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MINNESOTA STATE AGENCY POLLINATOR REPORT

2017 ANNUAL REPORT

MINNESOTA

PREFACE

EXECUTIVE ORDER

Minnesota Governor Mark Dayton issued an executive order in August 2016 directing a team of state agency experts to take immediate action to restore pollinator health in the state. Under the order, the Environmental Quality Board was charged with establishing the Interagency Pollinator Protection Team.

INTERAGENCY POLLINATOR PROTECTION TEAM

Team members are from the Minnesota Departments of Administration, Agriculture, Corrections, Education, Health, Natural Resources, Transportation, the Minnesota Board of Water and Soil Resources, the Minnesota Pollution Control Agency, and the Minnesota Zoo.

This is the Interagency Pollinator Protection Team's first annual progress report to the Environmental Quality Board. This report catalogs existing agency initiatives and programs and provides a menu of options for pollinator policy, budget and research. This report serves to unify state agency efforts on pollinator protection, share information with external stakeholders and build a framework to measure progress toward full implementation of the Governor's executive order. Additionally, this report is a living document. As we gain new information, our indicators and proposed options for policy, budget and research may change.

MEGACHILE LEAFCUTTER BEE FEMALE ON PURPLE CONEFLOWER

Tara Harris/Minnesota Zoo

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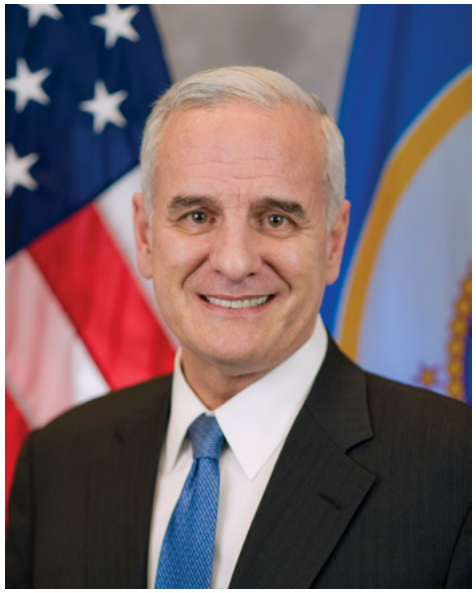
FROM THE GOVERNOR



Dear Fellow Minnesotan:

Though small in size, pollinators play a large role in shaping Minnesota's natural identity and supporting a vital agricultural economy. Many of our iconic state symbols, including the pink and white lady slipper, the Honeycrisp™ apple, and even the blueberry muffin depend on having a healthy population of pollinators. Bees, butterflies and other pollinating insects are critical to protecting the health of our natural resources, unique ecosystems and our way of life.

Pollinators are essential to Minnesota's economy. Our $90 billion agricultural sector would not be possible without the free services provided by pollinators. Small businesses in all sectors— from tourism operations to outfitters to restaurants to landscaping firms— also derive substantial benefits from pollinators. Pollinator protection is necessary to ensure a strong state economy.

The evidence is clear - pollinators are in danger in Minnesota. A wide range of pressures, including habitat loss, pesticides, diseases and parasites have driven a significant decline in pollinator populations over the last decade. Because of the complex nature of the problem, there is not one simple solution. I have asked state agencies to lead the way with a variety of actions across the spectrum of pollinator protection to harness the power of science and collaboration to protect this crucial resource.

However, these steps alone will not be enough. All Minnesotans have the power to protect pollinators and must work together to make progress toward solutions. Whether you plant a small pollinator garden or devote many acres to a conservation easement; whether you take the Minnesota Pollinator Pledge or propose a pollinator protection ordinance to your local government; whether you cut your grass less frequently or adopt an integrated pest management strategy for your crops, you can make a difference.

We must act together, and we must act now to protect pollinators in Minnesota.

Sincerely,

Mark Dayton
Governor

INTRODUCTION

FRAMEWORK

We use Results-Based Accountability, a data-driven decision-making process that identifies the goals and metrics needed to produce our desired outcomes. This is a high-level report, rather than a detailed plan, and we have limited it to actions within the authority and current budgets of state agencies.

Our desired outcome is healthy, diverse pollinator populations that sustain and enhance Minnesota's environment, economy, and quality of life.

In order to meet the overall outcome, we have identified three specific goals in areas where state agencies have the greatest potential to reduce stress on pollinators:

1. Lands throughout Minnesota support healthy, diverse and abundant pollinator populations.
2. Minnesotans use pesticides judiciously and only when necessary, in order to reduce the harm to pollinators from pesticides while retaining economic strength.
3. Minnesotans understand, value and actively support pollinator populations

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$16,000,000,000

That's "billion"— with a "bee."

The estimated annual value of honey bees' pollination of food crops in the United States is $16 billion.

