



KENTUCKY
Monarch
CONSERVATION PLAN



DEDICATION

This plan is dedicated to Mary Carol Cooper, director of the Native Plant Program at Salato Wildlife Education Center and employee from 4/7/1997 through 12/31/2010. Mary Carol Cooper's passion for native plant and pollinator conservation in Kentucky inspired all who knew her. Her legacy of conservation will live on forever in our backyard gardens and in our hearts.



DAVE BAKER PHOTO



— Ellis Lauder milk

THE MONARCH BUTTERFLY (*Danaus plexippus*) is one of the most recognized and beloved species in the world. Children and adults alike are drawn to this beautiful and iconic species with its striking orange wings and black venation. Once a familiar backyard species, the monarch was widespread, abundant, and easily observed. Countless schoolchildren have learned the butterfly life cycle by rearing monarchs in their classrooms or at home. In 1975, admiration for the monarch grew when it was discovered that adults

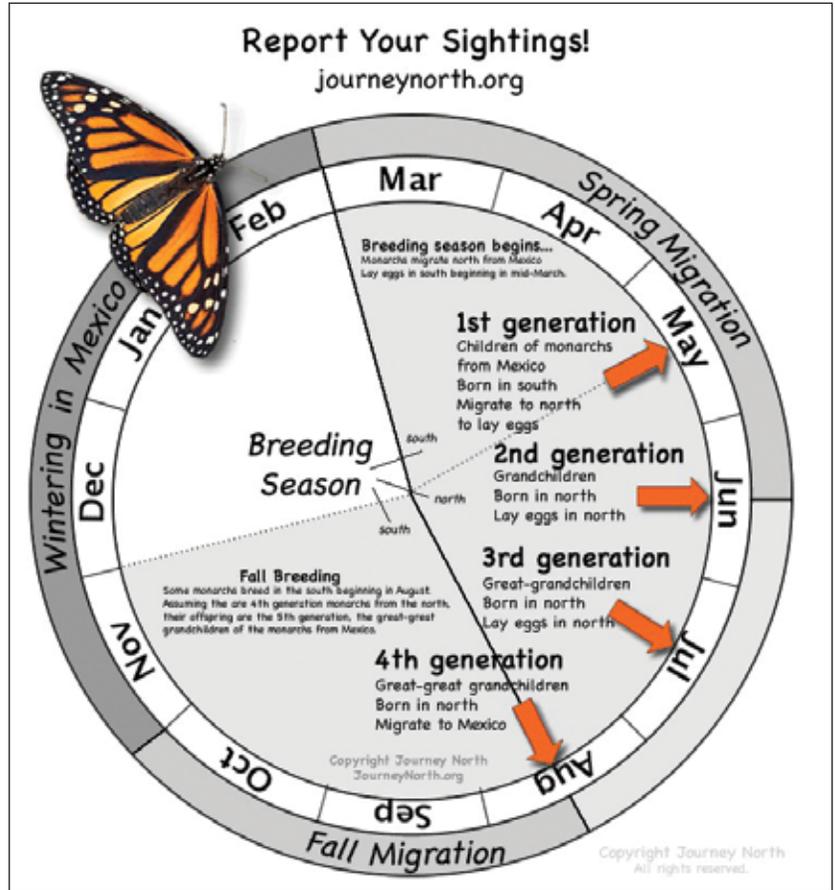
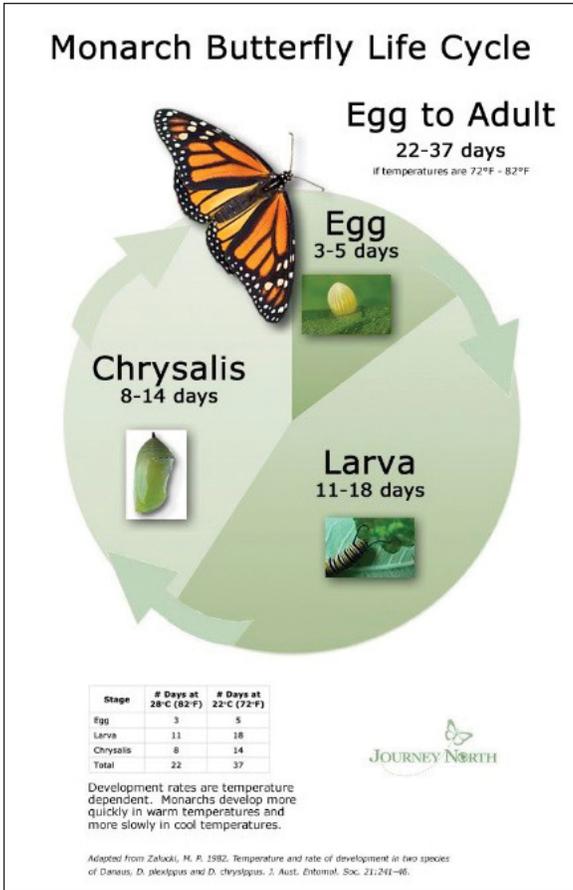
Executive Summary

from the eastern North American population, long known to migrate “somewhere” to southern destinations, were overwintering by the millions in the oyamel forests of the Sierra Madre Mountains in Mexico. Tragically, only forty years later, this annual phenomenon is now in serious jeopardy due to the precipitous crash of the monarch population.

In fact, monarchs have declined by approximately 90% over the last 20 years (Monarch Joint Venture, 2017), and by as much as 97% from the highest population estimates in the winter of 1996-97. This massive decline in numbers can be attributed to numerous obstacles faced by the species. Monarch Joint Venture (MJV) identifies six major categories of threats to monarchs: breeding habitat loss, overwintering habitat loss, climate change,

pesticides, natural enemies, and other anthropogenic factors. Some of these factors are beyond our scope of control in Kentucky and will not be addressed here, but more information is available on the MJV website at: <http://monarchjointventure.org/threats/>. Without significant changes in the way humans manage the landscape and a concerted effort by citizens across Canada, Mexico, and the United States, future generations may not bear witness to one of the greatest migrations on Earth.

