Biodiversity

INTRODUCTION

The natural environment around transportation infrastructure includes not only land and water but also various plants, fish and wildlife that use it for habitat and food. The environment near highways, airports and railways all are vital to the ecosystem in the state. In Minnesota, populations of monarch butterflies, rusty-patched bumble bees and little brown bats have declined. Native prairie land habitat was wiped out throughout history and is still in decline. Invasive species are spreading through highway and waterway networks hurting wildlife native to Minnesota. Protecting the biodiversity of Minnesota is essential for the well-being of communities and the environment.

ROADSIDES

The highway system in Minnesota plays an important role in the health of the state's ecosystems. Much of the impact the highway system has on the environment is through the land and water around it. Highway roadsides are primarily used for maintenance, potential road expansion or bike trails. MnDOT is responsible for maintaining more than 12,000 miles of state highways, out of the 141,000 total road miles in Minnesota. Roadsides on these highways include 255,000 acres of state land, of which 175,000 acres are green space. The roadside serves many functions:

- Roadside ditches drain excess water away from roads
- Roadsides provide a safe space for vehicles that leave the travel lanes
- Roadsides provide a place for snow storage in the winter
- Roadsides provide a location for public utilities (e.g. sewer, storm sewer, electric and communications lines)
- Roadsides often contain desirable vegetation that improves highway aesthetics and provides control of erosion and drifting snow
- Roadsides provide habitat for pollinators, nesting birds and other small wildlife

Figure 1: Native Plants on a Roadside in Minnesota

MINNESOTA WILDLIFE

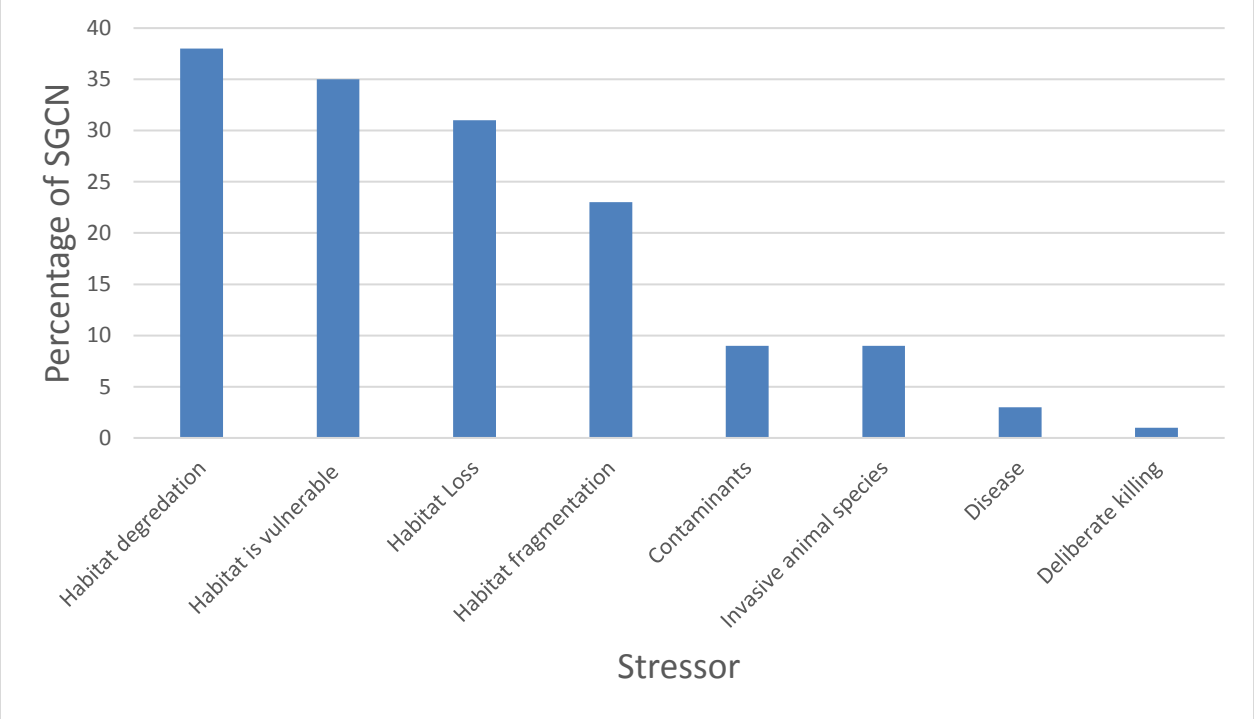
Minnesota is home to 21 animals and four plants listed on the endangered or threatened species list (Figure 2).[1] Some of these animals include the rusty-patched bumble bee, the Topeka shiner, and the northern long-eared bat. There are 1,652 endangered or threatened species in the United States with an additional 28 proposed species and 30 candidate species to be added to the list. Proposed species were reviewed, warrant listing and are in a period of public comment before final determination. Candidates are reviewed each year to determine if they should still be listed.

