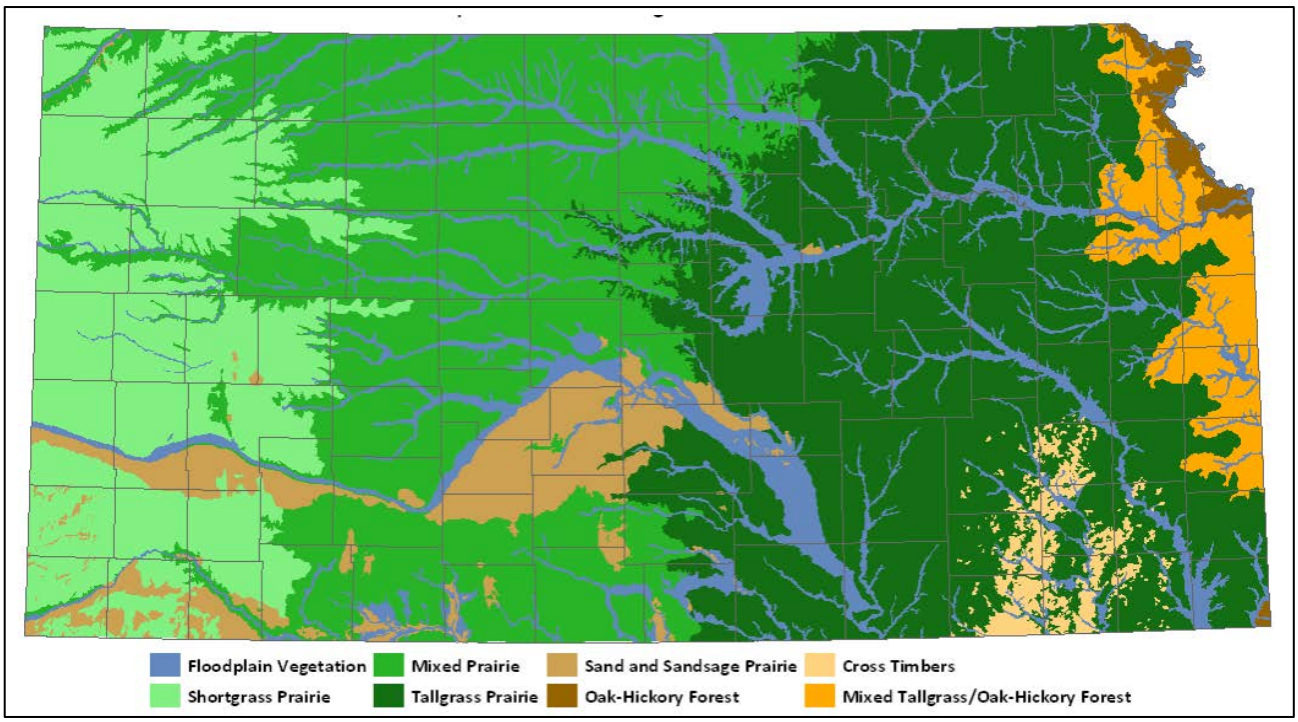
Map courtesy of University of Kansas Applied Remote Sensing (KARS) Program

In the Central and Western region, where nectar producing plants are important particularly during the fall migration, at least one species of the four genera of forbs listed in the USDA PLANTS database as having a *Very High* value to monarchs occurred on 100% of the non-federal rangeland acres including *Solidago*, *Liatris*, *Aster*, and *Helianthus* (Lessard 2017). Nearly all the grasslands in Kansas are in private ownership, which underscores the need to work with private landowners and managers. The ongoing level of conservation efforts by those who do not participate in any conservation programs, coupled with those landowners who are provided assistance through federal, state, and NGO conservation programs, will be considered essential to maintaining the current baseline of important monarch resources identified in the NRI data. The Kansas Monarch Conservation Plan employs recommendations for voluntary rangeland management practices that focus on the implementation of more historically-appropriate ecosystem processes and patterns of disturbance into rangeland management practices, as well as references to existing habitat conservation and restoration programs offered by several partners that can provide technical and financial assistance to landowners implementing these practices.

The cropland portions of the Kansas Plan will focus on using the full complement of available conservation funding to assist landowners in targeting conservation practices where and how they will be most beneficial to meet the needs of wildlife and land management goals. This includes advocating for the targeted use of available CRP acres and practices, as well as other state and federal conservation

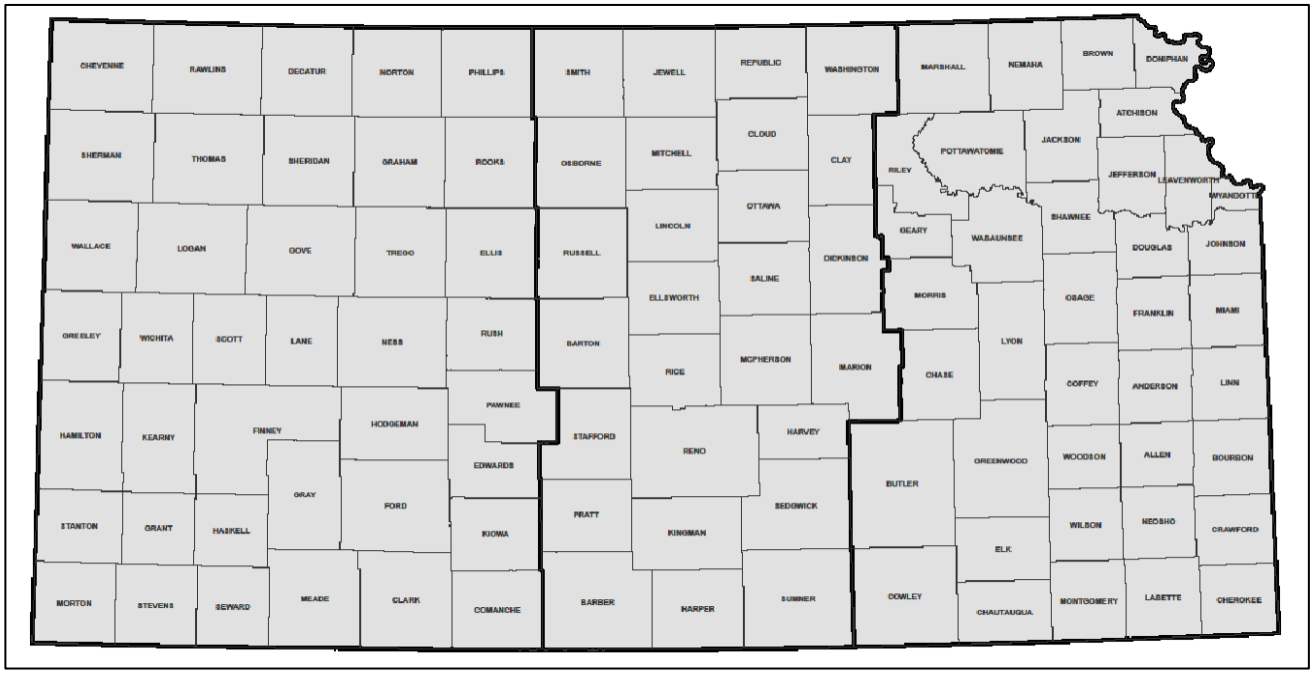
programs and efforts (e.g. EQIP, RCPP programs, State Wildlife Grants, KDWPT Habitat First, etc.) designed to provide wildlife habitat, build soil health, and improve air and water quality.

Figure 8. Generalized Vegetation of Kansas – Küchler's Map of Potential Vegetation



Map courtesy of University of Kansas Applied Remote Sensing (KARS) Program

Figure 9: Western, Central, and Eastern Regions of Kansas



Map provided by USDA, NRCS NRI.

While the primary focus of the Plan is built around restoration and enhancements of agricultural lands, the Kansas Monarch Conservation Plan identifies the need and importance for conserving, restoring, and enhancing pollinator habitat along roadsides, utility, energy, and railroad rights-of-way. In addition to rights-of-way, the Kansas Plan also identifies the need for conservation opportunities within urban, residential, and corporate-owned areas.

Other major components of the Kansas Plan will focus on outreach and education as well as research and monitoring components appropriate for all sectors mentioned above, as well as the general public. Efforts focused on cross-sector work is needed for successful implementation of the Plan. Engaging partners across the monarch breeding and migratory range is critical to supporting overall recovery.

MONARCH SPECIES AND HABITAT CONSERVATION GOALS

The Kansas Monarch Task Force currently consists of 68 partner organizations representing ranchers, farmers, agricultural and conservation non-governmental organizations, various industries, academia, tribal nations, and governmental agencies. The collaborative is working together to create the Kansas Monarch Conservation Plan and seeks to work with all entities within the state interested in pollinator conservation on private and public lands.

Planning for this conservation effort began with the Kansas Monarch Conservation Plan Summit which occurred June 7 and 8, 2017. Attendees at the Summit discussed monarch biology and threats, previously completed or ongoing projects to benefit pollinator habitat within the state, possible new projects to also benefit monarchs, and form work groups to help draft the goals and strategies which follow. As previously noted, work groups were based on “sectors” of the overall conservation framework to be employed by this plan: Grasslands, Croplands, Rights-of-Way, Urban and Outreach, Research and Monitoring. Work group participation was voluntary for all members. Kansas Monarch Task Force members who were unable to serve on work groups provided assistance by reviewing draft plan goals and providing comments to improve the goals and overall plan. A listing of work group members and the organizations they represent can be found in Appendix 1.

Four workgroups produced short-term goals intended to get underway as soon as possible and produce habitat benefits within 3-5 years of commencement. Aside from these short-term goals, other goals listed for each sector are cumulative for the proposed 20-year timeframe that this plan is operative. However, it is the intention of the Kansas Monarch Task Force for the plan to act as a “living document” to be updated and revised to suit changing circumstances or new information about monarch biology and habitat needs. Many of the goals that follow propose to use existing conservation technical/financial assistance programs offered through a number of organizations/agencies represented on the Kansas Monarch Task Force, and thus would not require new programs to be developed and funded. All proposed habitat conservation and enhancement activities will be voluntary in nature. The Kansas Monarch Conservation Plan will place no new mandates or requirements on landowners, businesses, private organizations, or public agencies.