As is the case with many other species, habitat loss and alteration are the primary culprits threatening monarchs. These can be addressed, at least to some degree, in Kentucky. What are these habitat changes and why did they suddenly affect monarchs so drastically? What are the other factors contributing to the declines that Kentucky citizens can address? To answer these questions, we need



to start by explaining what is required to complete the monarch life cycle and what kind of habitat restoration must take place for their survival.

The next generation of monarchs begins when females lay eggs on host plants, specifically various milkweed species (*Asclepias spp.*), which is the required food source for the caterpillars that emerge from those eggs. Monarchs must have milkweeds to complete their life cycle and without them, they cannot survive. In approximately 4-6 days, the eggs laid on the milkweeds hatch, and the caterpillars begin to feed on the plant's leaves. After about 9-13 days, the caterpillars each form a chrysalis where the pupa undergoes its transformation into an adult, a process spanning another 8-12 days. Upon emergence, the adults must find flowers so they can consume nectar for fuel and begin the life cycle all over again.

One generation, typically the fourth produced each year, is special. This gen-

eration enters a reproductive diapause (suspended development) in late summer or early fall. This includes the majority of adult monarch butterflies in eastern North America at this time, which then begin a southward migration to the Sierra Madre Mountains in the States of Mexico and Michoacán, Mexico. Along the journey, adult monarchs must find safe havens to spend the night, more flowers to provide nectar for flight, and avoid collisions with vehicles, wind turbines, and other obstacles they may encounter.

This journey is perilous with countless losses, but each year millions of butterflies defy the odds and reach their destination in Mexico. These incredible monarch adults then overwinter in the same oyamel forests on the mountaintops their ancestors used, at elevations of approximately 10,000 feet. Some eastern individuals join the southern Florida non-migratory population, while others remain in the southern U.S. in a reproductive state during

winter months where they reproduce on non-native tropical milkweeds. Monarchs west of the Rocky Mountains spend the winter along the California coast, though a small subset of this population will also make the trek to Mexico.

In February, the adults in Mexico begin to mate and start their journey to the U.S. and Canada. Like the journey south, they need to find shelter and flowers for fuel, but this time there is the added pressure of finding milkweeds (*Asclepias spp.*) so they can lay their eggs for the next generation. It is critical the monarchs soon find milkweed after leaving their winter grounds in Mexico, because the adults that begin the journey north do not reach the most northern destinations of the species' summer range. Just as the individuals from last summer's, non-reproductive generation miraculously knew when to begin the journey south and where to go in Mexico, the offspring from the eggs laid along the spring migration route continue the journey north



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to destinations they have never been before.

At one time, milkweeds were widespread and abundant because sustainable land use practices were commonplace, facilitating the monarch female's search for host plants. In Kentucky, small family farms were the norm, and milkweed often grew among the row crops, pastures, fencerows, and field edges. Fallow fields were also common as crop rotation was a standard practice. Bush hogs weren't nearly as prevalent, and zero-turn mowers had not yet been invented, so neatly trimmed farms were uncommon. Today, fallow fields are rare. Manicured landscapes with little habitat beneficial to monarchs, other pollinators, or even wildlife in general have proliferated.

Use of extensive mowing and herbicides targeting milkweed species has increased over the past several decades for a multitude of reasons. Some species of milkweed contain substances called cardenolides, which are toxic to livestock. Often efforts to eradicate milkweed are not contained only to production fields, resulting in farm-scale control of milkweed species.

Furthermore, in 1996 and 1998, respectively, Genetically Modified Organisms (GMOs) in the form of herbicide-resistant soybeans and corn were developed. The corn and soybeans were resistant to the herbicide, but all other plants and weeds were not. These varieties of herbicide-resistant corn and soybeans represent approximately 90% of soybeans and 80% of corn now grown in the U.S (Forbes Magazine), and require specific herbicides (toxic to milkweeds). As a result of the widespread use of these herbicides and over-spray into fencerows and field edges, milkweed and other beneficial pollinator plants, once so abundant, began to disappear at an alarmingly fast rate.

Consequently, it has been estimated that more than one billion milkweed stems have been lost from the breeding range of the monarch in eastern North America, primarily because of habitat loss or alteration. Due to the rapid and severe declines in monarch numbers, an Endangered Species Act Petition to list the monarch as a threatened species was filed in 2014. The petition stated that

croplands in Iowa, an important state within the monarch's breeding range, lost 98.7% of its milkweed from 1999 to 2012. During this same time period, an estimated 64% of milkweeds were lost from the entire Midwest, an area crucial for monarch reproduction. The petition also stated that milkweeds in croplands produce monarchs at a rate nearly four times higher than plants in other settings, so losses in croplands have a disproportionate impact on monarchs. According to the petition, the losses translated into an estimated 88% fewer monarchs in the region in 2012 than were produced in 1999.

Natural enemies and exotic species introductions are also playing a role in the loss of monarchs.

Monarch larvae and eggs are particularly vulnerable to predation. According to MJV, only about 5% of monarchs reach the last larval instar. Native predators such as ants, spiders, true bugs, beetles, and lacewing larvae are known predators of monarch eggs and larvae, but exotic predators such as Chinese mantids are also taking a toll. The monarch larval stage in particular is also vulnerable to parasitoids. Parasitoids are organisms that require development inside or on a host to complete their life cycle, eventually killing the host. The larval stage is the most common target for parasitoids. MJV suggests that at least twelve tachinid flies and one braconid wasp species are known monarch parasitoids. A native pupal parasitoid, *Pteromalus cassotis*, was recently re-discovered, but little is known about the effect it has on monarch populations. Parasitoids are used as well-meaning biological control agents for unwanted pests, but they often have harmful effects on non-target species like monarchs and other pollinators. Although not usually fatal per se, parasites also



Monarch caterpillar on common milkweed (*Asclepias syriaca*)

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contribute to the stresses on monarchs by weakening individuals and having negative impacts on survival, mass, reproduction, and the resources needed for migration. One of the best known monarch parasites is a protozoan called *Ophryocystis elektroscirrha*, or OE. This parasite has a higher occurrence in monarch populations that do not migrate, such as the one in Florida, and may be exacerbated in areas with exotic milkweeds that grow year-round.