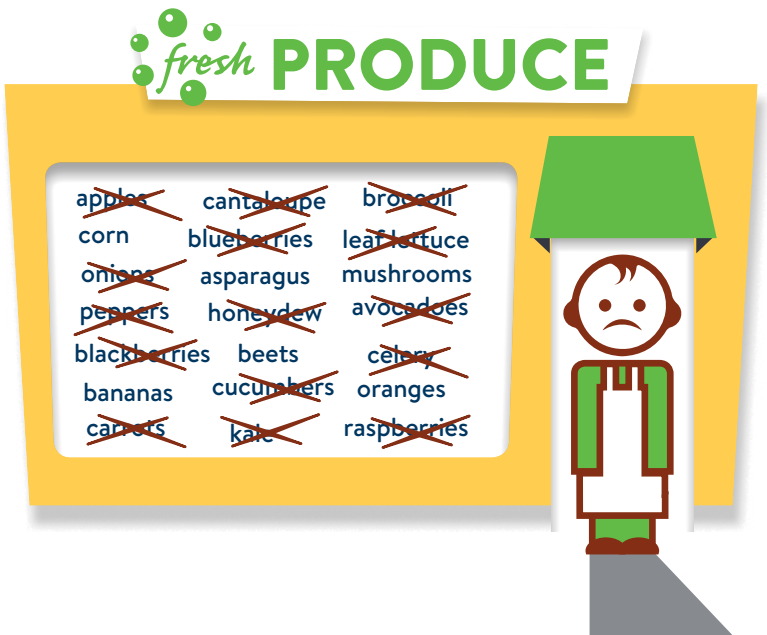
We will use two indicator metrics to track progress toward the overall outcome. We will use the National Agricultural Statistics Service's data to track quarterly colony losses of managed bees. Additionally, we will track the number of pollinators that the Minnesota Wildlife Action Plan identifies as a Species in Greatest Conservation Need to gauge the status of wild pollinators. This metric will not change from year to year, but only as the Minnesota updates its Wildlife Action Plan every 10 years.

POLLINATORS PLAY A ROLE IN THE ECOSYSTEM *AND* THE ECONOMY

Pollinators provide enormous ecological, economic and aesthetic benefits. They are critical to maintaining the healthy natural ecosystems that Minnesotans value. Bees are the most efficient and important animal pollinators for many of our food crops. Honey bees' pollination of food crops in the United States provides an estimated $16 billion to the economy, and native pollinators provide an additional $3 billion in value. We must also recognize the uncalculated, but significant worth of native plant pollination, food and habitat for wildlife and other benefits that pollinators provide.

Honey bees (a species not native to North America) attract attention because they are an important part of food production. The media spotlight on the rising rate of honey bee colony collapses has spurred many research projects.

WITHOUT POLLINATORS MANY PRODUCE CHOICES DISAPPEAR



POLLINATORS ARE IN TROUBLE

Because of their familiarity and wide geographic range, we recognize honey bees and monarch butterflies as flagship species for all pollinators; however, many other species of bees, butterflies, moths, beetles and birds are also pollinators. Honey bee losses came to the public's attention in 2006 when some beekeepers reported losing between 30 and 90 percent of their colonies. Since no single factor could explain these losses, the phenomenon was called Colony Collapse Disorder. Since then, Minnesota has seen unsustainable honey bee colony losses, reaching a total winter loss of 44,784 colonies, or nearly 36 percent of all colonies reported to the Bee Informed Partnership, in the winter of 2015-2016. Beekeepers consider that colony losses up to 15 percent could be considered "acceptable" for the winter.

While the Bee Informed Partnership has collected seasonal colony loss information for several years, which helps us establish a trend, the National Agricultural Statistics Service only began collecting quarterly numbers in 2015. These quarterly numbers will give us a better picture of bee health, but the two loss numbers are calculated differently, meaning that we cannot compare the quarterly losses directly to the Bee Informed Partnership's winter losses.

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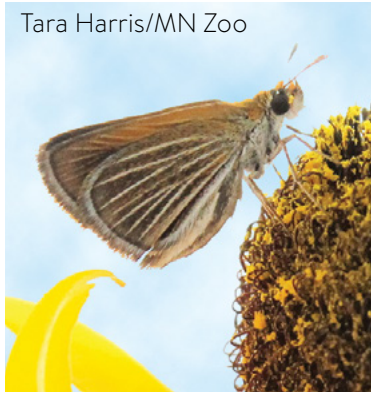
SPECIES IN **GREATEST CONSERVATION NEED**

Minnesota's State Wildlife Action Plan lists 33 species of butterflies and moths and five species of bumble bees as "Species in Greatest Conservation Need." Several of these species are also listed or being considered for listing under the federal Endangered Species Act.

STATUS UNDER THE **FEDERAL ENDANGERED SPECIES ACT:**

ENDANGERED


Tara Harris/MN Zoo

Poweshiek skipperling

Sam Shaw

Karner blue butterfly

Heather Holm

Rusty-patched bumble bee

THREATENED

Cale Nordmeyer/MN Zoo

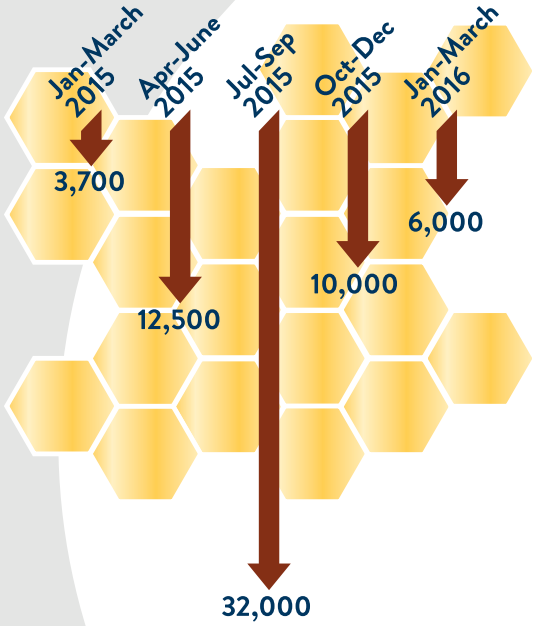
Dakota skipper

UNDER REVIEW

Cale Nordmeyer

Monarch butterfly

MINNESOTA QUARTERLY HONEY BEE COLONY LOSSES



CAUSES OF POLLINATOR DECLINE

FLOWERLESS LANDSCAPE
LACK OF CROP DIVERSITY
PESTICIDES
PARASITES
DISEASES
MANAGEMENT PRACTICES

Pollinators face many threats, and there is no one solution to prevent pollinator declines and restore pollinator health. We must learn about how these stressors interact with each other and what we can do to reduce their impacts on pollinators.