Short-Term Sector Goals

Grasslands Sector

Combined 5-year habitat enhancement and creation goals:

1. At least 125,000 acres of management practices implemented on private lands to improve grassland habitat for monarchs
    - USFWS – 108,200 acres via USFWS-Partners for Fish and Wildlife program
    - KDWPT – 10,000 acres through Improving Working Lands for Monarch Butterflies Regional Conservation Partnership Program (RCPP) projects
    - The Nature Conservancy (TNC) – 10,000 acres through projects enrolled in Native Grazing Land Protection in the Plains RCPP projects
    - Audubon of Kansas (AOK) – 1,750 acres of grassland improvement through AOK habitat management plans
2. At least 500 acres of newly created native grassland habitat through conversion of existing non-native grasslands or croplands
    - KDWPT – through funding from Improving Working Lands for Monarch Butterflies RCPP
3. At least 45 miles of riparian zone enhancement and 665 acres of wetland habitat improvements to benefit native pollinators, including monarchs
    - USFWS-Partners for Fish and Wildlife program projects
4. Over 4,000 acres of grassland habitat protected through conservation easements
    - TNC – as part of Native Grazing Land Protection in the Plains RCPP projects

Croplands Sector

5-year habitat enhancement and creation goals:

1. Re-enroll approximately 300,000 pollinator-friendly CRP acres as they expire over the next five years (2019-2023)
    - Cropland Work Group members support landowners using full available complement of Conservation Reserve Program acres to target conservation in areas and ways which will best meet their goals for overall farm income, efficiency, and wildlife conservation. Goaled acres are based on projected acres of CRP expiring in wildlife-friendly practices, such as: CP2, CP4D, CP23/23A, CP27/28, CP33, CP38, and CP42 over next 5 years.
    - Where needed, Work Group members recommend that reenrolling CRP be enhanced through management practices, such as burning, disking, or inter-seeding to increase existing vegetative diversity and benefits to native pollinators.
2. Create 200,000 pollinator-friendly CRP acres
    - Through use of existing pollinator-friendly CRP conservation practices and acres and/or new practices/acres authorized in next Farm Bill.
3. Create 78,000 acres of pollinator-friendly cover crops planted
    - Through enrollment in USDA-NRCS conservation programs such as EQIP, CSP, or future alternative program offerings
4. Create 22,000 acres of pollinator-friendly plantings co-created with partner organizations

Rights-of-Way Sector

5-year habitat enhancement goals

1. Rights-of-Way (RoW) Work Group member companies and organizations will evaluate habitat availability within existing owned/managed rights-of-way to ensure at least 10% of existing acres provide habitat for native pollinators
    - Where needed, companies will employ restoration/management practices to meet the 10% goal on existing rights-of-way.
2. RoW Work Group member companies will prioritize avoidance of native rangeland when siting new developments.
    - As appropriate, member companies will restore temporary disturbances with pollinator-friendly restoration seed mixes on all new owned rights-of-way and will encourage landowners to allow planting of similar mixes to restore habitat on unowned rights-of-way.

Urban & Outreach Sector

5-year habitat creation and enhancement goals and public outreach goals

1. To facilitate native plant use in landscape and greenscape projects, Kansas Forest Service will create and distribute 1,600 pollinator boxes with 50 plants each that include 10 different plant species beneficial to monarchs
    - 100 boxes (5000 plants) in 2019; 500 boxes (25,000 plants) in 2020; 1,000 boxes (50,000 plants) in 2021
2. Provide 20 pollinator habitat workshops, sponsored by KDWPT and KACD, to educate landowners, conservationists, and interested individuals about pollinator declines and ways to improve pollinator habitat
3. Grassland Heritage Foundation will collaborate with Kansas Rural Center and Douglas County Master Gardeners to produce a native prairie restoration guide.
    - Other planned outreach and education projects discussed, to be done independently or in collaboration are: a blog focused on prairie restoration projects, native plant gardening workshop series, native prairie demonstration and restoration tours, and increasing native plant availability to gardeners and landscapers by conducting an annual Spring and Fall native plant sales.
4. Support RoW Work Group with roadside management and right-of-way outreach efforts with local counties and other right-of-way managers
    - Develop a document with quick, concise, constant message addressing the importance of utilizing rights-of-way as pollinator habitat and educating about proper management, including mowing, spot spraying practices. Document should also include information on proper native forb, grass, and noxious weed identification.

Comprehensive Sector Goals, Strategies, and Action Items

Grasslands Sector

Kansas currently has substantial monarch habitat due to a large proportion of native rangelands remaining in the state. However, rangeland habitat can be improved in some areas, particularly where habitat has been degraded by fire suppression, woody vegetation expansion, invasive species encroachment, historic over- or under-utilization of annual forage production, and herbicide applications

that can reduce plant species diversity and habitat structure. Moreover, there are portions of the state where a larger proportion of the available land has been converted to cropland. In these areas, the management of remnant grasslands is of increased importance. With these principals in mind, the overall goal for the grassland working group is to maintain, enhance, and conserve all the native rangeland remaining in Kansas. Specifically, the working group will work to maintain the milkweed and floral resources already found on rangelands, and improve existing grasslands through outreach, education, and voluntary conservation programs with willing landowners.

Ecosystem processes and patterns of disturbance essential to the maintenance of grasslands include: prescribed fire and grazing system practices that focus on a broader range of spatial and temporal habitat and plant species heterogeneity; invasive woody and herbaceous species control; reduced broadcast herbicide application on grazing lands; and restoration of habitat previously converted to other uses.

The Grassland working group focuses on fire, grazing, and rangeland management practices that promote spatial and temporal plant diversity and habitat heterogeneity critical to monarchs, native pollinators, and many other wildlife species.

GOAL 1: To conserve, maintain, or enhance monarch habitat on privately owned grasslands in Kansas.

Objective A: Identify target areas that are critical to monarch breeding and migration habitat.

Objective B: Increase heterogeneity-based habitat management that benefits profitability and monarchs on working landscapes as an alternative to techniques that promote habitat homogeneity.

Strategy 1. Promote and provide assistance to increase patch-burn grazing in critical monarch areas by identifying and overcoming barriers to wider utilization of the practice.

Strategy 2. Decrease invasive woody plant cover in grasslands.

Strategy 3. Reduce broadcast herbicide application on grazing lands and hay meadows by providing education to landowners and managers.

- Promote spot spraying of invasive or harmful plant species.
- Encourage managers to consider the importance of forbs and legumes to beef production, the ecosystem, and wildlife.

Strategy 4. Convert monotypic non-native grasslands into native grasses and forbs.

Strategy 5. Educate landowners and managers for early detection and rapid control of invasive non-native plants, particularly sericea lespedeza and Old World bluestems.

Strategy 6. Encourage appropriate timing of mowing and haying to increase pollinator habitat and floral resources.

Objective C: Maintain, enhance, and create monarch habitat on existing and expiring CRP enrolled lands.

Strategy 1. Develop BMP's for CRP enhancement and management specifically for monarchs on existing and expiring CRP acres.

Strategy 2. Focus additional resources to enhance management within targeted areas of existing CRP beneficial to Monarchs.

Strategy 3. Facilitate conversion of expired CRP to working grasslands through education efforts so monarch habitat can be maintained or improved.

Strategy 4. Promote enrollment into priority CRP practices and initiatives such as CP42, CP38, and CP88.

Strategy 5. Encourage use of prescribed fire and grazing as CRP management tools to increase stand heterogeneity.

GOAL 2: Provide additional outreach and education about monarch conservation needs and beneficial practices to grassland landowners and managers.

Objective A. Collaborate with Urban and Outreach Work Group to educate landowners and managers on the value and importance of pollinator and monarch conservation.

Strategy 1. Develop quick, concise, and constant messaging documents that includes information regarding financial and technical assistance program opportunities.

Strategy 2. Develop heterogeneity management workshops that emphasize the contribution of broadleaf plants to increased cattle production.

Strategy 3. Develop one-page producer-oriented documents to define grassland best-management-practices (BMPs).

- Emphasize brush management and appropriate use of prescribed fire and herbicide application in grassland management plans.

Objective B. Enhance grassland and hay meadows management on state and federal public lands using BMPs as appropriate.

Strategy 1. Use demonstration sites for managers to walk and see how forb-diverse practices are possible and profitable.

Cropland Sector

The Cropland Work Group acknowledges that cropland composes a large proportion of the land area in Kansas but believe there is room for targeted habitat restoration or conservation on many farms in the state. The group supports voluntary, incentive-based conservation practice implementation that can enhance overall farm management efficiency and profitability through the use of existing financial and

technical assistance programs. To that end, the Cropland Working Group recommends using the full complement of available conservation funding to assist landowners to target conservation practices where and how they will be most beneficial to meet the needs of wildlife and land management goals. This includes advocating for the targeted use of available Conservation Reserve Program acres and practices, as well as other state and federal conservation programs and efforts (*e.g.* EQIP, RCPP programs, State Wildlife Grants, KDWPT Habitat First, etc.) designed to provide beneficial wildlife habitat, build soil health, and improve air and water quality.

GOAL 1: **Maintain, enhance, and create monarch habitat within cropland systems to the extent possible.**

Objective A. Work with landowners and tenants to encourage full use of current FSA, NRCS, and state monarch programs such as CP-42, EQIP, CSP and Monarch and Pollinator RCPP for monarch feeding and breeding habitat creation and maintenance.

Strategy 1. Create a crop budgeting tool that compares the costs and benefits of commercial crop planting versus establishing monarch habitat within portions of cropland.

Strategy 2. Demonstrate precision agriculture applications that can be used to identify crop acreage best suited for monarch, pollinator, and beneficial insect habit.

Strategy 3. Work with landowners and tenants to enhance their management of acreage currently enrolled in FSA, NRCS, and other available wildlife habitat and cover crop programs so they better benefit monarchs, pollinators, and beneficial insects.

Strategy 4. Work with NRCS to identify available practices that benefit monarchs and other pollinators, develop others as needed, and ensure they are fully available through all relevant NRCS and FSA programs, including CSP, CRP, EQIP and the Monarch and Pollinator RCPP.

Objective B. Work with landowners and tenants to enhance their management of cropland acreage to best avoid, minimize, and/or offset potential damage to monarchs, pollinators, and beneficial insects.

Strategy 1. Increase and improve education and awareness among landowners, tenants and pesticide applicators on the best available science on the effects of pesticides on monarchs and their habitat., Couple that outreach with additional efforts to improve education and awareness of the strategies and practices of Integrated Pest Management (IPM) to control crop pests with minimal pesticides.

Strategy 2. Explore ways to improve timing and precision of pesticide applications to minimize damage to monarchs, pollinators, and beneficial insect populations.

Strategy 3. Work with landowners and tenants to identify and manage non-crop areas (*e.g.* field edges, fence rows, and pivot corners) within their cropping systems to enhance habitat for monarchs.

Strategy 4. Identify the time periods when blooming crops, such as alfalfa and various cover crops, are most beneficial to monarchs and other pollinators, and encourage landowners and tenants to consider delaying harvest to extend the bloom periods. Further explore the impacts and economics of reduced lignin alfalfa and its ability to allow delayed harvest while maintaining forage quality and increasing overall yields.

Strategy 5. Create an Organic Farming Subcommittee that will focus on pollinator and beneficial insect best management practices for current or transitioning organic farmers.