Figure 2: U.S. Fish and Wildlife Service Endangered or Threatened Species List

Federally Mandated Endangered or Threatened Species	Minnesota	U.S.
Animals	21	710
Plants	4	942
Total	25	1652

Minnesota is home to over 2,000 known native wildlife species. Approximately 16 percent (346) of these species are identified as Species in Greatest Conservation Need in Minnesota's Wildlife Action Plan because they are rare, their populations are declining or they face serious threats that may cause them to decline. This is up from 292 total species on this list in 2005. Minnesota's Wildlife Action Plan 2015-2025 showed that habitat-related stressors were leading factors associated with animals being listed as SGCN (Figure 3). The factors listed below interact and can cause a cumulative impact on population decline.

Figure 3: Stressors on Minnesota's Species in Greatest Conservation Need[2]



[1] U.S. Fish and Wildlife Service
[2] Minnesota DNR

POLLINATORS

Pollinators play an important role in the health of the environment. Many food sources and wildflowers depend on pollinators. Across the country, honey bee colonies are in drastic decline. Honey bee losses worsened with a total winter loss of 44,784 colonies or almost 36 percent in 2015.[3] A total of five bumble bees are identified as Species in Greatest Conservation Need in the State's Wildlife Action Plan, with the rusty-patched bumble bee also listed under the Endangered Species Act. Bumble bees are important for the health of fruits, wildflowers, vegetables and animals that rely on these for food. Without pollinators many of the food and flowers that exist today will be gone and the economy will suffer.

Monarch butterflies live in prairie land and migrate to avoid freezing temperatures. A healthy monarch population is a good indicator of a healthy ecosystem. Habitat loss and herbicide use caused an 80 percent reduction in the population since the mid-1990s.[4] During that time, herbicides killed native plants like milkweed and other nectar sources. These plants provide monarchs with habitat for breeding, resting and refueling during migration.[5]

Without action, populations of pollinators in Minnesota will continue to decline with negative implications for other aspects of our environment.

SUPPORT AND PROTECTION OF NATIVE PLANTS

Much of Minnesota's landscape is flowerless and lacks floral diversity. Providing native prairie land is an important step in stopping the decline of pollinators. Less than 2 percent of the original native prairie land in Minnesota is still around today. The vast amount of land on highway roadsides can be used to reverse the loss of native plants and pollinators. These areas of native plants not only help pollinators but also upland birds, songbirds and provide places to filter water and reduce runoff. Some of our roadsides are among the last remaining habitats of rare plants. For example, one of only two remaining locations of western prairie fringed orchid, a federally threatened plant species in Southeast Minnesota, is in a state highway roadside. The only known location of prairie shooting star in the entire state is in a state highway roadside. Other roadsides harbor populations of other state and federally listed plant species. Many of these roadside prairie remnants are being degraded by excessive haying, herbicide drift, invasive species and other disturbances.

The quality of native habitat can vary depending on its management. Certain features must be present in order to create a natural environment. A high quality native prairie land includes these characteristics:[6]

- High-diversity and abundance of native plants that bloom continuously throughout the growing season
- Adequate food and nesting resources
- Minimal pesticide use
- Plants that are buffered from pesticide drift
- High-quality habitat and pollinator species
- Connectivity to other pollinator habitat

[3] 2017 Minnesota State Agency Pollinator Report
[4] 2017 Minnesota State Agency Pollinator Report
[5] U.S. Fish and Wildlife Service
[6] 2017 Minnesota State Agency Pollinator Report

To enhance native roadside habitat, construction projects must use strategies to encourage planting native seeds and discourage invasive plants through early detection and actions like prescribed fire. MnDOT is increasingly planting native seeds on new construction projects. Between 2010 and 2015, native seed mixes were used in 36 percent of MnDOT project areas, resulting in 2,709 acres of pollinator-friendly habitat.

This issue is not only being addressed on public land. Pollinator habitat on private land is protected through programs like the Conservation Reserve Program and Reinvest in Minnesota. In the future, it will be important to categorize this land as high-, medium-, and low-quality habitat to identify land with the highest potential.[7]

MnDOT signed onto the I-35 initiative to establish "a cooperative and coordinated effort to establish best practices and promote public awareness of the monarch butterfly and other pollinator conservation".[8] The I-35 initiative is important to monarchs because it is in the flyway the butterflies use during their annual migration. The Federal Highway Administration and five other state transportation agencies will provide habitat for monarch butterflies to use during their yearly migration.