Likewise, monarch butterfly populations have seen an approximately 80 percent decline since the mid-1990s. The introduction of genetically modified herbicide-resistant crops allowed for broadcast herbicide applications. Monarch butterflies lay their eggs exclusively on milkweed plants, which declined on the agricultural landscape by an estimated 81 percent between 1999 and 2010. The loss of other pollinator-attractive plants has also diminished available food sources for many other pollinators.

POLLINATORS TELL US ABOUT OUR ENVIRONMENT

Insect pollinators are particularly vulnerable to environmental changes due to their complex development: a variety of stressors harm the insect at different growth stages and times of the year. Various species of pollinators, or even the same pollinator at a different stage in its life cycle, will not respond in the same way to the same factors. Overall, habitat loss, habitat degradation, climate change, pesticide exposures, diseases and parasites affect pollinators.

The impacts intensify when these factors combine with each other.

State agencies have varying roles related to these stressors, and some have a clearer responsibility and authority to control certain aspects of the problem than others. For example, parasites can not only weaken and kill pollinating insects themselves, but they may also be a vector that can transmit viruses. Pesticide exposure, poor nutrition and habitat loss can exacerbate the impacts of diseases and parasites, while access to diverse and abundant floral

WHAT ARE **PESTICIDES?**

PESTICIDES ARE SUBSTANCES USED TO PREVENT, DESTROY, REPEL OR MITIGATE PESTS.

- They can be applied to lawns, gardens, crops, products, or bodies of water to reduce the impact of harmful insects, plants, animals and microorganisms such as fungi and bacteria.
- They have the potential to cause harm to the environment, humans and other species that are not specifically targeted.

WHAT'S THE BUZZ ON NEONICOTINOIDS?

Insecticides are a type of pesticide intended to control insects. Systemic insecticides are water soluble, meaning they can move through plant tissues to reach all parts of a treated plant, including pollen and nectar. Neonicotinoids are one class of systemic insecticides commonly used in a wide range of products formulated for use in agricultural, horticultural and residential settings.

While neonicotinoid insecticides can be less toxic to mammals, fish and birds than many other types of insecticides, they can be harmful to pollinating insects and other beneficial insects. Because they are systemic and have long half-lives, neonicotinoid residue can remain in plants or soil long after their initial application. At high enough levels, their residues can kill pollinating insects outright and at lower levels, they can cause sublethal effects that impair the health of solitary bees and of honey bee and bumble bee colonies. However, permitted application rates and other requirements on pesticide labels are intended to mitigate these risks.

resources may help pollinators withstand those impacts. The state does not have a direct role in reducing parasites or pathogens; however, agencies do have the ability to regulate pesticide use, influence land management practices and increase floral resources in the landscape.

We have much to learn about the interactions between stressors and pollinators in Minnesota, which include at least 400 species of native bees and over 140 species of native butterflies.

While this report focuses on state agency actions and those areas where state agencies can make changes to reduce stressors on pollinator health and population, Minnesota is home to many researchers working to answer questions about the human relationship with pollinators and their habitat, ecology and health.

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Minnesota Zoo

RESEARCH IN MINNESOTA

There are many pollinator research projects underway in Minnesota. A variety of organizations conduct surveys and research, including the University of Minnesota, Minnesota Master Naturalists, Great River Greening, the Xerces Society, and others. Some of the major topics Minnesota researchers are investigating include:

- Landscape effects on honey bee health and native bee diversity.
- Honey bee foraging preferences.
- Nutrition of roadside plants for pollinators such as bumble bees and monarchs.
- Pollination services of native bees in relation to diversity, community composition, and ecosystem function.
- The extent of pesticide drift from agricultural fields onto native prairies and other flowering habitat.
- Effects of neonicotinoid insecticides used in landscapes and greenhouses on beneficial insects, including bees, predators, and parasitoids.
- Flexibility of development and behavior in insects, especially in the context of rapid environmental change.
- The effectiveness and risks of insecticides and other pest management techniques used in agricultural systems on non-target insects.
- The economic value of crop pollinators.
- Diversity, abundance, range and phenology of native pollinators.

Butterfly scientist Cale Nordmeyer monitoring Poweshiek skipperling at the Minnesota Zoo.

STATE AGENCY RESEARCH

The Department of Natural Resources is conducting the first region-wide, quantitative surveys of native bees ever undertaken in the state. These surveys and related work in museums have documented over 400 species of bees in Minnesota and provided data for the agency to map where each species lives. The agency also conducts and coordinates butterfly surveys across dozens of prairie remnants, revealing significant long-term declines, and even apparent local and regional extinctions of many prairie butterflies, like the federally endangered Poweshiek skipperling and federally threatened Dakota skipper. This research helps us understand the baseline condition of pollinators in Minnesota.

The Minnesota Zoo manages the Prairie Butterfly Conservation Program, which is funded primarily through the Environment and Natural Resources Trust Fund and, like the Department of Natural Resources, focuses on two species that are native to Minnesota, the Dakota skipper and Poweshiek skipperling. This is the first and only conservation program dedicated to breeding and rearing these butterflies. The Zoo will soon use these zoo-based butterfly populations to build wild populations through recommended population augmentation and reintroduction programs.

Minnesota Zoo scientists also collect data on these prairie butterflies to gain a better understanding of their biology and needs in the wild. The Zoo partners with the U.S. Fish and Wildlife Service, the Minnesota Department of Natural Resources, the University of Minnesota and others to study habitat health and the degree of pesticide drift at several prairies, as well as other factors that potentially affect these once-abundant pollinators.

ENVIRONMENT AND NATURAL RESOURCES **TRUST FUND**

Between 2013 and 2016, the Legislature followed recommendations from the Legislative-Citizen Commission on Minnesota Resources to appropriate nearly $7 million from the Environment and Natural Resources Trust Fund, for which the Minnesota State Lottery generates money, for 18 projects directly related to pollinator issues.