BRINGING BACK THE MONARCH

A concerted effort is needed to recover monarch populations, not just for the sake of safeguarding biodiversity, but also to ensure food security and food supply stability. Monarchs and other pollinators contribute greatly to food supplies and economies. Native pollinators contribute over \$24 Billion to the U.S. economy via agricultural production benefits (pollination). With more than 90% of Kentucky's nearly 26 million acres privately owned, private lands management will be a critical



Adult on
butterfly
milkweed
(*Asclepias
tuberosa*)

USFWS PHOTO

part of any plan to bring back the monarchs. Education will play an essential role in raising public awareness of the monarch's plight and inspiring individual participation. Even small backyards have room for milkweed and nectar plants capable of producing monarchs and supporting other pollinators each year. Every contribution is an important step toward recovery. Public lands and rights-of-way, such as power lines and roadsides, will also be important to recovery efforts. The Xerces Society for Invertebrate Conservation estimated that roadsides alone cover more than 10 million acres of land in the U.S. Another 9 million acres is found in power transmission lines and 12 million in pipelines, the cumulative total of which is roughly equivalent to about one-third of the land area found in the national park system.

These areas are underutilized for species conservation, that when well managed can act as corridors and networks of corridors allowing monarchs and other species to move along uninterrupted habitat,

helping to prevent the isolation of populations. Continued research and monitoring of our work will be needed to see how effective it has been in helping monarch numbers. Ultimately, funding to carry out monarch recovery efforts will be the determining factor as to how much of this work can be completed.

Fortunately, the road to monarch recovery is already underway. In late October of 2015, the Midwest Association of Fish and Wildlife Agencies and the United States Fish and Wildlife Service sponsored a "States Monarch Conservation Workshop" with cooperation from the National Wildlife Federation, Association of Fish and Wildlife Agencies, and Pheasants Forever. The workshop was designed to bring together key partners from the Midwest region to begin the process of developing state monarch conservation plans. The final goal being to merge these plans into a regional monarch conservation plan. Some states had begun the process of developing a monarch conservation plan, and organizations such as Monarch

Joint Venture, Monarch Watch, Wild Ones, and garden clubs, including some here in Kentucky, were already working to restore monarch habitat.

The first step for developing a Kentucky plan was to identify the key partners in the state, bring them together, identify the problems, and develop next step solutions to increase monarch numbers. In February of 2016 a one-day "Kentucky Monarch Summit" was held in Frankfort and representatives from approximately 40 state and federal agencies and non-government organizations attended. Presentations were given to highlight the needs of and threats to the monarch, as well as current recovery efforts, to ensure that everyone had a clear understanding of what needed to be done. Participants were asked to complete a questionnaire for expediting monarch recovery, and volunteers were sought to assist in the development of a monarch conservation plan.

A follow-up working group meeting for those who volunteered was held at the Salato Wildlife Education Center in April 2016 to identify the needs and begin development of a plan. A steering committee and the following six subcommittees were also established: Education and Outreach, Funding, Private Lands, Public Lands, Research and Monitoring, and Rights-of-Way. The subcommittees were charged with developing goals, challenges, and strategies to implement monarch conservation through a Kentucky Monarch Conservation Plan.

The plan that follows is the initial result of these efforts, but it will be adaptable to changes in technology and our knowledge regarding the monarchs' needs. Time is of the essence since monarch numbers are at critically low levels and need to rebound as quickly as possible to ensure the migration is not lost forever. Our initial plan seeks to meet target benchmarks within a 5-year period, and this plan is designed to be adaptively managed and updated on a frequent basis. We need your help, so we hope you will engage in the efforts outlined in this plan to do your part to bring back the monarchs.

Education and Outreach



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OVERVIEW: *Although the migration of the monarch butterfly is one of the most intriguing phenomena in the natural world, we also depend on these butterflies for our food and wildflower diversity. Monarchs serve key roles in pollination, both for food production and for wildflower gardens (75% of wildflowers need pollination to flower). By instating education and outreach efforts across Kentucky, we can raise awareness about the importance of the monarch and its lifecycle. Through the formation of a network of engaged volunteers and interest groups, we can create and maintain monarch habitat and spread the message about the importance of these conservation efforts.*

GOAL: *Enhance public knowledge of monarch butterflies, the plight of the monarch, and ways that citizens of the commonwealth can become involved in helping this species.*

CHALLENGE 1:

Identify and expand communication to target audiences.

- **Strategy:** Identify priority audiences for monarch conservation.
- **Strategy:** Utilize varying communication methods and strategies based on target audience. (e.g., presentations at industry meetings or workshops, presentations for local and state government agencies, social media, radio, direct communication, print)
- **Strategy:** Measure change in support and participation of monarch conservation among target groups by developing effectiveness measures. Adapt and change messaging approach to target audiences if not creating desired response.

Assessment: Priority monarch conservation audiences will be identified and participation/support levels in monarch conservation will be quantifiable. All strategies will be implemented within the 5-year benchmark.

CHALLENGE 2:

Increase public knowledge of the monarch butterfly and its life cycle. Public awareness is increasing as studies and reports demonstrate a dramatic decline in migrating monarchs, bees and other pollinators. If Kentucky can create a “buzz” around

monarchs and raise awareness and knowledge, then progress can be made.

- **Strategy:** Create, promote and maintain Kentucky-specific social media sites. Rely on existing website resources (Monarch Joint Venture) for streamlined information. Explore feasibility of a link to Kentucky-specific materials within these existing websites.
- **Strategy:** Utilize local media outlets, newspaper articles, television, radio, and podcasts.
- **Strategy:** Create “branded” signage at KY welcome centers and rest stops and provide informational brochures.
- **Strategy:** Recruit a celebrity spokesperson to be the face of Kentucky’s monarch outreach.
- **Strategy:** Develop public service announcements.
- **Strategy:** Partner with the Monarch Conservation Science Partnership and Monarch Joint Venture to integrate a statewide citizen science program in Kentucky aimed at inventorying milkweed stems and recording monarch eggs and caterpillars.