ELIMINATION OF INVASIVE ROADSIDE WEEDS

Proper land management not only improves the ecosystem for native plants and pollinators, but also eliminates invasive and harmful roadside weeds. Many foreign plants are introduced to Minnesota ecosystems without their natural enemies. These weeds are called either invasive species or noxious weeds. Improperly managed roadsides facilitate the spread of invasive species across the landscape. This allows invasive species to invade adjacent land and degrade the habitat and biodiversity that the land contains. With effective management, however, roadsides become an important venue for early detection and rapid control of new invasive species. This reduces the long term impacts that invasive species could otherwise have on adjacent lands.

The Minnesota Department of Agriculture developed a Noxious Weed List, which lists all of the noxious weeds in the state, most of which are also classified as invasive species.[9] Vegetation management on 175,000 acres of green space on Minnesota highway roadsides takes a variety of tactics including biological control, appropriate herbicides, mowing and prescribed fire. This varied approach improves environmental health by reducing the amount of herbicides used and mowing done on roadways. Some roads are mowed at times that disrupt the natural habitat. Statutes to guide the proper management of this land can help support a healthy ecosystem.

OTHER ANIMALS AT RISK

Bats

Minnesota is home to eight bat species, four of which migrate south for the winter and four hibernate in the region. While bats in the state are not viewed as pollinators, they do have several ecological benefits that can go unnoticed. Bats provide natural pest control. An individual little brown bat can consume 1,000 mosquitoes in one hour.[10] They also help farmers through the control of pests that damage crops. Some farmers build their own bat houses in order to help increase the bat population and manage pests.

[7] 2017 Minnesota State Agency Pollinator Report
[8] Memorandum of Understanding Agreement for the Support of a Monarch Highway
[9] Minnesota Department of Transportation
[10] http://statebystategardening.com/state.php/mn/print/the_ecological_benefits_of_bats/

The populations of many bat species are declining. This is attributed to human impacts such as habitat destruction, direct killing, disturbance of hibernating and maternity colonies, cave vandalism and use of pesticides and other chemical toxins. Most recently white-nose syndrome led to the death of over 5.7 million cave-dwelling bats. This is a fungus disease that is very contagious and can spread through other mammals and equipment that humans bring into caves. The disease does not have a direct impact on humans or livestock but indirectly impacts them through the loss of the ecological benefits bats provide.

During construction projects, some habitat might be impacted, but not eliminated. Some bat habitat was lost during construction of the I-90 bridge near La Crosse, Wisconsin. Thousands of bats were using the area underneath the bridge as a home. When the bridge went under construction, the Minnesota and Wisconsin Departments of Transportation partnered to build bat houses to give the bats somewhere to live during the construction period and hopefully into the future.

Wildlife Conflicts and Crossings

Many different species of wildlife have trouble crossing over the roads built in their native habitat. This can cause conflict with drivers as they try to avoid a collision. Many roads and bridges were not built with this in mind, so wildlife can become trapped or unable to successfully return to safety. One area of concern today is the impact infrastructure has on turtles. Turtles can nest on the shoulders of the highway, attempt to cross a road near wetlands and get hurt from materials used during construction. The Minnesota Department of Natural Resources provides solutions to help minimize the impact highways can have on turtle habitat.[11]

- Fences can be built to direct movement away from dangerous roads
- Grading of gravel shoulders near lakes and wetlands should be avoided during mid-May to August
- Roads can be designed with bridges for turtles to cross
- Traditional curb and gutter designs can be adapted to minimize threat
- Culvert sizes should be optimized

Fish Passage

Barriers to fish passage can be created when roadways and waterways intersect. The natural flow of species like trout and northern pike are affected by the type of road design used to cross a waterway. The Minnesota DNR prefers bridges as the best solution for water crossings, but culverts are typically less expensive. Culverts with smooth bottoms can cause faster water flow and limit fish passage. MnDOT is testing new culvert designs to determine an optimal design to mimic natural conditions and minimize conflict with aquatic life.