MONARCH BUTTERFLY ON JOE PYE WEED

Ryan Clausen/Minnesota Zoo

GOAL 1

GOAL 1: LANDS THROUGHOUT MINNESOTA SUPPORT HEALTHY, DIVERSE, AND ABUNDANT POLLINATOR POPULATIONS.

Indicator: Acres of state-owned or state-managed pollinator habitat within the Eastern Broadleaf Forest ecological province.

We can gauge trends in available pollinator habitat statewide by monitoring the acres of pollinator habitat in public and private ownership in the Eastern Broadleaf Forest ecological province.

State agencies like the Departments of Natural Resources, Transportation and many others have data that allow us to track the acres of pollinator habitat on state-managed lands. Agency staff continue to develop protocols for mapping and tracking these acres.

Private acres are tracked through programs like the Conservation Reserve Program and Reinvest in Minnesota.

With additional resources, future reports could categorize acres as high-, medium- and low-quality wild pollinator habitat to help identify acres with the highest potential for improvement. More resources would also provide the opportunity to work with the private and non-profit sectors to track and categorize acres of pollinator habitat on private land. Tracking public and private acres in tandem would allow for strategic habitat development or enhancement in order to provide connectivity between areas of high-quality habitat.

MONARCH BUTTERFLIES AND HONEY BEES HAVE **SPECIALIZED NEEDS**

Monarch caterpillars only eat plants in the milkweed family, making those plants essential for monarch butterfly habitat.

Honey bees require large tracts of flowering plants in order to produce sufficient honey to survive winter and generate a surplus of honey for beekeepers to harvest. These plants may be non-native, but they should be non-invasive. Examples include alfalfa and blooming cover crops like canola or buckwheat. Both native and European basswood trees can provide another high-quality source of food for honey bees. Honey bees also require a source of clean, fresh water.

WHAT IS POLLINATOR HABITAT?

Minnesota's pollinators come in many shapes and sizes and rely on many diverse habitats, including prairies, grasslands, forests, and wet meadows. Insect pollinators feed on pollen and nectar from flowers, and some immature insects feed on foliage. Some species rely on plants or plant materials for shelter.

High-quality native pollinator habitat includes these characteristics:

- A high diversity and abundance of native plants that bloom continuously throughout the growing season,
- Adequate food and nesting resources,
- Pesticide use that is nonexistent or follows an integrated pest management plan or integrated vegetation management plan,
- Sufficiently buffered from pesticide drift,
- Management that maintains high-quality habitat and pollinator species,
- High-quality landscape context, and
- Connectivity to other pollinator habitat or large acreage.

Pollinator habitat does not include areas dominated by a single species, turf grass, open water, or cattail marshes.

WHY SHOULD WE TRACK POLLINATOR HABITAT IN THE EASTERN BROADLEAF FOREST PROVINCE?

Pollinators live in each of Minnesota's four ecosystem provinces. We can track acres in the Eastern Broadleaf Forest to symbolize pollinator habitat in other parts of the state.

We focus on the Eastern Broadleaf Forest because it lacks an overarching conservation strategy like the Minnesota Prairie Conservation Plan, which coordinates conservation efforts for two other sections of the state. Also, less than 5 percent of the nearly 12 million acres in the Eastern Broadleaf Forest are in public ownership. This strongly contrasts with the northeastern section of the state, where more than half of acres are in public ownership. Finally, the Eastern Broadleaf Forest contains both urban and rural areas, so tracking in this area would allow agencies to develop habitat strategies for different land uses that could apply to the rest of the state. Given appropriate resources, we could expand tracking to pollinator habitat throughout the state.

WHAT ARE WE CURRENTLY DOING?

Private landowners in the Eastern Broadleaf Forest Province have enrolled over 35,700 acres of pollinator habitat through the Reinvest in Minnesota permanent easement program. Other programs such as the Conservation Reserve Program and the

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LONG-TERM PLANNING:

State agencies participate in a wide variety of long-term land-use planning, such as the Minnesota Prairie Conservation Plan. We should consider pollinators in these plans whenever practical.

Environmental Quality Incentives Program also provide incentives to establish pollinator habitat. The Board of Water and Soil Resources estimates that the Eastern Broadleaf Forest contains over 270,000 acres of land enrolled in the Conservation Reserve Program.

The Board of Water and Soil Resources offers suggestions for pollinator seed mixes and an online pollinator toolbox to guide efforts of local partners in establishing pollinator habitat through their easement, wetland, or water quality programs.

The Department of Transportation has collaborated on the development of 23 native seed mixes containing pollinator-friendly species, which are available to state agencies and local units of government. Between 2010 and 2015, the Department of Transportation used native seed mixes on 36 percent of its project acres, which resulted in planting 2,709 acres of pollinator-friendly habitat. The agency also developed an online tool and guidance to assist public and private designers in choosing the right seed mix for a given project.

Public land managers like the Department of Natural Resources have managed for biodiversity for many years, creating habitat that supports a variety of insects and pollinators. The Department of Natural Resources also created a suite of best management practices for pollinators, requiring their use on the lands that they manage.

POLLINATOR-FRIENDLY **SOLAR SITES**

The Board of Water and Soil Resources developed a pollinator assessment for solar projects, which will allow qualifying developers or owners of solar sites to claim that their arrays provide beneficial habitat for pollinators.

Ramsey, MN site seeded Oct. 2014. Photo Courtesy Prairie Restorations Inc.

OPPORTUNITIES FOR **POLLINATOR HABITAT ON PUBLIC LANDS**

Beyond state agencies, many public entities have the ability to support pollinator habitat on their land. Some examples include hospitals, schools, county and township rights-of-way and the land beneath power transmission lines.