Objective C. Encourage enrollment in available playa restoration programs to manage playas as native plant communities for monarchs, pollinators, and beneficial insects.

Strategy 1. Create and demonstrate crop and livestock budgeting tools that compare the costs, benefits, and soil and water health improvements of converting tame pasturelands and playas into native plant communities.

Rights-of-Way Sector

While right-of-way habitat is a smaller component of available landcover within the state, cumulative acreage included within some types of right-of-way easements are still a significant proportion of the state's land area. Moreover, the holders of those easements are less numerous than the number of landowners managing grassland and cropland within the state. For instance, Kansas Department of Transportation is thought to maintain and manage more acres of the state than any other single landowner or entity. Given these facts and understanding that the linear nature of rights-of-way make them excellent potential connectivity corridors linking larger areas of potential habitat, the Rights-of-Way Work Group is committed to continuing to work to avoid/minimize impacts to available habitat when obtaining new rights-of-way and managing/enhancing existing rights-of-way to provide benefits to monarchs and other species native to Kansas.

GOAL 1: **Maintain native grassed right-of-way areas and minimize disturbance to existing prairies.**

Objective A. Promote the importance of avoiding native grassed areas when siting new development.

Strategy 1. Distribute informational correspondence to permitting departments, consultants, and others who make decisions regarding where to place facilities, lines, and roads to consider such native grassed areas crucial pollinator habitat and to weigh these areas heavily in studies, environmental assessments, and cost/benefit analyses.

Objective B. Create or revise regionally-specific native grass-forb seed mixes to better suit monarch/pollinator resource needs.

Strategy 1. Establish mixes consisting of a wide diversity of nectar producing forbs including milkweed species, that bloom throughout the growing season (spring, summer, and fall) to provide monarchs and other pollinators essential feeding and egg laying habitat. Decrease the percentage of taller growing and/or aggressively growing grasses in

the mixes to reduce competition with beneficial forbs. Adaptations of the mixes may be necessary and may request expert review of mixes before utilization.

Strategy 2. Consider, and where possible, implement management practices which will help maintain diverse and beneficial grass-forb habitat in rights-of-way. Practices may include prescribed fire, targeted herbicide applications of invasive species, and combined with interseeding.

Objective C. Revise mowing policies to avoid critical monarch migration and breeding periods.

Strategy 1. Limit mowing to early spring and late fall when not in clear zones or other safety critical areas.

Strategy 2. Reduce mowing to 2-3-year mowing cycle where possible, or annual mowing in late fall to winter.

Objective D. Revise herbicide application policies to avoid broadcast or widespread applications, which negatively impact pollinator habitat, and unnecessarily increase costs.

Objective E. Improve implementation and compliance of monarch/pollinator BMPs within companies and agencies.

Strategy 1. Conduct annual education of field and district employees that focuses on beneficial forbs vs. noxious weeds and invasive plants, and the value of native forbs, milkweeds, and native grasses as crucial monarch and pollinator habitat. Include education regarding revised mowing and herbicide application policies.

GOAL 2: Restore rights-of-way to native grass-forb communities, where appropriate.

Objective A. Identify right-of-way sites to restore and enhance monarch habitat.

Strategy 1. Restore/enhance habitat using regionally- and ecologically-specific milkweed seeds and plugs, and nectar forbs in areas that include:

a. native grass but few beneficial forbs, or

b. areas which can serve as high-traffic public demonstration areas through conversion from non-beneficial habitat or restoration/enhancement of native grasslands on industry-owned properties and rights-of-way.

Strategy 2. Identify and control undesirable woody species encroachment in rights-of-way to improve habitat (Red Cedar, etc.) Care should be taken to consider conservation of smaller desirable species where possible.

Objective B. Document and monitor selected restored sites.

Strategy 1. Use photos and location identifiers to record pre-existing site conditions and restoration efforts; document success of restoration using plant surveys and site conditions to monitor success.

GOAL 3: Influence right-of-way companies and agencies with outreach and education

Objective A. Educate companies and agencies on monarch conservation practices.

Strategy 1. Conduct RoW Monarch Field Visits (minimum of one a year) to facilitate an exchange of ideas between RoW Working Group Members, applicable personnel, and other prospective RoW members. Meet in the field/on site to view potential, existing, and newly managed areas or restoration sites. Collaborate to discuss ideas, successes, and problem solve.

Strategy 2. Seek to influence with presentations, participation or both at one of the following or similar events

a. county weed departments training event
b. Kansas County Highway Association event
c. rural electric coop meetings
d. utility company or representative conferences or training events.
e. alternate to presenting – partner with another utility in a monarch conservation project

Strategy 3. Produce a document, website, display, or publication to provide education regarding the importance of native forbs in rights-of-way.

Objective B. Educate the public on right-of-way monarch conservation practices.

Strategy 1. Use existing industry, agency, community, and academic educational programs and documents to enhance the public's understanding of monarch conservation. Consider using:

a. websites, newsletters, signage, displays, and other media
b. select sites with high public visibility, such as rest areas or utility corridors, to incorporate native grass-forb plantings; install signage to educate public on benefits of native plants in rights-of-way
c. foster other monarch educational opportunities and events by partnering with supportive groups, such as native plant societies, garden clubs, and tourism organizations.

Urban and Outreach Sector

Public buy-in is critical for the success of large-scale conservation efforts. With respect to monarch conservation, understanding and acceptance of the need for habitat may not be enough. Additional habitat for monarchs is not just needed in rural areas, and the species will be benefitted by increasing habitat available in developed areas.

GOAL 1: Facilitate the use of native plants in landscape and greenscape projects.

Strategy 1. Kansas Forest Service will create and distribute 1,600 pollinator boxes with 50 plants each that include 10 different plant species beneficial to monarchs

a. 100 boxes (5000 plants) in 2019; 500 boxes (25,000 plants) in 2020; 1,000 boxes (50,000 plants) in 2021

Strategy 2. Grassland Heritage Foundation will collaborate with Kansas Rural Center and Douglas County Master Gardeners to produce a native restoration guide.

a. Other planned outreach and education projects discussed, to be done independently or in collaboration are: a blog focused on prairie restoration projects, native plant gardening workshop series, native prairie demonstration/restoration tours, and add an additional native plant sale during the fall season as a counterpart to the existing spring sale.

GOAL 2: Facilitate outreach and education efforts within all Kansas Monarch Conservation Plan sectors.

Strategy 1: Provide 20 pollinator habitat workshops, sponsored by KDWPT and KACD, to educate landowners, conservationists, and interested individuals about pollinator declines and ways to improve pollinator habitat.

Strategy 2: Support efforts to produce outreach events and messaging documents/tools by providing review with suggestions and comments to improve the information conveyed.

Research and Monitoring Sector

Much more could be learned about monarch biology and ecology within Kansas. Work group members hope to support ongoing and future research and monitoring efforts for monarchs in the state. As new information becomes available, work group members is help distribute it to interested parties.

GOAL 1: Increase our understanding of monarch biology and ecology in the state.

Research Priority 1: Conduct a comprehensive assessment of the current vegetative communities as well as supporting research into daily dispersal distance, migration distance related to habitat connectivity in the state.

a. support protection of priority habitat areas
b. support reestablishment of lost habitat in priority areas

Research Priority 2: Conduct literature reviews and/or research to determine the direct impact of pesticides on monarchs and monarch larva

Research Priority 3: Conduct literature reviews and/or research on the presence of monarchs in western Kansas during migration seasons to understand how to prioritize the creation or enhancement of foraging and breeding resources for both northward and southward migrations.

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Appendix 1: The Kansas Monarch Task Force Membership
105 members representing 68 organizations.

Members

Ag Innovations
Audubon of Kansas
Bayer Crop Science
Cleanline Energy
Dow AgroSciences
DuPont Pioneer
Dyck Arboretum of the Plains
Emporia State University
Farm Service Agency
Grassland Heritage Foundation
Heartland Conservation Alliance
ITC Great Plains
Johnson County Park & Recreation District
Kansas Agricultural Aviation Association
Kansas Association of Conservation Districts
Kansas City Native Plant Initiative
Kansas Cooperative Council
Kansas Corn Growers Association
Kansas County Highway Association
Kansas Department of Agriculture
Kansas Department of Agriculture - Division of Conservation
Kansas Department of Transportation
Kansas Department of Wildlife, Parks, and Tourism
Kansas Electric Cooperatives, Inc.
Kansas Farm Bureau
Kansas Farmers Union
Kansas Forest Service
Kansas Grain Sorghum Commission/Producers Association
Kansas Graziers Association
Kansas Grazing Lands Coalition
Kansas Livestock Association
Kansas Master Naturalist
Kansas Native Plant Society
Kansas Rural Center
Kansas Sierra Club
Kansas Soybean Commission
Kansas State University - Department of Entomology
Kansas State University - Southwest Research and Extension Center
Kansas Turnpike Authority
Kansas Wheat Commission
Kansas Wildlife Federation
Midwest Association of Fish and Wildlife Agencies
Monarch Watch
Monsanto
Mycogen Seed
National Park Service
National Wild Turkey Federation
No-Till on The Plains
Northern Natural Gas
Oneok
Pheasants Forever/Quail Forever
Playa Lakes Joint Venture
Prairie Band of Potawatomi Nation
Southeast Kansas Audubon Society
The Nature Conservancy Kansas
Topeka Zoo & KS Association of Zoos
U.S. Army Corps of Engineers - Tulsa District
U.S. Department of Defense - Fort Riley
U.S. Environmental Protection Agency - Region 7
U.S. Fish and Wildlife Service, Partners Program
U.S. Fish and Wildlife Service, LCC Program
U.S. Fish and Wildlife Service, Ecological Services
U.S. Department of Agriculture - Farm Service Agency
U.S. Department of Agriculture - Natural Resources Conservation Service, Region 5
U.S. Department of Agriculture - Natural Resources Conservation Service, Kansas
Westar Energy
Western Association of Fish and Wildlife Agencies
Xerces Society for Invertebrate Conservation

Appendix 2: Existing Monarch Conservation and Outreach in Kansas (2014-2018), unless otherwise noted)

Kansas, Farm Service Agency has enrolled 1,558,018 acres of CRP in the state that benefit pollinators as of January 2017 (CRP total acres for 2017 were 2,071,634). These 1,558,018 acres were created through 22 CRP practices that provide native forbs and grasses for breeding and feeding resources, as well as provide habitat cover necessary for completing life cycles. None of these practices include non-native plant species in the seed mixes.