Assessment: All strategies should be implemented in 5 years, and a third of the school-aged population of the state should be able to recognize a monarch butterfly within 5 years (assessed via online survey tool).

CHALLENGE 3:

Educate the public about the importance of and current threats to monarchs and other pollinators. Through establishing a network of informed educators, supportive materials and increasing Certified Monarch Waystations, this effort could have enormous impact.

- **Strategy:** Recruit and train “monarch ambassadors” (including children) across the state who will conduct outreach to teach about monarchs.
- **Strategy:** Create educational materials (videos, articles, PowerPoint programs and teaching aids) as tools for the ambassadors and other educators/presenters.
- **Strategy:** Adapt Kentucky Department of Fish and Wildlife Resources’ Backyard Wildlife program to include information on Monarch Waystations.
- **Strategy:** Identify and adapt (as needed) existing educational presentations and material on monarchs and certified monarch waystations.
- **Strategy:** Fund and develop locally appropriate native pollinator seed packets to be distributed with educational materials.
- **Strategy:** Use social media sites to steer Kentucky’s public to existing FAQ and “ask the expert” resources. Encourage residents to post images, suggestions and



comments on social media sites.

- **Strategy:** Increase knowledge of large landowners, both public and private, about monarchs and their plight.
- **Strategy:** Increase school districts' knowledge about monarch waystations and pollinator gardens as tools to teach the Kentucky Academic Science Standards.
- **Strategy:** Promote Certified Monarch Waystations and more than double the number in the state, with a goal of establishing 1,000.
- **Strategy:** Develop a Monarchs Across Kentucky curriculum using existing curriculum that can be found at the University of Minnesota Monarch Lab (<http://monarchlab.org/education-and-gardening/curricula>) to supplement current curriculum programs such as Project WILD.

Assessment: In 5 years, the monarch ambassadors will have worked with residents in every county, 1,000 new monarch waystations will be developed and certified with Monarch Watch, and more educational materials will be available.

CHALLENGE 4:

Promote public awareness on the harmful effects of spraying pesticides, especially neonicotinoids, on plants that are important to monarchs and other pollinators.

- **Strategy:** Enlist plant nurseries and sellers, including large-scale sellers like Lowe's, Home Depot, etc., to educate customers on use of pesticides, especially neonicotinoids.
- **Strategy:** Encourage retailers to start selling flowers and garden plants free of neonicotinoids.
- **Strategy:** In lieu of the above, ask retailers to label products that contain neonicotinoids.
- **Strategy:** Work with retailers to create educational signage and material regarding impacts of neonicotinoids.
- **Strategy:** Request that retailers post signage that explains the risks of neonicotinoids.
- **Strategy:** Distribute existing neonicotinoid educational materials developed by other organizations.

Assessment: 50% of Kentucky nurseries have signage and/or educational materials about neonicotinoids. All strategies will be employed by the 5-year benchmark.

CHALLENGE 5:

Increase public awareness on where milkweeds and native nectar producing plants are available for purchase.

- **Strategy:** Provide current lists of where pesticide-free, native milkweed plugs and seeds, as well as native nectar plants, can be purchased.
- **Strategy:** Use existing educational products such as brochures, website content and social media content to promote information about the importance of planting nectar-producing flowers and providing recommendations about which flowering plants have the greatest importance for monarch survival. Many of these educational products can be found at the Monarch Joint Venture website (<http://monarchjointventure.org/>)
- **Strategy:** Use existing educational material: presentations, brochures, publications, website content and social media content to share how to identify monarch eggs and caterpillars. Again, many of these resources can be found at the Monarch Joint Venture website.
- **Strategy:** Establish a website at kentuckymonarchs.com. Let this website include the existing list of native plant vendors but also expand upon that information by providing links to helpful resources. This website can include a blog as well as menus and pages that lead to helpful resources. Devise and implement strategies for driving traffic to this website. Monitor website traffic and periodically review and revise strategies for increasing website traffic.

Assessment: In 5 years, we will have a database available on the website with information about where to purchase milkweeds and other native nectar producing plants. We will have educational materials available for download from the website.

CHALLENGE 6:

Support local specialist groups.

- **Strategy:** Identify local networks of ambassadors and develop a monarch conservation training program. Ambassadors will be trained in education, habitat development and research efforts. Develop programs based on audience and region of the state.
- **Strategy:** Develop science-based resources to aid ambassadors in communicating the principles of monarch conservation, including habitat, research and education.
- **Strategy:** Support local monarch efforts with financial resources and outreach materials.
- **Strategy:** Provide information on potential funding mechanisms for the installation (and certification) of monarch waystations and pollinator gardens.

Assessment: Two of these five strategies will be completed by the 5-year benchmark. Within 10 years, priority audiences will be identified and outreach toolkits will be available for ambassadors. An effective and comprehensive training program will be developed and implemented for the network of local ambassadors.

CHALLENGE 7:

Outreach to Civic Groups. Engage environmentally-conscious civic groups across the state (e.g. garden clubs, FFA, 4H, Boy Scouts, Girl Scouts, etc.) in monarch conservation (i.e. train-the-trainer).

- **Strategy:** Meet with at least one civic group per county regarding the urgent need for monarch conservation.
- **Strategy:** Secure annual funding for seed packets to encourage citizens to develop pollinator plantings.
- **Strategy:** Secure annual funding to develop signage for landowners engaged in monarch conservation.
- **Strategy:** Identify and distribute existing monarch conservation and Monarch Waystation educational materials to civic groups through conferences, community events and other civic activities. Encourage civic groups to distribute these materials to their members.

Assessment: All strategies will be implemented by the 5-year benchmark.

Private Lands Habitat Management

OVERVIEW: *Monarch butterfly (Danaus plexippus) populations have experienced alarming reductions during the past 20 years, with the decline in the subspecies (Danaus plexippus plexippus) that breeds east of the Rocky Mountains being of particular concern. Multiple generations of monarchs use summer habitat in Kentucky, and it is assumed that loss of monarch habitat in the state has contributed to population declines. With 95% of Kentucky under private ownership, collaboration with these landowners will be essential for monarch conservation efforts in the state to be successful.*

GOAL: *Form monarch conservation partnerships with private landowners across Kentucky to maintain quality monarch habitat through establishment and management of new plantings or management of existing habitat.*



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CHALLENGE 1: Implement Non-corporate Pollinator Plantings

Partner with private, non-corporate landowners (e.g. production & hobby farmers, wildlife enthusiasts, non-profit organizations) across the state to establish quality pollinator plantings that include milkweeds and nectar producing plants for monarchs and other pollinators.