FUTURE ACTIONS

PROMOTE, PROTECT, RESTORE, AND MANAGE POLLINATOR HABITAT ON STATE-OWNED OR STATE-MANAGED LANDS

Many state agencies already provide pollinator habitat on their land, but they could improve existing habitat to meet high-quality habitat standards, accelerate implementation of pollinator habitat projects and create new high-quality habitat with more funding. Potential areas include:

- Department of Corrections facilities.
- Department of Military Affairs solar sites.
- Department of Administration's Capitol Complex.
- Pollution Control Agency's closed landfills.
- Department of Transportation's roadsides.
- Department of Natural Resources' scientific and natural areas, aquatic management areas, wildlife management areas, state parks and trails, and state forests.

USING **CLOSED LANDFILL BUFFERS** FOR POLLINATOR HABITAT

The Pollution Control Agency manages 109 closed landfills, which provide an example of how state agencies can turn under-utilized land into pollinator habitat. Given resources, the Board of Water and Soil Resources would work with the Pollution Control Agency to develop a pilot program to test pollinator-friendly seed mixes on the buffer areas at some of these landfills.

PURPOSELY MANAGE STATE ROADSIDES TO MAINTAIN INFRASTRUCTURE WHILE ALSO SUPPORTING POLLINATORS

Roadsides can provide important habitat for pollinators, but they must also be maintained for road safety. Currently, ditches and rights-of-way are often mowed or hayed without permission from the road authority, resulting in disruption of habitat. Minnesota roadside mowing statutes could be clarified to support undisturbed native vegetation and enforce proper management.

Undisturbed native vegetation on roadsides not only provides improved habitat for wildlife, including pollinators, but it also reduces long-term costs for weed and erosion control, provides increased water infiltration rates and supports the infrastructure of the road.

WALKING **THE WALK**

The Department of Administration updated its landscaping plan to include only neonicotinoid-free plants on the Capitol Complex. It will require all state building construction and renovation projects to do the same.

MONARCH **HIGHWAY**

The Department of Transportation is working with the Federal Highway Administration and five other state highway agencies along the Interstate 35 corridor to coordinate joint educational materials, shared vegetation management practices, and strategies for pollinator-friendly seed mixes. This effort, the "Monarch Highway," will provide necessary way stations for monarch butterflies during their yearly migration along this route.

DEDICATED POLLINATOR RESOURCES

Dedicated pollinator staff in select agencies, particularly at the Departments of Natural Resources and Transportation, would increase the capacity of state agencies to guide pollinator initiatives, work on pollinator policies, and respond to requests. They would also help provide technical guidance to stakeholders, conduct outreach presentations for the public, identify research needs, and accelerate interagency pollinator activities.

HOW CAN WE BETTER MONITOR ACRES OF POLLINATOR HABITAT?

We need to identify opportunities for habitat creation or restoration, and we need platforms to streamline accomplishment tracking. With additional resources, we could:

- Build a centralized database to track land management activities.
- Expand our tracking beyond state-managed land by surveying counties, school districts and other public entities to gather information on existing pollinator habitat.

Board of Water and Soil Resources

- Build a GIS layer to track pollinator habitat statewide.
- Develop and implement a ranking system to assess the quality of pollinator habitat.
- Research the effectiveness of buffers as pollinator habitat.
- Write and carry out a conservation strategy for the Eastern Broadleaf Forest.