Kansas, USDA Natural Resources Conservation Service has enrolled 613,737 acres from 2014-2016 in the following programs: A) Practice 647 (Early Successional Habitat Development/Management) 455 acres; B) Practice 314 (Brush Management) 114,363 ACRES; C) Practice 338 (Prescribed Burning) 37,030 acres; Practice 340 (Cover Crop) 27,013 ACRES; D) Practice 538 (Prescribed Grazing) 403,182 acres; E) Practice ANM09 (Grazing Management to Improve Wildlife Habitat) 2,387 acres; F) SQL04 (Use of Cover Crop Mixes) 27,646 acres; G) ANM11 (Patch Burn Grazing to Improve Wildlife Habitat) 1,694 acres.

Kansas, United States Fish and Wildlife Service, Partners for Fish and Wildlife Program has enhanced or restored 49,804 upland and lowland acres and 183 riparian miles (2014-2016) that benefit Monarchs and other native pollinators. These acres are all on private lands and found in three major native grassland landscapes in the state, which include the Flint Hills, the Smoky Hills, and the Red Hills. These landscapes are primarily privately owned and managed for cattle production. The practices supported by the KS Partners Program include invasive species control that affects Monarch habitat, as well as grazing and fire practices that promote Monarch and other native pollinator habitat. 17,080 acres and 73.3 miles have been restored or enhanced in the Flint Hills; 11,780 acres and 48.4 miles in the Smoky Hills; and 20,944 acres 61.9 miles in the Red Hills.

Kansas, United States Fish and Wildlife Service, National Refuge System has 26,900 acres of refuge lands that are under active Monarch habitat management in 2017. The practices implemented by the KS USFWS refuge system to restore or improve Monarch habitat include native forb and grass plantings, fire and grazing practices, invasive species control (including woody plant expansion), and moist soil management. 10,000 acres are managed for Monarchs at Quivira NWR; 1,800 acres at Marais des Cygnes NWR; 9,100 acres at Kirwin NWR; and 6,000 acres at Flint Hills NWR.

Kansas Department of Wildlife, Parks, and Tourism has implemented or facilitated the implementation of several management practices to improve habitat for monarch butterflies. Relevant rangeland management practices employed by KDWPT (on private and public lands) include: Prescribed Burning (32,118.3 acres), Invasive Brush Management (17,965.2 acres), Invasive Herbaceous Weed Control (32,029.8 acres), and Prescribed Grazing Plans (18,429 acres). Projects that provide benefits to pollinators and other wildlife on cropland areas include: Conversion of Cropland/Introduced Grass to Native Plants (4,115.5 acres), Forb Inter-seeding in CRP-type Cover (480.1 acres), Pollinator Plots /Buffers (Plots planted within cropland settings ~ 30 plots and 154.3 acres), and Cover Crop Plantings (2,234 acres).KDWPT Parks Division planted 25 small pollinator plots as outreach and educational opportunities at state parks, ranging in size from 0.1-5.1 acres. 79 staff members have been trained on monarch/pollinator habitat practices, and the Parks and Public Lands divisions had 9 outreach and education field targeted towards the public and landowners.
Great Plains Nature Center hosted an annual “Pollinator Party” in 2014, 2015, 2016, and 2017. Attendance for the four years is >3,000 people. The Chisholm Creek Park is a Monarch Waystation (in

the very large category), and two small native wildflower gardens have been planted on the GPNC campus.

Kansas Wetlands Education Center has an Annual Butterfly Festival that includes educational materials on the monarch butterfly, habitat restoration and pollinators in general. They conduct monarch tagging and are a Monarch Waystation and have a school program offered for local classroom learning opportunities. The school program centers on the monarch life cycle, migration, life history, and includes tagging demonstrations. Over 500 children have been reached through those efforts. Kansas Wetlands Education Center also collects milkweed seed for Monarch Watch, as well as collects, germinates and grows local milkweeds for local distribution in the spring and fall.

Kansas Grazing Lands Coalition has delivered 15 Private Landowner Habitat Conservation Agreements through the 2015 NFWF Monarch Grant Funds program from 2015-2017. These agreements have resulted in over 15,000 acres being restored or enhanced specifically for Monarch and native pollinator conservation across the state of Kansas.
Kansas Department of Transportation manages 140,320 acres of KS roadway rights-of-way for monarch and other wildlife habitat. Practices include native-only grass and forb plantings on all

Kansas Department of Transportation's creation and enhancement of pollinator habitat dates to 2003 when a partnership was formed with the KDWPT, the Kansas Wildflower Society, the Kansas Biological Survey, Audubon of Kansas, and the Kansas Turnpike Authority to produce the "Kansas Wildflowers, Native Grasses and Shrubs" brochure. This publication depicted KDOT's efforts to improve pollinator habitat and beautify roadways by restoring the right-of-way to native habitat. Another effort includes developing regional native grass and wildflower mixes, to include milkweed species, with an abundance and diversity of species that provide sequential and overlapping bloom times to provide nectar and egg laying resources for monarchs and pollinators throughout the growing season. KDOT has prioritized the use of locally sourced plant material to improve establishment and persistence of plantings that have higher value to pollinators. These mixes are not only beneficial to pollinators, but they provide abundant flowering plants that can draw tourists and aid in filtration of stormwater runoff. These mixes are designed for use on every project statewide where right-of-way seeding is required after road/bridge construction is complete.
KDOT staff and partners from conservation groups and KDWPT formed an Aesthetics Task Force to develop a better way to manage the more than 150,000 acres of state-owned highway right-of-way. Policies were updated limiting the frequency and timing of mowing, spot spraying and the elimination of broad application of herbicides to control noxious and invasive weeds. This not only reduces roadside maintenance costs, but also benefits the many pollinators that inhabit the right-of-way.
KDOT identified many areas across the state for areas of high likelihood for successful pollinator friendly plantings and created many acres of beneficial pollinator habitat.
In 2016 KDOT, along with five other state DOTs and the FHA, signed an agreement to improve pollinator habitat along I-35 (The Monarch Highway), a key migratory corridor for Monarch butterflies. This agreement establishes a cooperative and coordinated effort to establish best practices and promote public awareness of the Monarch butterfly and other pollinators.
In cooperation with the Monarch Highway agreement KDOT created 15 acres of pollinator habitat that consists of 23 native wildflower seed species and 1152 milkweed plugs (2 species), at the Homewood Rest Area and is currently monitoring its success. Several other sites along the I-35 corridor, currently totaling 40 acres, have been identified and efforts are underway to convert these previously mowed grassy areas into beneficial native grass and wildflower pollinator enhancement areas. Future sites have been identified, and as funds become available, will also become areas beneficial to the preservation of

the monarch.
KDOT developed a website to bring attention to the decline of the monarch population, and how important it is to support and promote pollinator habitat, while also showcasing some pollinator projects achieved by KDOT. http://pollinatorpartners.ksdot.org
KDOT celebrated National Pollinator Week in June by having displays in their lobby area. In support of this event, KDOT sent out 2 blog posts, 2 Facebook posts and 2 Twitter posts celebrating the importance of pollinators and highlighting what KDOT has done to support pollinator habitat. KDOT also created two "mascots" that will appear in various pollinator articles and on the website. KDOT plans to continue to celebrate National Pollinator Week in the future.
KDOT is currently involved in a native wildflower/milkweed enhancement project located at the Montgomery County Rest Area that will replace and enhance the plant beds and acreage surrounding the rest area to provide beneficial habitat to monarchs and pollinators, as well as signage to help educate the public on the importance of providing native vegetation in our landscapes that benefit pollinators.
KDOT will continue to disseminate information to the public and other KDOT employees through the use of their Translines and Stormwater newsletters, educating about their pollinator efforts.

Kansas Turnpike Authority maintains ~6,000 acres of right-of way as native prairie. KTA has established a program to only mow a section of right-of-way once every two years. They use land management practices such as delayed mowing and allow adjacent land owners to burn KTA RoW when burning their own pasture to promote native ecosystem processes. KTA only uses native plant mixtures to reseed KTA roadsides, and they follow the seeding mixture and rates standards that KDOT uses.

Kansas Soybean Association works on behalf of Kansas's 15,000 soybean farms and officially support the following regarding monarchs and native pollinator conservation: 1) 2.6.5.01 ASA believes input benefits and economic impact on farmers and consumers should be considered in laws and regulations designed to protect endangered species. ASA favors exempting man-made agricultural structures from the provisions of the Endangered Species Act. (2015); 2) 2.6.5.02 ASA believes laws and regulations designed to protect endangered species must be science based. ASA supports legislation and education that would protect producers from unintentional impacts to endangered species. (2017); 3) 2.6.5.03 ASA supports voluntary based efforts on private lands to improve pollinator and Monarch butterfly habitat and urges federal, state and local governments to incorporate methods to improve such habitat on publicly owned lands. (2016); 4)2.6.5.04 ASA supports the collaborative efforts of the National Resources Conservation Service (NRCS) and U.S. Fish and Wildlife Services (USFWS) that created the Monarch Butterfly Conference Report (December 2016). This report gives the pathways for producers to receive predictability should the Monarch become listed under the Endangered Species Act (ESA). (2017)

Kansas Farm Bureau represents over 50,000 landowners and managers in the state of Kansas. To their members, they officially support the following in regards to monarchs and native pollinator conservation: 1) American Farm Bureau Foundation #203 - Programs that increase the availability and additional planting of non-noxious pollinator forage on private and government-owned or managed lands; and 2) Kansas Farm Bureau CNR-11 - As an alternative to placing species on threatened or endangered lists, we support developing conservation management plans that will increase or maintain the population and make listing unnecessary. Conservation management plans should be the result of a cooperative effort by landowners, agricultural producers, wildlife managers, conservation technicians and the appropriate federal and state agencies. Any conservation management plan should be voluntary and provide incentives to private landowners for protecting or enhancing habitat for species needing

protection. Non-participants in voluntary species conservation management plans should not be held to the standards of the plan. Kansas Farm Bureau sponsors the annual Monarch Mania at Quivira National Wildlife Refuge,

Kansas Corn Commission supports AFBF #230 and KFB CNR-11, as stated above in the Kansas Farm Bureau section.

Westar Energy manages 6,825 acres of native grasslands using fire and grazing to enhance Monarch and other native wildlife habitat, including 425 acres of brush/tree control in 2016. In 2017, Westar started managing 6,500 acres of company-owned native grassland in Pottawatomie County for monarch and other wildlife using fire, grazing, haying, and invasive/noxious weed/woody control for monarchs and other wildlife. In particular, they are switching 25% of their prescribed burning acres per year across all of their native prairie holdings to late summer/fall burns to promote milkweed production later in the year when Monarchs are migrating south and still laying eggs while traveling. In 2017: 1) Westar helped create (through funding and service) three Pollinator Garden plantings in each Pottawatomie, Reno, and Shawnee counties, as well as numerous schoolyard pollinator gardens at various schools in the Topeka Public School District; 2) a prescribed burning workshop that focused on the benefits of different types of burning for monarch and other wildlife habitat on native prairies; 3) provided funding to Monarch Watch to distribute milkweed and nectaring plants to 15 Kansas state parks; 4) Westar Energy's Green Team conducts 50-70 projects per year that focus on restoring or enhancing native prairies, including conducting prescribed fires on state and federal conservation lands, planting native plant stands, and converting cool season (non-native) grass stands to native prairie.