- **Strategy:** Use existing United States Department of Agriculture (USDA) program incentives to establish pollinator plantings in every Kentucky county on private non-corporate land.
- **Strategy:** Establish 100 acres of new pollinator plantings in the Conservation Reserve Enhancement Program (CREP) area, the Livingston county Quail Focus Area, and the Shaker Village Quail Focus Area.
- **Strategy:** Secure annual funding to support purchase of seed (bulk & individual packets) for pollinator plantings on private non-corporate land that is not eligible for USDA program incentives.
- **Strategy:** Secure Milkweed from Monarch Watch for two large-scale (2 acres minimum) private Monarch Waystation restoration efforts (to be identified).

<http://monarchwatch.org/bring-back-the-monarchs/milkweed/free-milkweeds-for-restoration-projects/>

- **Strategy:** Secure annual funding to develop signage for private non-corporate landowners engaged in monarch conservation.

Assessment: All strategies will be implemented by the 5-year benchmark.

CHALLENGE 2: Implement Corporate Pollinator Plantings

Partner with private, corporate landowners across the state (e.g. utility companies, coal companies, horse farms, distilleries, golf courses, nursing homes) to establish quality pollinator plantings that include milkweeds for monarchs and appropriate nectar producing habitat.

- **Strategy:** Use KDFWR's KY Business Conservation Partnership program to establish at least one new pollinator planting per county on private corporate land while emphasizing maintenance, employee, and public relations benefits (i.e. less mowing costs, wildlife viewing areas for relaxation, good environmental stewardship).

- **Strategy:** Secure annual funding to develop signage for private corporate landowners engaged in monarch conservation.
- **Strategy:** Secure annual funding to purchase seed (bulk & individual packets) for pollinator plantings on private corporate land that is not eligible for USDA program incentives.

Assessment: Two of three strategies will be implemented by the 5-year benchmark.

CHALLENGE 3: Implement Backyard Pollinator Plantings

Partner with landowners across the state to establish quality pollinator plantings including milkweed and nectar producing habitats in "backyard" type settings within urban and suburban areas.

- **Strategy:** Coordinate with University of Kentucky Master Gardener programs to install and certify a minimum of one new private Monarch Waystation in each participating county.
- **Strategy:** Use KDFWR's Backyard Wildlife program to establish at least one new pollinator planting per county in non-traditional areas such as schools, churches, cemeteries, urban/suburban



sites, homeowner association properties, community gardens, etc.

- **Strategy:** Secure annual funding for the purchase of seed (bulk & individual packets) for pollinator plantings in non-traditional areas.
- **Strategy:** Secure annual funding to develop signage for non-traditional landowners engaged in monarch conservation.

Assessment: Two of three strategies will be implemented by the 5-year benchmark.

CHALLENGE 4: Management of Existing Monarch Habitat

Private land owners have diverse land use interests making it difficult to orchestrate monarch habitat management and inventories on private land. Effective management is necessary to sustain milkweed and complementary pollinator species in existing monarch habitat. Landowners need concise and clear direction on how to manage newly created and existing habitat.

- **Strategy:** Identify and promote Best Management Practices (BMPs) for monarch habitat.
- **Strategy:** Develop at least one printed and one online educational tool to communicate identified management practices.
- **Strategy:** Secure funding for publication of printed monarch habitat management material.
- **Strategy:** Distribute monarch habitat management material to private landowners via University of Kentucky Extension Office educational outreach classes, Master Gardening programs, state garden clubs, and public/private arboretums.
- **Strategy:** Train appropriate agencies and non-governmental organizations (Kentucky Department of Fish and Wildlife Resources, University of



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Kentucky Extension, USDA Natural Resources Conservation Service, USDA Farm Service Agency, The Nature Conservancy, Kentucky Farm Bureau, and Kentucky Department of Agriculture) on delivering sound monarch habitat management recommendations that should be shared as part of an overall monarch awareness and habitat management message.

Assessment: All strategies will be implemented by the 5-year benchmark.

CHALLENGE 5: Reduced Mowing Campaign

Minimize annual mowing by farmers, businesses, and other private landowners.

- **Strategy:** Develop brochure explaining

the need for and benefits of less mowing.

- **Strategy:** Publish newspaper articles in major media markets addressing the impact of excessive mowing on monarchs.
- **Strategy:** Utilize USDA Farm Service Agency's newsletter to increase awareness of effects of mowing on monarchs.
- **Strategy:** Collaborate with USDA to limit annual mowing requirements in Farm Bill programs.

Assessment: Two of four strategies will be implemented by the 5-year benchmark.

CHALLENGE 6: Demonstration Sites

Develop monarch habitat demonstration sites around the state to facilitate awareness of the issue and show examples of high quality monarch habitat.

- **Strategy:** Develop at least one demonstration site per county, possibly at University of Kentucky Extension offices.
- **Strategy:** Post signage at demonstration sites explaining the need for monarch conservation and where to obtain more information.
- **Strategy:** Facilitate annual monitoring of demonstration sites (citizen science or grant funded) to evaluate maintenance needs.

Assessment: All strategies will be implemented by the 5-year benchmark.



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Public Lands Habitat Management

OVERVIEW: *Public lands, which comprise less than 5% of Kentucky, are ideal sites for implementation of monarch protection because they serve as an interface between people and nature. Public lands offer several potential benefits: demonstration areas, trained land management staff, trained educators and interpreters, easy access, and readily accessible audiences. Monarch habitat restoration on public land associates agencies with positive actions and results. Funding sources are more likely to be available for public lands. Some public land organizations even have the capacity to create vast monarch habitat and provide the manpower and equipment for maintenance.*

GOAL: *Establish a strategy for identifying practitioners within each public land agency who have decision-making powers about implementing a Monarch Habitat Management plan and then sharing scientific information documenting the need to create more monarch habitat with these practitioners.*

CHALLENGE 1:

Identify relevant public land entities and determine the proper contact(s) for discussing monarch habitat initiatives.