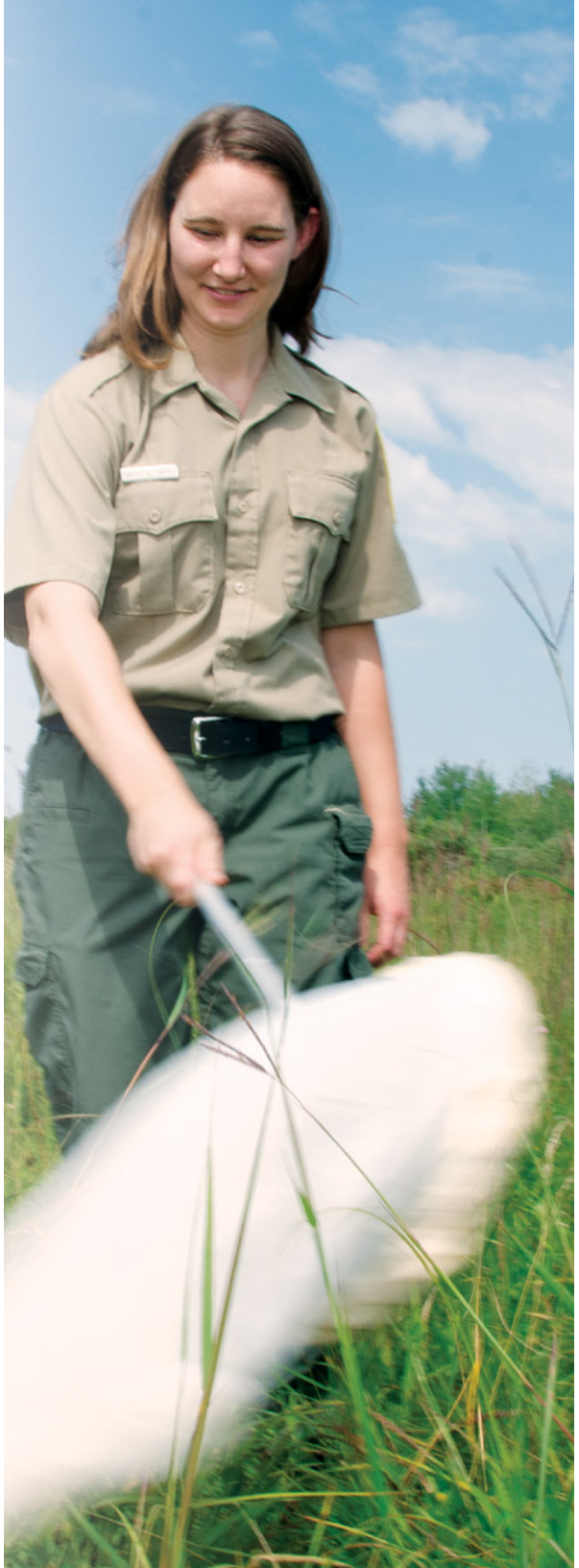
KEEPING NATURAL AREAS **SAFE**

State agencies will continue communicating with the non-profit FieldWatch, Inc. to promote the inclusion of conservation plantings and natural areas to their DriftWatch™ mapping program. This would help pesticide applicators identify areas that are sensitive to pesticide drift.

HOW CAN WE BETTER MONITOR POLLINATOR POPULATIONS?

We are still learning about pollinator populations in Minnesota. We need to address knowledge gaps about pollinators to inform and optimize habitat creation, restoration and management. We need to assess the status of populations and establish a baseline before we can track population trends. In order to improve monitoring, state agencies need funding to:

- Conduct baseline surveys and implement long-term monitoring programs for pollinators.
- Conduct regular surveys of all pollinators that qualify as Species in Greatest Conservation Need.
- Train more state field staff to identify hard-to-differentiate pollinator species.
- Fund research to compile state species lists for pollinator groups such as butterflies, moths, wasps, flies, and beetles.
- Compile data from previous surveys and museums to determine the historic presence of pollinators.
- Support IT solutions for data management and sharing.
- Provide long-term support for citizen science programs to collect and analyze pollinator data.



DNR bee researcher Crystal Boyd collecting bee samples.

HOW CAN WE PREVENT COMMERCIALLY RAISED BUMBLE BEES AND MONARCH BUTTERFLIES FROM HARMING NATIVE POPULATIONS?

Commercially raised pollinators can harbor fungi or diseases that transfer to wild populations. Bumble bees, for example, may be imported to Minnesota and used in greenhouses to pollinate crops like tomatoes, or outdoors for crops like apples. This could be a threat to bees like the rusty patched bumble bee, which was recently listed as a federally endangered species.

Some people release commercially raised monarch butterflies for reasons ranging from wedding celebrations to elementary school science lessons. The monarch butterfly is currently being reviewed for listing under the Endangered Species Act.

Scientists recognize that regulating the use of commercially raised bumble bees and monarch butterflies would help to protect wild, native pollinators. Requiring a permit to obtain and use commercially raised pollinators would allow the state to track the location of purchased insects and educate buyers on safe usage. Restricting use to contained areas would help to prevent the spread of disease. Commercial vendors could also be required to show that the insects they sell are disease free (or have very low levels of disease).

GOAL 2

GOAL 2: MINNESOTANS USE PESTICIDES JUDICIOUSLY AND ONLY WHEN NECESSARY, IN ORDER TO REDUCE THE HARM TO POLLINATORS FROM PESTICIDES WHILE RETAINING ECONOMIC STRENGTH.

Indicator: Level of familiarity with best practices for application of insecticides and common practices of insecticide users.

Agriculture is a cornerstone of Minnesota's economy. We need to ensure that the agricultural economy can thrive while at the same time protecting pollinators. We recognize the importance of pesticides to treat pests, but they must be used properly and only when necessary in order to minimize potential environmental impacts and ensure that this tool can remain in farmers' toolboxes.

The Department of Agriculture regulates the use, application, storage, sale, handling and disposal of pesticides. Pesticides must be registered with both the U.S. Environmental Protection Agency and the state of Minnesota. The department will work with the National Agricultural Statistics Service to carry out surveys to assess the familiarity of insecticide users, mainly farmers and consultants, with various pests, pest thresholds, integrated pest management practices and the risks of insecticides.

The survey will also include questions about how applicators use insecticide products. Additionally, the department conducts inspections statewide to check for compliance with pesticide laws and performs investigations about pesticide use complaints. Tracking the results of surveys and routine and complaint-driven inspections will help us determine whether Minnesotans are using pesticides judiciously and only when necessary.

Some pesticides may move away from the application site through water, air or soil, where plants that attract pollinators may take them up. Movement of pesticides away from the target site depends upon several factors including uptake by plants, soil types, weather conditions and the properties of the individual pesticide.

Pesticide drift occurs when pesticide particles move through the air away from the target area for application at the time of application or soon after. Pesticide drift is illegal, and pesticide labels carry warnings on how to avoid it, along with enforceable instructions for application. Using pesticides judiciously and appropriately with best management practices can reduce the offsite movement of pesticides into pollinator habitats.

PESTICIDE **MONITORING**

The Department of Agriculture monitors water for many pesticides used in Minnesota each year and determines if a sample has enough pesticides to pose a risk to human health or aquatic life. The Department of Health uses a chemical review process to establish the level at which a contaminant can be in drinking water without causing harm or illness.

Overuse or misuse of pesticides is a concern not only due to potential effects on pollinators, but also because it allows genetic resistance to arise within the pest population. Neonicotinoid insecticide seed treatments on soybeans are one area where prophylactic use may not provide an economic benefit, due to the absence of high pest pressures and a mismatch in timing between the insecticide's effectiveness and the presence of soybean aphids, their main pest of concern.

When growers plant seeds treated with systemic insecticides, the mechanical action of the planter may release contaminated dust particles from treated seeds into the air. Contaminated dust particles in the air or settled on pollinator-attractive plants can expose pollinators to insecticide levels that may be toxic to them at a level high enough to cause immediate death or by continued exposure at lower levels, which can impair pollinators' foraging activities, navigation, and reproduction.