Monarch Watch has 561 Monarch Waystations in KS, ranking 15th in the nation for number of waystations. As of 30 August 2017, the organization had distributed 6,008 milkweed plugs to schools, NGOs, and other restoration projects from 2014-2017. Monarch Watch maintains an active blog that keeps visitors updated on monarch conservation issues, seasonal movements, tagging events, species biology, and The Monarch Highway Project.

Grassland Heritage Foundation owns and maintains three prairie properties. At Rachel Snyder Prairie, GHF's largest prairie, at least 80 acres is managed for monarchs and other native pollinators. This prairie is also a highly visited field site where the public can see the positive effects of burning, bush hogging woody vegetation, and spot spraying for noxious weeds for monarch habitat. GHF also hosts numerous educational activities including workshops, garden and prairie tours, and a blog, and gives annual undergraduate and graduate student research scholarships that support native grassland research. In 2017, they started a new scholarship specifically aimed at supporting native pollinator research on native prairies. Through the GHF Native Plant Sales, over 14,000 native plants have been distributed to the public in the last six years. More information and a schedule of events can be found at www.grasslandheritage.org.

Kansas State University Southwest Research and Extension Center created an extension bulletin on small-scale monarch habitat creation for Kansas homeowners and city landscapers in 2017. The KSRE SW Research Center gives local (western KS) presentations on gardening for monarchs and other pollinators in backyards and developed areas. The research center planted a pollinator garden near the near headquarters since 2014, and the center is actively managing a 2-acre unused to pasture to increase milkweed and nectaring plant species. In 2017, KSRE SW Research Center created a N0 MOW sign to distribute to KS landowners and managers to promote pollinator habitat on county and township roadsides.

Clean Line Energy promotes the maintenance of sustainable and perennial habitat within transmission line rights-of-way for pollinator and wildlife habitat while maintaining transmission line clearance. They create vegetation management plans in accordance with the principles of Integrated Vegetation Management and Transmission Vegetation Management Planning. Clean Line Energy is one of multiple industrial and NGO financial contributors to the Sand County Foundation's Leopold Conservation Award in Kansas.

Kansas Native Plant Society has created multiple Fact Sheets and Position Statements: 1) Bringing Native Plants to Kansas Roadsides (updated January 2017); 2) Gardening with Wildflowers; 3) The Value of Prairie Plants to Rangelands Health and Wildlife Populations. Kansas Native Plant Society has produced numerous books and posters promoting the maintenance and establishment of native forbs and grasses and their importance in maintaining pollinator habitat and ecosystem functioning. The organization maintains an up-to-date list with contact information of native seed and plant providers for the state. Kansas Native Plant Society maintains an annual graduate student research scholarship that promotes native prairie research, including native pollinators. Their website houses a substantial Resources Section that provides numerous links to internal and external resources that educate the public on native plant and pollinator establishment, maintenance, and benefits. Kansas Native Plant Society has multiple statewide annual wildflower walks that educate and promote the importance of native plants to pollinators, wildlife and ecosystem health.

US Environmental Protection Agency, Region 7 has 1.5-acre Pollinator Prairie Site that Monarch Watch uses every year for demonstrations, as well as numerous schools, girl and boy scout troupes visiting every year. At this same site, the USEPA Region 7 has a large pollinator focused event annually for the public titled "Wonder of Discovery". Thousands of people have experienced the Caterpillar Petting Zoo, Caterpillar and Butterfly Exhibits, Monarch Life Cycle Exhibit, Native Bees Vs Honey Bees, Building Native Bee Houses, Reducing or Eliminating Chemicals in the Home Garden, Bat Exhibit, Pollinator Arts & Crafts and Games. Region 7 USEPA trains regional project managers on how to restore and maintain pollinator habitat at all EPA and Superfund sites, by order of the 2014 Presidential Memorandum to Increase Pollinator Habitat on all EPA and Superfund sites.

Kansas Pheasants Forever/Quail Forever works with Kansas NRCS EQIP and CSP programs, FSA CRP and CCRP, and KDWPT State Cost Share to help leverage their own program dollars. KS Pheasants Forever/Quail Forever, with the help of their partners listed above, have implemented over 50 projects since 2014 in Marshall, Jackson, Washington, Nemaha, Lyon, Johnson, Sumner, Jefferson, and Brown counties. The KS organization also has produced monarch workshops, and given monarch and pollinator talks at multiple Conservation District Ag Days meetings across the state. Pheasants Forever/Quail Forever has a Youth Pollinator Habitat Program that engages over 700 chapters nationwide to help youth, families, and communities establish pollinator habitat projects.

US Department of Army, Fort Leavenworth has three pollinator projects on the base since 2014, and they include: 1) a butterfly garden at the youth center; 2) a 1-acre flowering shrub pollinator planting at base headquarters, and 3) a boy scout project that removed honey suckle and replanted flowering shrubs for pollinator habitat. The Fort also works to change mowing practices to avoid the mowing of milkweeds and treat teasel with spot treatment to prevent encroachment on native prairie and woodlands that are important for pollinators.

Southeast Audubon Society conducts annual Monarch tagging events in Parsons, KS, as well as pollinator programs to homeschool groups, public schools, and other organizations.

Dyck Arboretum of the Plains has helped establish 70 Monarch school gardens in over 16 counties in south central KS. Dyck Arboretum has one of the largest Native Plant Sales in the central Great Plains two per year, the Spring and Fall Native Plant sale to promote native plantings in home gardens. These sales draw people statewide and out-of-state. Dyck consults with landowners to restore native prairie, control invasive plant species, create burn management plans, and design seed mixes for new prairie plantings.

Playa Lakes Joint Venture helped develop the recently approved CP38b CRP SAFE Migratory Bird and Pollinator program that will support up to 10,000 acres of playa and upland restoration in Kansas.

National Wild Turkey Federation partners with in the state of KS with state and federal agencies to leverage their own program dollars to restore and enhance through prescribed fire, native prairie plantings, woody vegetation removal, and invasive species control.
Burroughs Audubon of Greater KC/KCNPI received a 2105 NFWF Monarch Habitat Grant. With those funds they have implemented over a dozen projects on the ground in the Great Kansas City that include small urban garden to large landscape plantings. These grant dollars and in-kind time were leveraged with the counties of Johnson and Wyandotte, Kansas City Park and Recreation Department, Kansas City Power and Light, and Bridging the Gap.
Prairie Band Potawatomi has a joint project with NRCS in Jackson County on tribal land that started in 2017. The projects will look at the benefits of cover crops for pollinator communities.

Kansas Sierra Club AND K-State Extension Master Naturalists combined has done ~250 presentations to various groups on gardening for monarchs; creating butterfly gardens; monarch tagging and education programs at Ernie Miller Nature Center; monarch programs for Sierra Club members; a children's book about monarch biology and life cycle. Statewide outreach.
Quivira National Wildlife Refuge regularly work to improve sand-prairie wetland for monarchs and other native pollinators through enhancement of existing native prairie and wetland, as well as planting numerous pollinator gardens across the refuge and planting prior farmland back to high diversity native plant stands. ~100 people per year attend Monarch Mania at the refuge's Monarch Waystation. At least 300 monarchs have been tagged per year since 2014, the only limiting factor to tagging more individuals in volunteers. Quivira gives multiple pollinator presentations per year for outreach and education purposes since 2014. The refuge has a pollinator garden that is actively visited and used for outreach and education for monarchs and other pollinators. Quivira serves as one of two pollinator coordinators for the USFWS Mountain-Prairie Region where information is shared across regions, agencies, partners, and stakeholders. These coordinators have also created a document for the Air Force to support the management of pollinator habitat on bases across the United States.

Tallgrass Prairie National Preserve, National Park Service has created several restoration areas near the headquarters with some plots being restored with only seeding, termed the restoration plots, and the other plots, termed the 'pollinator plots' being restored using only live plants and plugs. Tallgrass Prairie National Preserve gives many pollinator tours on the preserve every year, and numerous pollinator workshops and presentations. Every June they have a pollinator weekend that is centered around their annual butterfly count event.
Kansas Wildlife Federation has two pollinator restoration projects in Rush County and one in Ford County. The federation has provided numerous pollinator presentations at their annual meeting the last three years, which is a meeting that is open to the public.

Dow AgroSciences and Mycogen Seeds partners with numerous Kansas landowner organizations, Kansas USFWS, and Kansas researchers to improve invasive species control on native rangelands while promoting native plant expression and expansion. They work with every noxious weed director in the state for appropriate chemical selection and application procedures. Dow Agrosciences has created over 100 articles regarding native plant benefits and habitat to native ecosystem health and function, which have reached over 150,000 ranchers and 50,000 roadside/aquatic/forestry/rangeland managers. Leading sponsor for the Environmental Stewardship Award for the National Cattlemen's Beef Association. Dow AgroSciences is a major partner in the 2015 Kansas Grazing Lands Coalition NFWF Monarch Habitat Grant Award.

Kansas Rural Center provides stakeholders with numerous pollinator educational products and resources through their website and annual meeting. https://kansasruralcenter.org/pollinator-resources/

Kansas Forest Service has numerous programs that support monarch and native pollinator habitat creation and improvement, both within gardens and across large native landscapes, and include: community forestry, rural forestry, prescribed and wildland fire management, forest health, riparian forestry, and conservation tree program. Many of the species we have historically offered are cited as supporting an array of pollinators. Kansas Forest Service is currently exploring options to offer forb and grass species in addition to the shrub and tree species offered. Supporting and enhancing pollinator habitat would be a major component of this effort.

US Department of Army, Fort Riley, Environmental Division funded a multi-year study from 2014-2016 that looked at the spatially explicit estimates of the distribution and abundance of Regal fritillaries on the fort. This project provided models that identify habitat features and management practices that influence the density of adults and produce information on the effectiveness of management strategies for populations on Fort Riley. In an effort to improve grassland habitat for pollinators, Fort Riley has engaged in selectively spraying stands of brome. 4,200 acres of brome have been treated in the last five years. This treatment reduces the brome and increases forb production and other native vegetation. Fort Riley received a grant from the National Environmental Education Foundation to purchase wildflower seed. The seed was used to improve pollinator habitat in reclaimed grassland. Fort Riley in partnership with local boy scout troop acquired milkweed plants from the Monarch Watch. Milkweed plots were established in a reclaimed soil borrow site. Fort Riley has an intensive prescribed burn program that burns 20,000-25,000 acres annually to maintain native prairie habitat. Fort Riley controls invasive plants and woody vegetation. Fort Riley has converted many of the wildlife food plots from row crop to alfalfa, which will benefit pollinator species.