AQUATIC INVASIVE SPECIES

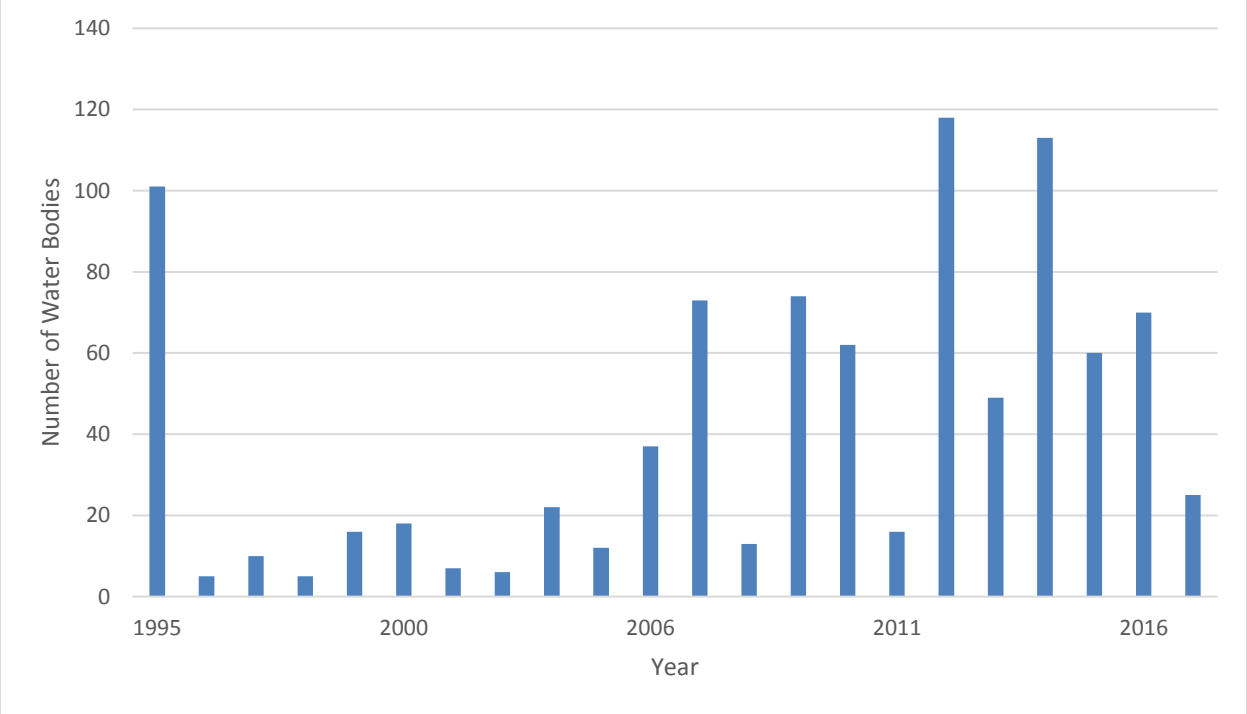
Opening the Great Lakes Seaway to modern shipping in the mid-20th century increased the risk of aquatic invasive species spreading on ships or through ballast water. The impacts of aquatic invasive species are wide and varied. The ecological and environmental impacts of invasive species like the zebra mussel, sea lamprey, spiny and fishhook waterfleas, Eurasian milfoil and purple loosestrife range from being a nuisance to potentially devastating, including some forced extinctions of native plants and animals. Despite recent efforts to prevent the introduction of aquatic invasive species, new discoveries of these species

[11] Minnesota Department of Natural Resources

were made in recent years that resulted from aquaculture, intentional or unintentional releases, shipping, recreational boating and water gardening.

Several invasive carp species pose potential negative impacts on Minnesota's aquatic ecosystems, economy and outdoor heritage. Perhaps the most well-known invasive carp species in Minnesota is the Silver Carp. Silver Carp and other invasive carp alter ecosystem food chains and may put severe pressure on native species. The Minnesota DNR tracks water bodies infested with certain aquatic invasive species that could spread to other waters. About 5 percent of the lakes in Minnesota are on the infested waters list. As of August 2016, zebra mussels were confirmed in 121 lakes, rivers and wetlands. Figure 4 shows the number of water bodies that were added to the infested waters list by year. As of October 2015, there are a total of 820 water bodies listed on the infested waters list.

Figure 4: Number of Water Bodies Added to Infested Waters List by Year



Minnesota is home to a diverse and important environment that provides essential habitat for wildlife. The loss of prairie land and damage done to the ecosystem has major effects on environmental quality. Through improved roadside management, native plantings and wildlife habitat protection and enhancement, this trend can be reversed.

RELATED TRENDS

- Climate Change
- Air Quality
- Water Quality
- Health Trends in Minnesota
- Racial Disparities and Equity in Minnesota