WHAT ARE WE CURRENTLY DOING?

Special registration review

In 2014, the Minnesota Legislature directed the Department of Agriculture to develop underlying criteria that would be necessary to conduct a special registration review of neonicotinoid insecticides for the State of Minnesota. Consequently, the Department of Agriculture completed its Registration Review of Neonicotinoid Use, Registration, and Insect Pollinator Impacts in Minnesota and released the report in conjunction with Governor Dayton's executive order in August 2016. Both the special review and the executive order can be found in the "Quick Guide for Action" section at the end of this report.

Verification of need

As a result of the special registration review's findings, the Department of Agriculture is establishing a strategy to ensure there is a need for foliar use of neonicotinoid insecticides on agricultural crops before they are sprayed. Further, the agency is in the process of increasing inspections for pesticides that are highly toxic to pollinators. These inspections will ensure that neonicotinoids and other highly toxic pesticides are used in accordance with pesticide labels.

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WHAT IS **IPM?**

Integrated pest management (IPM) is an economic and ecosystem-based long-term strategy to manage pests (weeds, insects, or diseases) without relying on pesticides as the first line of defense. It requires a systematic plan that includes monitoring and employing a combination of pest management tactics to control and prevent populations of pests before they cause economic or ecologic losses.

Integrated pest management is not only used in agricultural systems but also in a wide variety of vegetated systems and favors practices that limit risks to both human and ecosystem health.

Department of Agriculture

GOAL 2

Pesticide sales data
The Department of Agriculture publishes annual pesticide sales data for pesticide active ingredients based on pesticide registrant reporting requirements, which can be found on the department's website. These sales data provide an indication of long-term pesticide use trends. However, we must take care in interpreting these data, because pesticides sold in Minnesota may not be used in the same year that they are sold, and in some cases, may never be used in the state. Pesticide use varies greatly from year to year based on pest pressures and other factors, and so does not provide a reliable correlation to judicious use. Additionally, without data on pesticide treated seeds, this information will not show the full picture of neonicotinoid sales in Minnesota.

Pesticide applicator training
The Department of Agriculture works with the University of Minnesota and other partners to prepare pesticide manuals and license pesticide applicators. The pesticide applicator exam and training include information on how pesticides may affect pollinators. They also include best management practices that applicators can use to reduce harm to pollinators and their habitat.

FUTURE ACTIONS

Action steps from the Departmant of Agriculture's Special Registration Review
In order to limit the harm of neonicotinoids to pollinators, the Department of Agriculture identified eight action steps in its Special Registration Review of Neonicotinoid Use, Registration, and Insect Pollinator Impacts in Minnesota. The primary objective of the agency's actions is to develop a strong, science-based stewardship program to educate pesticide applicators

HUMMINGBIRD HOVERS AT A FRAGRANT HYSSOP PLANT

Minnesota Zoo

on judicious use of products containing neonicotinoids and other pesticides of concern. This program will include guidance for pesticide users on how to best follow label language and incorporate an integrated pest management approach into their pest management program. The eight recommendations and details about each can be found in the special registration review, which is accessible via the "Quick Guide for Action" section at the end of this report.

Using integrated pest management to reduce crop loss in Minnesota

Crop pests exist at different levels in crop fields from the time of planting to harvest, and at different levels from year to year depending on weather. Many factors influence pest populations, including environmental conditions, parasites or disease, and competition for food and space between members within the pest population.

Successful integrated pest management requires an understanding of all of these factors, plus pest life cycles and field history. An integrated pest management strategy uses pesticides only after all other pest management tactics have been considered and before pest damage results in significant crop losses. Given the diverse number of pests and their activity for any crop, it is necessary to monitor pests to determine when they first appear and when population levels pose an economic threat. University of Minnesota pest management specialists have developed thresholds for some pests to determine when a grower must take action to prevent economic loss. However, up-to-date pest thresholds and acceptable integrated pest management criteria specific to Minnesota are either obsolete or do not exist for many pests. Should additional resources be available, the Department of Agriculture could fund research projects on integrated pest management including pest scouting techniques, pest pressures and economic thresholds.

The Department of Agriculture encourages an integrated pest management plan for every Minnesota farm, and with funding, could provide more outreach to meet that goal. Private Pesticide Applicator Certification classes through University of Minnesota Extension could provide a venue to gather information on behavioral shifts of Minnesotan growers toward integrated pest management rather than prophylactic pesticide applications.

How can we minimize harm to pollinators from pesticide drift and movement?

Reducing the use of unnecessary pesticides lessens the risk of impacts on non-target organisms, including pollinators. New technology and precision agriculture techniques can help reduce pesticide use and help applicators keep pesticides on target and away from the surrounding areas. Additionally, pesticide applicator training materials and classes could place a greater emphasis on employing best management practices to protect pollinators from exposure and maintaining pollinator-beneficial plants where possible.

Beyond this, we need more support for research to gain a better understanding of pesticide contamination in areas around agricultural fields. For example, testing plant samples from areas of pollinator habitat would allow us to assess the safety and effectiveness of buffers and other areas near agricultural fields as pollinator habitat.

Dave Hanson/MnDOT

GOAL 3

GOAL 3: MINNESOTANS UNDERSTAND, VALUE, AND ACTIVELY SUPPORT POLLINATOR POPULATIONS.

Indicator: Nursery and garden center sales of pollinator-friendly plants.

As consumers learn more about the importance of pollinators to our food supply and ecosystem health, they may change their purchasing habits and demand neonicotinoid-free seed and plants. Tracking trends in annual sales of pollinator-friendly plants can help us understand the public's awareness of and support for pollinator populations.