Kansas City Native Plant Initiative works bi-state as Kansas City straddles the state line. The initiative has restored 100 acres in Johnson County along the Mill Creek Streamway Trail in Shawnee Mission Park for monarchs and other native pollinators. One right-of-way area in Johnson County has been restored for monarch and native pollinator habitat; 30 acres at Wyandotte Soccer Complex and National Soccer Training and Development Center; 4000 square feet at the Antioch Native Garden in Johnson County; multiple plantings at Shawnee Mission Schools Administration building and schools in Johnson County; ¼-½ acre plantings at multiple Blue Valley schools in Johnson County. All restorations follow monarch habitat standards set forth by Johnson County Park & Recreation District (JCPRD), Bridging the Gap, Burrough's Audubon, and Kansas City Native Plant Initiative. In urban gardens every 100 sq ft includes 4-5 milkweed plants and at least 2 asters and/or goldenrod for monarch fall migration. The initiative has helped 175 homeowner and city gardens in Johnson County KS, Jackson, Clay & Platte County Missouri get started. Kansas City Native Plant Initiative has contributed to the branding of native plants for retail to promote sales to urban property owners. They have conducted five workshops

for homeowners plus; two Monarch Look & Learn at Loose Park Garden for public Municipal workshops for cities installing monarch gardens * Education session with KC Codes Inspectors ; Workshop for 80 large landscape professionals on native plantings' Workshop for small landscape professionals; 2 Public programs on native plants attracting more than 600 people; Make a Difference with Native Plants for 40 decision makers in Parks, Schools and recreation; Native Plant Open House at a private garden; Work with Monarch's View of the City/Field Museum Guide on creating urban monarch habitat for engaging more 'monarch champions' ; Promotion of partners' education programs - Powell Gardens, Grow Native, Mid-America Regional Council, City of Lenexa; Native plant sale - over 1000 plants sold in Johnson County; Promote local native plant sales; Bi-Monthly newsletter to partners and public. Purchased a Flail vacuum for Johnson County Parks. Kansas City Native Plant Initiative is a cross-state collaborative effort that partners with several other partners across state lines to educate and inspire urban residents to create pollinator habitat in urban settings.
Kansas Wetlands Education Center, KDWPT, has an Annual Butterfly Festival that includes educational materials on the monarch butterfly, habitat restoration and pollinators in general. They conduct monarch tagging and are a Monarch Waystation and have a school program they give at center on the monarch life cycle, migration, life history, and have tagging demonstrations. Kansas Wetlands Education Center collets milkweed seed for Monarch Watch, as well as collects, germinates and grows local milkweeds for local distribution in the spring and fall.

The Xerces Society has produced multiple documents regarding biology and conservation of monarchs and other pollinators in the Southern Plains (including Kansas). These documents include monarch plant list, pollinator plants list, instructions on how to install pollinator meadows, etc., and these documents are available at xerces.org as free downloads. The Xerces Society also provides technical assistance to the USDA NRCS and its partners regarding monarch and pollinator conservation. http://xerces.org/monarchs/.

Topeka Zoo and Conservation Center has created a dozen butterfly gardens on zoo grounds. The zoo has also planted large numbers of milkweed plants and nectaring plants on the demonstration prairie at the Kansas Museum of History. The Topeka Zoo partners with the Kansas Museum of History on for public outreach regarding monarch habitat, as well as have a joint monarch tagging event annually.

Appendix 3: The Grassland Working Group Best Management Practices

The Grassland Working Group has created a list of Best Management Practices for the conservation and restoration of monarch and native pollinator required habitat on Kansas grasslands.

One of the primary needs for restoring and managing Kansas rangelands for native pollinators and other wildlife is the integration of ecologically appropriate fire cycles in grazing management systems. The grasslands of the Great Plains, and the wildlife within those grasslands, evolved with fire as one of the primary drivers of ecosystem processes, patterns, and services (Symstad & Jonas 2011). Large scale fire suppression by humans has negatively impacted those processes, patterns, and services to the detriment of grassland obligate species, such as the monarch (Sankaran et al. 2004). Promotion of the safe, planned use of fire (at historically/ecologically appropriate intervals) as a management tool can be used to restore prairie communities, control a number of invasive herbaceous and woody species, and improve palatability and nutritional content of native vegetation for grazing animals (Anderson 2006).

Grazing is also an important dynamic process within the prairie ecosystem, and livestock grazing within Kansas grasslands is important financially and culturally. The Kansas Monarch Task Force believes that the coupling of well-planned fire and grazing systems may be the most efficient and economically feasible approach for broad scale restoration and enhancement of native prairies in Kansas. As such, there should be a continued emphasis on improving grassland manager knowledge and use of prescribed grazing plans for all grazing systems. We encourage landowners, grassland managers, and technical service providers to produce and use adaptive grazing plans which account for local, site specific characteristics (geography, forage availability, type of grazing operation, season(s) of use, etc.) and climatic variability when calculating stocking and forage utilization rates as well as rest-return intervals.

Fire

Fire is necessary for the long-term maintenance of pollinator habitat and livestock production in all native rangeland ecosystems (Knapp et al. 1993; Fuhlendorf & Engle 2004). Fire can be safely returned to prairie ecosystems using well-planned prescribed fire applications.

Common Prescribed Fire Systems in Kansas

1. Irregular, Whole Field Prescribed Fire – This practice is generally employed to meet a specific objective (CRP stand regeneration as part of Mid-Contract Management, pasture burning to reduce invasive species, reduce standing dead litter prior to inter-seeding, etc.) and is employed on a whole field basis only as required. Other prescribed fire systems described below often employ a more regular, or cyclical, fire return interval.
2. Annual Spring Burning – This is a beef production-oriented practice most commonly applied in the Flint Hills ecoregion of Kansas. The practice burns every portion of a grazed area just before cattle are returned to the land each spring. This is often coupled with doubling traditional stocking rates of yearling cattle based on research showing increased weight gain efficiency for cattle on short grazing seasons following fire. While this practice is effective from a livestock production and brush management perspective, it may also produce a more homogenous landscape which can have adverse impacts on native flora and fauna as well as creating a growing societal concern in relation to potential air quality impacts attributed to the burning of many acres during the same time period.
3. Patch-Burn Grazing – Seeks to replicate the grazing and brush management benefits shown to occur with annual burning, but also promotes habitat heterogeneity and plant species diversity

that pollinators and grazers evolved with across the Great Plains. The basic principal is that portions of grazing units are burned each year (*e.g.* a different third of a grazing unit burned each year) on a rotation that provides differing age classes and vegetation characteristics in each portion of the grazing unit. Grazing animals spend a disproportionate amount of time in the most recently burned area which keeps their gain efficiencies high and provides an additional (beneficial) disturbance to the vegetative community, while providing different vegetation community structure for wildlife in the unburned portions of the unit each year. Since livestock largely do not impact the unburned areas, it also provides ample rest periods during the growing season to improve the overall vigor of the entire vegetative community. It is thought that this approach reproduces, on a smaller scale, the fire/grazing interactions seen at the landscape scale prior to settlement of Great Plains by European-American immigrants.

Suggestions for Prescribed Fire Use in Kansas

1. Burn based on historical fire cycles and seasons; acknowledging higher fire frequencies may be required to restore prairie to ecological site description parameters.
2. Consider splitting a property into multiple burn units that are burned at different times within and/or between years. This promotes early, mid and late season plant species beneficial to pollinators and livestock. Only conducting burns during the spring increases selection pressure on spring flowering plants and can reduce their presence in the community over time while concentrating air quality impacts during that same season.
3. Burning can have short-term negative or positive impacts on plants and animals. Some native prairie plants and animals thrive in areas that have been recently burned and grazed while others thrive in areas that have not been burned or grazed for multiple years. Overall, fire is a necessary process to maintain native grasslands and provides a net conservation benefit in the long-term.
4. Burning woodlands can promote pollinator habitat, particularly in oak-savannah sites.
5. Growing season burns promote the re-expression of some milkweed species, improving the resources for late-season breeding events and the fall migration. Also, growing season burns can extend crude protein and palatability of grazing lands for livestock.
6. Burn sericea lespedeza (*Lespedeza cuneata*) while it is in bloom, but before it goes to seed. This practice can help control the spread of this non-native, invasive species. In Kansas, the blooming (i.e., flowering) period for sericea lespedeza can be anywhere from early August-early September. Watching plant progression is important to burning at the right time.
7. When annually burning, do not go back and burn off patches that do not burn. These unburned areas provide important refugia and cover for monarchs and other wildlife and do not limit cattle gains.
8. Burning when non-native cool season grasses are in bud (but before they flower) can help control or reduce their spread. This is typically when new growth of native warm-season grasses is one to two inches.
9. Promote Prescribed Burning Associations (PBAs) across the state. Fire is needed to control woody plant expansion, invasive and noxious weeds, and stands of rank grass that are detrimental to the plants and habitat that monarchs need for breeding and migration. PBAs are landowner-led coalitions to support the safe, effective deployment of prescribed fire in an area. This “landowner-helping-landowner” framework ensures that knowledge of fire behavior can be spread through a community to advance the safe use of fire while also pooling necessary labor and equipment to conduct prescribed burns according to prepared specifications.

10. Fire is essential to maintaining native hay meadows. Fire should be used every 2-5 years depending on grassland type and climatic conditions. Consider using a rest and haying rotation within a hay meadow every year such as: rest 1/3 from haying every year and annually rotate the 1/3 that isn't hayed; the year that the meadow is burned, the burned area can be hayed.

Suggestions for Grazing Management in Kansas

1. Promote and support statewide and regional grazing organizations with a collective mission to regenerate Kansas grazing land resources.
2. Using various grazing practices, a land manager can manage for monarch habitat for the breeding and migration seasons. Patch-Burn grazing, described above, is a beneficial technique, others include:
    a. Two Pasture Switch Back
    b. Modified Two Pasture Patch-burn Grazing
    c. High Intensity-Low Frequency Grazing, Season-Long
    d. High Intensity-Low Frequency Grazing, Late Summer-Early Winter
    e. Grazing Without Feeding Hay
        i. If hay is used, restrict feeding to one geographic area that is already degraded and ensure hay does not contain noxious or invasive species. Monitor hay feeding sites for noxious or invasive species.
3. Base stocking rates upon annual forage availability and grazeable acres. Calculate based upon 25-35% grazed, 25-35% trampled or otherwise not available to grazing, and no less than 50% residual growth.
4. Maintain a diverse forb community for cattle production and pollinators. When available, forbs compose a significant portion of cattle diet at certain times and can have higher crude protein and digestibility compared to perennial grass (Holechek 1984).
5. Develop a drought contingency plan to adjust stocking rates based upon annual precipitation and forage production. Maintaining a diverse plant community can mitigate soil moisture deficits and maintain higher stocking rates relative to lower diversity prairie.
   National Drought Mitigation Center planning page:
   https://drought.unl.edu/droughtplanning/PlanningHome.aspx
6. Consider water developments, such as solar water wells, away from limited riparian or wetland areas.
7. Light to moderate grazing (stocking rate) is better than no Grazing or heavy grazing
    a. When grasslands are repeatedly overgrazed, or not grazed at all, habitat for many species is negatively impacted. Light to moderate grazing will also result in more drought resiliency in the vegetative community and provide the most consistent average daily gain for livestock (Knapp et al. 1998).