- **Strategy:** Develop a list of all the public land holding agencies in the state, with contact information for the appropriate person(s).

Assessment: All strategies will be implemented within 1-year.

CHALLENGE 2:

Convince diverse agencies with different priorities that monarch conservation is important enough for action.

- **Strategy:** After identifying individual land managers, schedule face-to-face meetings to present information regarding the monarch program.
- **Strategy:** Visit potential habitat sites with land managers and discuss restoration options.
- **Strategy:** Assist land managers with development of restoration and management plans for sites.

- **Strategy:** Provide land managers with accurate data on unit costs for installing and maintaining monarch habitat.

Assessment: All strategies will be implemented by the 5-year benchmark.

CHALLENGE 3:

Build a network of public land managers interested in developing monarch habitat and establish lines of communication between them.

- **Strategy:** Collect contact information from all the identified public land managers throughout the state that are interested in participating in the monarch restoration program.
- **Strategy:** Establish a user-friendly communication forum for all these individuals to discuss ideas and share experiences (e.g. possible monarch restoration list-serve).
- **Strategy:** Host several meetings during the year at various locations so individuals can continually develop and share ideas as well as see what others are doing.

Assessment: All strategies will be implemented by the 5-year benchmark.

CHALLENGE 4:

Establish large areas of continuous monarch habitat.

- **Strategy:** Once information is gathered on all the various public land agencies across the state, target restoration efforts towards larger tract sizes.
- **Strategy:** Develop and/or provide guidance to land managers detailing the process for establishing high quality monarch and pollinator habitat.

Assessment: All strategies will be implemented by the 5-year benchmark.

CHALLENGE 5:

Promote consistency among public lands/agencies—establish consistent messaging while still allowing various land management actions that suit the policies and needs of diverse agencies.

- **Strategy:** Identify key points for agencies to emphasize with the public re-



garding monarch restoration.

- **Strategy:** Develop multiple restoration and management guidelines to fit different situations.

Assessment: All strategies will be implemented by the 5-year benchmark.

CHALLENGE 6:

Acquire additional public land to protect and restore pollinator habitat.

- **Strategy:** Secure annual funding for Kentucky Heritage Land Conservation Fund and similar programs to purchase and protect suitable lands for monarchs

and other pollinators.

Assessment: Strategy will be implemented by the 5-year benchmark.

CHALLENGE 7:

Elevate importance of eight key Best Management Practices when evaluating projects for conserving pollinator habitat.

- **Strategy:** Align with regional and national initiatives to promote the following Best Management Practices for pollinator and monarch habitat
 - i. Focus on high quality foraging habitat.
 - ii. Identify important pollinator repro-

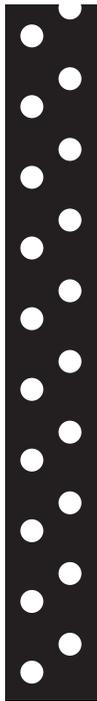
duction sites.

- iii. Determine important nesting and overwintering sites.
- iv. Identify pollinators of sensitive or at-risk plant species on Federal, State, local or non-governmental organization lists.
- v. Identify and remove invasive species to improve pollinator habitat.
- vi. Strive to use local, genetically appropriate native seeds.
- vii. Implement adaptive management of pollinator habitat.
- viii. Engage and inform the public.

Assessment: Strategy will be implemented by the 5-year benchmark.



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Right-of-Way Management

OVERVIEW: *Right-of-Ways (ROWs) have been identified as a significant opportunity for monarch habitat implementation at the landscape level. Thousands of acres of transportation, utility, and other ROWs dissect Kentucky from east to west, north to south. These areas present prime opportunity to convert traditional grass monocultures to expansive areas of optimal pollinator habitat. Ultimately, the availability and scale of ROWs may prove to be a hallmark in monarch butterfly recovery.*

GOAL: *Form partnerships, develop planting/mowing plans, and identify site selection parameters with various public and private entities to convert ROWs into significant pollinator habitat.*

CHALLENGE 1:

Germination and weed competition have proven to be a major hurdle for establishment of desirable species within ROWs. Therefore, we need to determine the best planting procedure to reduce weed competition and increase germination of milkweed and other desirable species within ROWs.

- **Strategy:** Work with Kentucky Transportation Cabinet, seed companies, and

others to discuss planting procedures.

- **Strategy:** Review previous planting plans from Kentucky Transportation Cabinet and other entities to determine what methods proved to be effective in ROWs.

Assessment: All strategies will be implemented by the 5-year benchmark.

CHALLENGE 2:

Develop prioritized list of focal areas

in which to begin ROW plantings and determine which entities to target.

- **Strategy:** Coordinate with stakeholders, including Kentucky Transportation Cabinet, to determine which sites may provide the greatest benefit to monarchs and pollinators.
- **Strategy:** Meet with stakeholders to determine overall interest in ROW plantings.



- **Strategy:** Identify five sites for ROW planting.

Assessment: All strategies will be implemented by the 5-year benchmark.

CHALLENGE 3:

Determine seed availability, cost of seed and equipment needs.

- **Strategy:** Meet with seed producers to establish cost and availability.
- **Strategy:** Discuss the feasibility of developing these ROW sites as potential seed sources. This may involve new

equipment or retrofitting existing equipment to harvest seed properly.

Assessment: All strategies will be implemented by the 5-year benchmark.

CHALLENGE 4:

Finalize proper mowing regimes and application techniques of specific herbicides to reduce non-native invasive plant competition and maximize growth of beneficial species.

- **Strategy:** Work with stakeholders, including Kentucky Transportation Cab-

net, to determine when to mow while keeping traffic safety concerns in mind.

- **Strategy:** Work with ROW stakeholders to take proactive measures preventing the spread of non-native invasive plants into restoration areas.
- **Strategy:** Coordinate pro-active measures to control the spread of undesirable species into restoration areas (e.g. signage for restoration areas, clean equipment policies).