To gauge Minnesota's level of understanding, we will collect data from over 300 nurseries from across the state. The nurseries are either members of the Minnesota Nursery and Landscape Association or listed with the Department of Natural Resources as a source of native plant or seed material.

We will establish statewide trends for the annual sales of pollinator-friendly and neonicotinoid-free plants. Increased demand would suggest growing public support for pollinator-friendly landscaping and habitat. We will continue collecting data on sales of pollinator-friendly plants as a proxy for progress as state agencies strive to increase Minnesotans' understanding, valuation and support for pollinator populations.

Board of Water and Soil Resources

WHAT IS A **POLLINATOR-FRIENDLY PLANT?***

Ideally, a pollinator-friendly plant:

- Produces pollen, nectar, and foliage that supports pollinators.
- Is not an invasive species.
- Is native.
- Has no pollinator-harmful pesticide residue available to pollinators.

* This is not a legal definition; for a technical definition, please see Minnesota Statutes 2016, Section 18H.14.

WHAT ARE WE CURRENTLY DOING?

Pollinator toolbox

The Board of Water and Soil Resources provides pollinator habitat guidance and resources for a wide range of agricultural conservation practices and conservation plantings with native plants including prairies, wetlands, pollinator plots and many other types.

Beyond suggestions for plants and seed mixes, the Board of Water and Soil Resources also provides funding, planting and management information, and tips for local conservation partners on how to use a finished project for community outreach and engagement. Tracking requests for conservation projects that include diverse conservation plantings as well as pollinator plots will help indicate farmer interest in the pollinators.

Pollinator promise

The Department of Agriculture asks visitors to the Minnesota State Fair to make the Minnesota Pollinator Promise and take an individual action to help pollinators. Since 2014, the agency has distributed 160,000 pollinator-friendly seed packets at the fair. The Pollinator Promise is available on the Department of Agriculture's website, which encourages visitors to share their pledge on social media with the hashtag #MNPollinatorHero.

In partnership with other state and federal agencies, the University of Minnesota and outside stakeholders, the Department of Agriculture also developed guidance on best management practices in agricultural landscapes, residential settings and roadsides and other rights-of-way.

Above right: Lt. Governor Tina Smith and Minnesota Department of Agriculture leaders take the pollinator pledge alongside State Fair visitors. Below: Students visit a new pollinator garden on the State Capitol Complex.

LOCAL POLLINATOR **PROTECTIONS**

As of March, 2017, two counties, two school districts, one township and 17 cities have passed resolutions to encourage pollinator-friendly habitat and practices. These resolutions show that Minnesotans want to move forward on pollinator protection.

GOAL 3

Learning at the Zoo
The Minnesota Zoo offers many chances to learn about pollinators. A seasonal butterfly garden lets visitors get close to pollinating insects, and prairie plantings with interpretive signs help visitors understand the habitat endangered pollinators need to survive and flourish.

Since 2015, the Minnesota Zoo has distributed nearly 12,000 pamphlets on butterflies and pollinator-friendly plants, 3,500 milkweed seed packets, and 1,500 mixed native seed packets to Zoo guests and the public. The Zoo also provides online pollinator resources.

LEARNING FROM **THE BEE LAB**

The Tashjian Bee and Pollinator Discovery Center at the University of Minnesota Landscape Arboretum provides a channel to provide community education and outreach using research, especially from the University of Minnesota Bee Lab, as a starting point.

Capitol visitors
The Department of Administration connects with thousands of people who visit the Capitol each year through pollinator gardens on and around the Capitol Mall. Educational signage highlights plants in the garden, pollinators and pollinator habitat.

Out and about
Members of the public can participate in pollinator-themed events and activities at state parks and trails, or learn about pollinators during one of the many public presentations given by the Minnesota Biological Survey, Nongame Wildlife Program, and other agency staff.

The Department of Natural Resources coordinates with the Minnesota Master Naturalists on the Minnesota Bee Atlas, a citizen science project funded in part by the Minnesota Environment and Natural Resources Trust Fund.

External educators can borrow a pollinator education kit through the agency's Project WILD.

FUTURE ACTIONS

Motivate Minnesotans to promote, protect, restore, and manage pollinator habitat

The state could encourage Minnesotans to create more habitat that meets our definition of high-quality pollinator habitat through several channels, including:

- Reinvigorating the Department of Natural Resources' Roadsides for Wildlife program, which empowers residents to influence their local road authority's management decisions.
- Support the Board of Water and Soil Resource's efforts to include high-quality pollinator habitat into all of their programs including conservation easements, wetland protection and restoration, clean water grants and cost-share grants that fund agricultural projects such as riparian buffers and cover crops.
- Provide educational materials to encourage recognition of beneficial insects and other strategies to decrease residential use of pesticides and to promote landscaping with native plants, purchased from local native plant suppliers that do not use systemic insecticides.

Develop a unified strategy for pollinator education and outreach across all state agencies

State agencies have a wide variety of resources available for a range of audiences. However, each agency currently promotes its own material. A coordinated strategy and a statewide web portal for pollinator information would provide one-stop shopping for Minnesotans interested in pollinators.

The Interagency Pollinator Protection Team and the Governor's Committee on Pollinator Protection provide a new framework for state agencies to communicate with each other and the public. With appropriate means, these teams could create accessible, plain language outreach materials that go beyond the activities of each individual agency.

Encourage cross-pollination

Many organizations, including nonprofits, businesses and advocacy groups have already created education and outreach materials about pollinator topics. Local governments and federal agencies have also worked to increase awareness of the problems facing pollinators and spur action. We can seek opportunities to develop partnerships and amplify the private and public sector efforts to reach a common goal.

Prairie plants along I-35.

Department of Transportation

WHERE CAN I LEARN MORE ABOUT POLLINATORS AND THE PROBLEMS THEY FACE?

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