Other Grassland Management Practices

Brush Management – Invasive trees can alter native plant community diversity. Depending on the ecological site and species of invasive trees present on the site a mechanical and/or chemical application can be used to control invasive trees. Recover low density infested areas first to prevent long-term alteration of ecological processes and plant communities. Allowing 30% invasive tree infestation before acting is synonymous to losing 30% of native prairie resources for pollinators. Landowners should contact a natural

resource technical assistance provider to explore the many financial and technical assistance opportunities available to control invasive trees.

Invasive Species Management – Identify and remove invasive species, including grasses, vines, shrubs, trees and forbs identified by natural resource professionals as nonnative invasive species or native invasive species.

http://www.kansasnativeplantsociety.org/invasive_plants.php

Clean all equipment being brought into the area from outside sources. Control invasive trees and shrubs as guided by natural resource professionals.

Application of Pesticides – When considering the use of pesticides to control invertebrates perceived as a threat, landowners should consult with a County Extension Agent or the Natural Resource Conservation Service to identify the resource concern and beneficial practices to address it if needed. If pesticide use must be implemented, use best management practices to avoid migration timing, breeding periods, locations, drift etc.

http://www.epa.gov/pesticides/factsheets/ipm.

Application of Herbicides- A healthy prairie with a diverse wildlife community is invaluable to pollinators and provides nectar resources needed by monarch butterfly adults. Control of invasive plant species is imperative to maintain this healthy prairie wildflower community. In the United States, invasive plants are linked to the decline of 33 butterfly species (New et al. 1995, Wilcove et al. 1998), and 15 of 18 recovery plans for threatened or endangered butterflies recommend invasive plant control (Schultz et al. 2008). While herbicides can be an important management tool, broadcast applications of herbicides can reduce important floral resources. To avoid herbicide damage to nontarget plants and associate pollinators, avoid broadcast spraying or pellet dispersal, which may kill large number of larval hostplant or adult forage plants. Instead, spot treatment of targeted invasive plant species is a preferred method, allowing for selective control. For floral invasive species, to minimize negative impacts to monarch and other pollinators, treatment prior to blooming is recommended. If treatment must occur during the blooming period, it is recommended to spray early or late in the day or on cloudy, cool days when butterflies and other pollinators are least active.

Mowing and Haying – Avoid mowing and or shredding or pastures before and during spring and fall migration. Consider other techniques to achieve land management goals.

Consider harvesting hay during non-blooming periods for beneficial nectar plants. Leave unharvested strips or areas as allowable or alternate timing of harvest. Avoid broadcast herbicide application, except to control noxious weeds.

Inter-seeding Forbs – Inter-seeding diverse fob mixes into pasture/CRP stands lacking a diverse forb community beneficial to pollinators. Follow guidelines for local CRP CP-42 plantings or consult a natural resource professional to develop a locally adapted seed mix beneficial to the monarch butterfly. Use native local seed sources ecologically suitable for your site.

https://websoilsurvey.nrcs.usda.gov/app/ When planting use minimum till drills.

Wetland Management – Management of water resources along riparian areas and other wetland types can also provide habitat for Monarchs. Migrating monarchs will stopover at water resources. Often, these wetland areas are rapidly invaded by nonnative and introduced species, making them unavailable to monarchs. Manage upland portions of the watershed to maintain, enhance or restore hydrologic function, water-holding capacity and healthy wetland plant communities. Develop grazing regimes that benefit the plant community, habitat structure and function. Include these areas in prescribed burn units.

Landowners can consult with natural resource professionals to identify resource concerns, monitor forage/habitat condition, and acquire technical guidance concerning monarch and pollinator conservation. Opportunities exist to continue rangeland management education by joining regional grazing groups through conservation organizations such as, Kansas Grazing Lands Coalition and attending educational events (i.e. Kansas Grazers, Range Schools, Comanche Pool Coffee Shops, K-State Extension, Prescribed Burn Workshops) to advance application of new resource management information and innovation.

NRCS's Field Office Technical Guide
https://efotg.sc.egov.usda.gov/#/

KDWPT's Habitat First Program – Practice Descriptions and Specifications
https://ksoutdoors.com/Services/Private-Landowner-Assistance/Wildlife-Biologists/Habitat-First-Program/Payment-Rates-Practice-Descriptions/Practice-Descriptions-Specifications

Appendix 4: The Cropland Working Group Best Management Practices

Kansas Cropland Best Management Practices for Monarchs and Native Pollinators
Cropland acres in Kansas play a large role in the management and recovery of Monarch Butterflies and native pollinators. As a component of the Kansas Monarch Conservation plan, our Best Management Practices (BMP's) as outlined in this document aim to maintain, enhance, and create suitable habitat for Monarch Butterflies within working cropland systems. The priority is to keep "working lands working," while still identifying opportunities to be good stewards of current habitats, cropland, and the recovery of native pollinators. The following BMP's are outlined into five major areas of best practices.

1. Identify opportunities to create habitat.

By creating new habitat for native pollinators, you provide the resources necessary for monarchs to produce successive generations in the spring and sustain their migration south in the fall. Additional habitat will beautify your farmstead and decrease mowing efforts.

Creating New Habitat

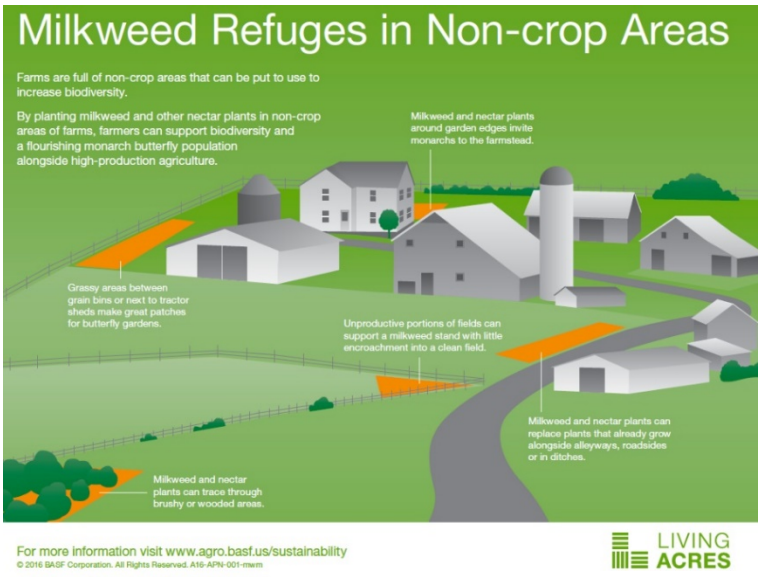

Image courtesy of BASF Corporation

- <u>Where?</u>
  - Near current structures or old farmsteads
  - Gardens and landscaping
  - Along roadways or ditches
  - Brushy or wooded areas
  - Field edges and buffer strips
  - Grassed waterways
  - Plant on unproductive pieces of current cropland
  - Around ponds or irrigation lakes
  - Riparian corridors and creeks

- <u>How?</u>
  - Purchase established plants from a reputable native plant nursery close to home or collect seeds from native plant prairies near your home.
  - Avoid digging up native plants from the wild. Often this is illegal and most mature plants will not survive transplanting.
  - For a list of local plant and seed sources visit Kansas Native Plant Society website.
  - A combination of early, middle and late blooming species with overlap in flowering times will fuel pollinators and butterfly during breeding and migration.

- <u>Continuous Management</u>
  - Avoid the use of insecticides in or surrounding your pollinator habitat.
  - Mowing should be limited and carefully planned
    - Untimely mowing can result in high levels of insect mortality.
    - Mowing also destroys landscape features that provide structural diversity and may impact nesting areas used by pollinators.

- Consider registering your habitat!
  - It is important that your conservation efforts are documented to show what is being done to help conserve the Monarch Butterfly. While your efforts through the Farm Service Agency (FSA), Natural Resource Conservation Service (NRCS), Fish and Wildlife, and non-governmental organizations will be accounted for within their programs; smaller plots that you do on your own, can be registered (if you choose) through one or more of the following programs:
    - Monarch Joint Venture, Monarch Conservation Map https://monarchjointventure.org/our-work/monarch-conservation-efforts-map
    - Monarch Watch, Monarch Waystation registry https://www.monarchwatch.org/waystations/certify.html
    - U.S. Fish and Wildlife Service, Monarch Conservation Database https://www.fws.gov/savethemonarch/MCD.html

Funding Opportunities

Various government programs exist to aid in creation and continuation of Monarch and native pollinator habitat. These programs are listed below.

- Conservation Reserve Program (CRP)
  - Offers a yearly rental payment to farmers who enroll and agree to remove environmentally sensitive land from agricultural production and plant species that improve environmental health and quality. Contracts are 10-15 years in length. Learn more by contacting your local County FSA office.
  - Through CRP, the Pollinator Habitat Initiative and its associated practice, *CP-42 Pollinator Habitat*, is specifically designed to provide better access to nutrition for pollinators.
- Natural Resources Conservation Service (NRCS)
  - Offers technical and financial assistance to help landowners plan, implement, and manage monarch habitat on farms, ranches and forests. Learn more by contacting your local County NRCS office.
  - Environmental Quality Incentives Program (EQIP)
  - Conservation Stewardship Program (CSP)
  - Regional Conservation Partnership Program (RCPP)
- Kansas Partners for Fish and Wildlife Program (USFWS)
  - Assists private landowners to restore, enhance, and develop thousands of acres of highly functional wetland, grassland, and woodland habitats throughout the state.
- Non-governmental Organizations (NGOs)
  - Many NGOs such as Pheasants Forever, are involved in innovative partnerships such as the Bee & Butterfly Habitat Fund. This assists in funding efforts to restore forage and breeding habitat for the iconic butterfly within its primary migration corridor

2. Implement Integrated Pest Management (IPM) Practices in Farmed Acres.

Integrated Pest Management is an effective and environmentally sensitive approach to pest management. According to the Environmental Protection Agency (EPA), IPM is not a single pest control method but a series of pest management evaluations, decisions and controls.