Assessment: Strategy will be implemented by the 5-year benchmark.



Common milkweed seedlings

USFWS PHOTO



Funding

OVERVIEW: *Effective rare species management and habitat management is expensive, and requires long term foresight and support. This is especially true for monarch butterfly, a wide ranging migratory species. Monarchs use habitat across the migration route, most of which is degraded or even missing. Conservation and restoration efforts will be costly.*

GOAL: *Generate funding mechanisms to support monarch conservation, including habitat restoration, management, education, and research.*

CHALLENGE 1:

Funding is needed to establish and/or manage monarch habitat on private land throughout Kentucky, in both large and small areas. Approximately 95% of Kentucky is privately owned.

- **Strategy:** Utilize existing USDA Farm Bill Programs including the Conservation Reserve Program (CRP), the Conservation Reserve Enhancement Program (CREP), the Environmental Quality Incentives Program (EQIP), and the Wetland Reserve Enhancement Program (WREP) to improve existing or potential pollinator habitat, including lands currently enrolled in these programs and new contracts.
 - Work to establish pollinator habitat management, such as fescue conversion,

as a ranking criterion in target areas to direct more funding to practices benefiting monarchs and other pollinators.

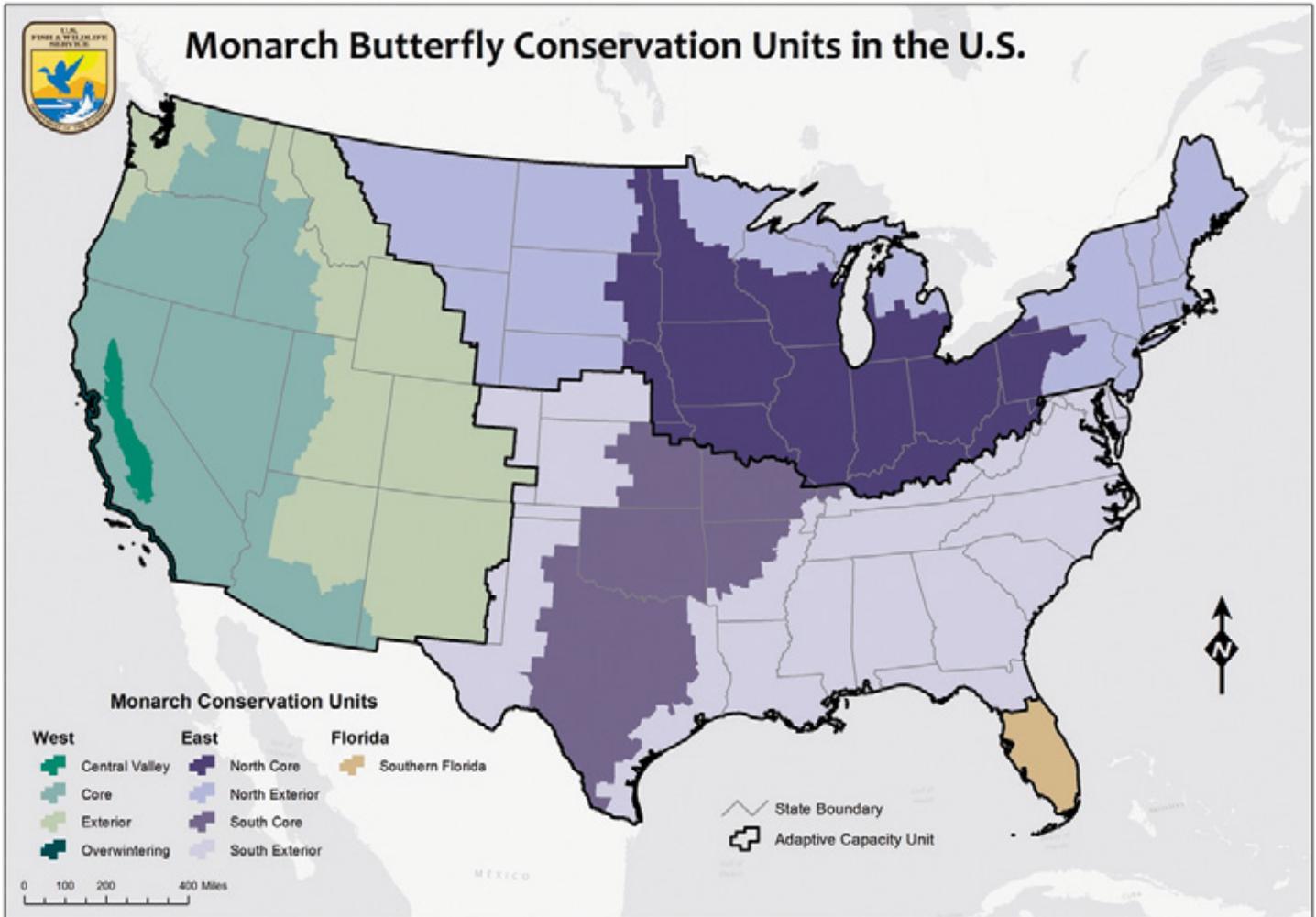
- Set a goal of enrolling 1,000 to 1,500 acres per year in pollinator habitat management on EQIP tracts.
 - Set a goal of directing mid-contract management of CRP and CREP land to improve pollinator habitat on at least 45,000 acres.
- **Strategy:** Utilize United States Fish and Wildlife Service (USFWS) Partners for Wildlife program to establish pollinator habitat in appropriate areas.

CHALLENGE 2:

Funding is needed to establish monarch habitat on public land throughout Kentucky, in both large and small areas. Kentucky's

public lands are owned by an assortment of organizations with varying missions.

- **Strategy:** Apply to the National Fish and Wildlife Foundation (NFWF) Monarch Conservation Fund for \$50,000 to \$250,000 to form a multi-agency collaborative effort to manage pollinator habitat on public lands throughout Kentucky, to include invasive species removal and prescribed fire on grasslands with natural milkweed populations (<http://www.nfwf.org/monarch/Pages/home.aspx>).
- **Strategy:** Apply to the Kentucky Heritage Land Conservation Fund (heritage-land.ky.gov) for funding of monarch habitat management on state-managed natural areas such as Wildlife Management Ar-



eas, Nature Preserves, Parks, Wild Rivers watersheds, and Conservation Easements to include invasive species removal and prescribed fire on grasslands with natural milkweed populations. Utilize this as non-federal match for appropriate federal grants, including NFWF, where possible.

- **Strategy:** Work with the Kentucky Department of Transportation to apply up to \$75,000 in Transportation Enhancement Funds to benefit pollinator habitat on highway rights-of-way and other sites.
- **Strategy:** Utilize \$25,000 in Imperiled Bat Conservation Funds to enhance pollinator habitat on appropriate sites as prey sources for rare bats.
- **Strategy:** Explore private funding sources, such as the Doris Duke Foundation and other charitable foundations.
- **Strategy:** Collaborate with conservation partners to direct agency program funding towards pollinator habitat improve-

ment on appropriate sites.

- **Strategy:** Work to secure annual funding for Kentucky Heritage Land Conservation Fund (KHLCF) to acquire and protect natural areas with significant or appropriate monarch and pollinator habitat.

CHALLENGE 3:

Milkweed species, which are host plants to monarch butterflies, are expensive to propagate and the supply is limited.

- **Strategy:** Identify funding sources for local propagation of milkweed species.

CHALLENGE 4:

Funding is also needed to educate the public on the importance of monarchs as pollinators.

- **Strategy:** Identify sources of funding for educational programs and publi-

cize through Kentucky Association for Environmental Education, such as the stipend for “Got Milkweed?K” training for teachers. (<http://pages.stolaf.edu/mohl/2016/04/06/2016-summer-workshops-for-teachers/>)

CHALLENGE 5:

Research funding is crucial to setting monarch population benchmarks in Kentucky and identifying sites with high quality pollinator habitat to facilitate directing limited funding to the best possible areas.

- **Strategy:** Identify research funding sources, and coordinate with existing research entities to ensure monarch conservation research needs are appropriately addressed.

Assessment: Half of these strategies will be employed by the 5-year benchmark.

Research and Monitoring



USFWS PHOTO

OVERVIEW: *A carefully constructed and implemented monitoring and research plan is of critical importance to the Kentucky Monarch Plan. It should provide objective and quantifiable parameters to measure the progress and effectiveness of individual efforts within the scope of the project (i.e. number of monarch stations established, acres of habitat restored). A comprehensive monitoring plan will track the collective impact of all efforts on the recovery of the monarch. A sound monitoring plan will add relevance to the project and enable informed decision making.*

GOAL: *We will utilize existing resources to develop a Kentucky monitoring protocol for monarch butterflies and habitats that is practical and designed to yield consistent results, if implemented by individuals of a variety of backgrounds with minimal training.*

CHALLENGE 1:

Define “suitable habitat” for monarch butterflies.

- **Strategy:** Identify experts who are familiar with current research.
- **Strategy:** Develop a list of highest-priority research questions regarding regionally specific habitat requirements for monarchs.
- **Strategy:** Engage university researchers in dialogue regarding monarch research priorities.

Assessment: All strategies will be implemented by the 5-year benchmark.

CHALLENGE 2:

Compile Best Available Science to define best management practices for monarch habitat restoration and management in Kentucky.

- **Strategy:** Form a committee of experts including land managers from Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources, The Nature Conservancy, monarch citizen scientists and others to generate a report on currently known best management practices as well as specific management questions that need to be addressed.

- **Strategy:** Share management protocols with managers involved in monarch habitat restoration.

Assessment: All strategies will be implemented by the 5-year benchmark.

CHALLENGE 3:

Determine location, distribution, and status of current and potential monarch habitat.

- **Strategy:** Create comprehensive database for monarch habitat based on Kentucky State Nature Preserves Natural Area Inventory (NAI) database, Biotics.



USFWS PHOTOS



- **Strategy:** Inventory new areas, update older records from NAI database.
- **Strategy:** Identify potential corridors and key areas for habitat establishment/protection.
- **Strategy:** Create report/product that can be shared with monarch taskforce.

Assessment: Two of four strategies will be implemented by the 5-year benchmark.

CHALLENGE 4:

Determine the best methodology for monitoring populations in Kentucky.

- **Strategy:** Seek advice from experts for input and review of existing protocols.
- **Strategy:** Select or adapt the most suitable monitoring protocol based on expert input.
- **Strategy:** Determine who will conduct

monitoring and who/how data will be tracked.

Assessment: All strategies will be implemented by the 5-year benchmark.

CHALLENGE 5:

Develop monitoring and reporting tools to identify and track the location and status of monarch habitat.

- **Strategy:** Coordinate with Monarch Watch to locate and track Monarch Waystations on private land in Kentucky and to obtain permission to add private landowner contact information to a Kentucky Monarch Habitat database.
- **Strategy:** Build a database of Monarch Waystations in Kentucky and quality of habitat at each waystation.
- **Strategy:** Develop a self-reporting tool

for landowners to provide information on their monarch habitat including size, quality, and contact information.

Assessment: Two of three strategies will be implemented by the 5-year benchmark.

CHALLENGE 6:

Monitor monarch migration in Kentucky.

- **Strategy:** Use Journey North tools to track and record Kentucky monarch sightings.
- **Strategy:** Leverage public interest using citizen science engagement for tracking Kentucky monarchs.
- **Strategy:** Train educators, scientists, and individuals in tracking and tagging Kentucky monarchs.

Assessment: All strategies will be implemented by the 5-year benchmark.



A simple way to help

The Kentucky Heritage Land Conservation Fund generates funding for natural areas habitat management, including pollinator habitat enhancement, through the sale of license plates featuring the viceroy butterfly, a monarch mimic.



KENTUCKY
Monarch
CONSERVATION PLAN



KENTUCKY DEPARTMENT OF
FISH AND WILDLIFE RESOURCES

1 Sportsman's Lane, Frankfort, KY 40601
1-800-858-1549 • fw.ky.gov

JANUARY 2018