Creating an IPM

1. Set Action Thresholds – Before taking any pest control action, set an action threshold. This is a point at which pest populations or environmental conditions indicate that pest control action must be taken. Sighting a single pest does not always mean control is needed. The level at which pests become an economic threat is critical to guide pest control decisions.
2. Monitor and Identify Pests – Not all insects, weeds, and other living organisms require control. Many organisms are innocuous and even beneficial. Monitor pests and identify them accurately, so that appropriate control decisions can be made.
3. Prevention – As a first line of pest control, aim to manage the crop from becoming a threat. This may mean using methods such as crop rotation, selecting pest-resistant varieties, and planting pest-free rootstock. These control methods can be very effective, cost-efficient and present little to no risk to people or the environment.
4. Control – If monitoring, identification, and action thresholds indicate that pest control is required, IPM programs then evaluate the proper control method. Effective, less risky pest controls are chosen first, including highly targeted chemicals, such as pheromones to disrupt pest mating, or mechanical control, such as trapping or weeding. If further monitoring, identification and action thresholds indicate controls are not working, then additional pest control methods would be employed, such as targeted spraying of pesticides. Broadcast spraying of non-specific pesticides should only be considered as a last resort.

3. Be a Pesticide Steward.

Pesticides are a vital tool in agriculture and the ability to utilize them must be maintained. Pesticide stewardship is necessary to maintain, enhance and expand Monarch habitat in Kansas. Pesticide stewardship begins with reading and following the label, knowing which insecticides are toxic to Monarchs and other pollinators, and proper application practices.

Good Practices

1. Follow label instructions every time a pesticide is used
   - Label restrictions are legally binding. Many pesticide labels have advisory Environmental Hazard statements and/or compulsory directions for use specific to pollinator protection. Be aware of label instructions.
2. Use insecticides that selectively target the pest of concern
   - When effective and economical chose an insecticide that has lower toxicity profiles for bees and other pollinators or have residues that are toxic for shorter durations.
3. Take steps to reduce or avoid pesticide drift
   - Avoid spraying near areas with flowering vegetation and actively foraging pollinators.
   - Check the weather forecast prior to application and avoid applying during high winds or temperature inversions.
   - Select spray nozzles that adhere to label recommendations and requirements and keep them in top working condition with regular cleaning, adjusting, and replacing.
   - Use appropriate level of pressure on a well-calibrated and maintained sprayer. Reducing pressure and increasing droplet size (where possible) can reduce drift.
4. Delay pesticide applications until monarchs and other pollinators cease foraging for the day
   - Typically occurs in early evening, e.g. 6:00-8:00 PM during summer months
5. Consider seed treatment technologies

- Delivers a precise application, shielding seeds from insects and diseases that exist in the soil during their early developmental stages
- Decreases the number of broadcast spray applications of non-specific insecticides lessening potential exposure to Monarchs and other pollinators.
- It is important to note that seed treatments, especially Neonicotinoid seed treatments, be used sparingly, since they may be harmful to pollinators. In certain high-risk situations such as fields with a known, harmful insect population, seed treatment may be unavoidable.

4. Manage Blooming Crops for Monarchs and Other Pollinators.

We all know that cover crops can reduce soil erosion and the costs of fertilizer, herbicides and insecticides while increasing soil health. They also can be managed for the specific benefit of Monarchs, other native pollinators and wildlife.

Cover Crops to Consider:

- Diverse mixes of flowering broadleaves are best for pollinators and can provide excellent nectaring opportunities when terminated past peak bloom (when practical).
- Buckwheat, sunflower, canola, clovers and others not only suppress weeds but enhance pollinator habitat when allowed to bloom.

Maintenance of Cover Crops:

- Terminate winter cover crops with grazing as this will allow maximum habitat and build soil organic matter.
- Terminate crops with as little physical disturbance as possible to benefit pollinators.
- One of the most useful online tools for evaluating cover crop options for specific situations and locations is the Midwest Cover Crops Council Decision Tool, http://mccc.msu.edu/selector-tool/I

Growing Alfalfa:

- Any alfalfa grower will tell you that fields of blooming alfalfa attract butterflies, but alfalfa too, can be managed for the betterment of Monarchs and other pollinators.
- When the Monarch migration is passing through Kansas (north in spring and south in the fall), consider harvesting at late bloom, especially during the month of September in Kansas. This will provide excellent nectaring opportunities for Monarchs and greater energy reserves in the roots.
- Consider growing reduced lignin varieties, which better maintain forage quality at later harvest dates. These alfalfas provide growers the flexibility to delay harvest, maximizing both yield and nectar potential, while maintaining forage quality.
- Practice Integrated Pest Management (see above). Focusing on maintaining populations of "beneficial insects" and suppressing pest populations below the economic injury level (EIL) rather than broadcast spraying of non-specific insecticides.

5. Be aware of local Beekeeper Hives and inform them of your planned management activities.

Open communication is the basis for understanding where managed pollinators are in relation to cropland. Growers and applicators can take specific steps to reduce potential impacts to colonies if they know where these colonies are located.

How to Identify:

- Utilize the Driftwatch website to locate beehives that may be near your location, https://ks.driftwatch.org/map
- Check with beekeepers for locations of local hives and repeat this process annually as beekeepers may change locations of hives.

Methods to Inform:

- Communicate planting activities to neighboring beekeepers when practical and be aware of beehives adjacent to the planting area.
- Keep local beekeepers contact details nearby.
- Give at least 24 hours' notice of spraying and provide the name and active ingredient of product being used.
- Appreciate that beekeepers are facing a tough challenge to keep their honeybee colonies alive and productive.
- Always follow the label directions and avoid spraying any plants where bees, Monarchs or other pollinators may be foraging or areas that could be attractive to bees.

General FAQ's

- Why should I consider turning less productive areas of my cropland into monarch and native pollinator habitat?
  - While there may be concern with the reduction in acres, your average profitability per acre farmed may increase. The cost and inputs for farming less productive acres is often greater than net income, resulting in a loss per acre. This is often due to inefficiencies such as excessive turning in small fields and odd shaped corners as well as reduced yields due to trees, hedge rows, and poorer soils.
  - By converting these less productive acres to Monarch habitat, you can focus your efforts on your most productive land while at the same time, doing your part to help reverse the dramatic Monarch population declines.
  - Ultimately as a grower, you must identify which areas you deem unproductive and determine overall costs and benefits.
- How can I identify less productive areas of my field?
  - Utilizing your yield monitoring maps and other computer applications can be useful in identifying these lesser productive areas.
- Can native habitats help with water quality issues on my cropland?
  - Monarch habitat provides the added benefit of improving water quality. Native grasses and wildflowers have extensive root systems which are more effective at holding water in the soil profile than non-native species.

Additional Resources

Conservation Reserve Program (CRP), https://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program/index

CRP Pollinator Habitat Initiative, https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/2015/CRPProgramsandInitiatives/Pollinator_Habitat_Initiative.pdf

Working Lands for Monarch Butterflies, Natural Resources Conservation Service https://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=nrcseprd1369640&ext=pdf.

Best Management Practices for Pollinator Protection in Field Corn, National Corn Growers Association https://www.ncga.com/file/1650/HBHC_Corn_030119.pdf.

Pesticides and Bees, Kansas State University Research and Extension (KSRE) https://www.bookstore.ksre.ksu.edu/pubs/MF3428.pdf

Creating and Managing Habitat Resources

Monarch Butterfly: Small-Scale Habitat Development in Kansas, KSRE https://www.bookstore.ksre.k-state.edu/pubs/MF3290.pdf

Growing Milkweed in Non-Crop Areas to Benefit Monarch Butterfly, BASF http://www.agro.basf.us/sustainability/living-acres-milkweed-brochure.pdf

The Kansas Native Plant Society, http://www.kansasnativeplantsociety.org/gardening.php

Mowing: Best Practices for Monarchs, Monarch Joint Venture https://monarchjointventure.org/images/uploads/documents/MowingForMonarchs.pdf

Integrated Pest Management Resources

Integrated Pest Management Principles, Environmental Protection Agency https://www.epa.gov/safepestcontrol/integrated-pest-management-ipm-principles

Integrated Pest Management and Wildlife, Natural Resources Conservation Service https://efotg.sc.egov.usda.gov/references/public/SC/IPM_for_Wildlife.pdf, along with the NCGA's IPM document

North Central Integrated Pest Management Center https://www.ncipmc.org/

Kansas State University (KSU) and KSRE Publications

- *KSU Integrated Pest Management,* http://www.k-state.edu/pesticides-ipm/integratedpestmanagement.html
- *KSU Facts & Information on Crop Pests in Kansas,* http://entomology.k-state.edu/extension/insect-information/crop-pests/
- *KSRE Alfalfa Insect Management,* https://www.bookstore.ksre.ksu.edu/pubs/MF809.PDF
- *KSRE Corn Insect Management,* https://www.bookstore.ksre.ksu.edu/pubs/MF810.pdf
- *KSRE Cotton Insect Management,* https://www.bookstore.ksre.ksu.edu/pubs/MF2674.pdf
- *KSRE Sorghum Insect Management,* https://www.bookstore.ksre.ksu.edu/pubs/MF742.pdf
- *KSRE Soybean Insect Management,* https://www.bookstore.ksre.ksu.edu/pubs/MF743.pdf

- *KSRE Sunflower Insect Management*, https://www.bookstore.ksre.ksu.edu/pubs/MF814.pdf
- *KSRE Wheat Insect Management*, https://www.bookstore.ksre.ksu.edu/pubs/mf745.pdf

Pesticide Stewardship Resources
Pesticide Stewardship Website https://pesticidestewardship.org/

The Guide to Seed Treatment Stewardship, https://seed-treatment-guide.com/wp-content/uploads/2018/02/Seed-Guide_Farmers_fixed.pdf

EPA Pollinator Protection, https://www.epa.gov/pollinator-protection

Syngenta Practicing Responsible Pesticide Application, http://www.syngenta-us.com/practicing-stewardship/responsible-pesticide-application

University of Nebraska-Lincoln, Protecting Pollinators from Pesticides, https://entomology.unl.edu/scilit/Protecting-pollinators-from-pesticides.pdf

University of Georgia, Protecting Pollinators from Pesticides, http://www.caes.uga.edu/departments/entomology/research/honey-bee-program/bees-beekeeping-pollination/pollination/pollination-protecting-pollinators-from-pesticides.html

Cover Cropping Resources
Cover Cropping for Pollinators and Beneficial Insects, Sustainable Agriculture Research and Extension https://www.sare.org/Learning-Center/Bulletins/Cover-Cropping-for-Pollinators-and-Beneficial-Insects

Cover Crop Economics, Sustainable Agriculture Research and Extension https://www.sare.org/Learning-Center/Bulletins/Cover-Crop-Economics

Cover Crops and Pollinators, Natural Resources Conservation Service https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs141p2_029229.pdf

Identifying Managed Pollinator Locations
Driftwatch Website, https://ks.driftwatch.org/map