MINNESOTA'S WILDLIFE ACTION PLAN 2025-2035

CONSERVING HABITATS AND BIODIVERSITY

DECIDUOUS WET FOREST

DEPARTMENT OF NATURAL RESOURCES

NONGAME WILDLIFE PROGRAM

Acknowledgments

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Cover Photos: DNR Biologist conducting ecological monitoring in deciduous wet forest, Allen Lake Aquatic Management Area, Katie Reisinger; Deciduous wet forest in St. Croix State Park, Grace Lehinger

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Deciduous Wet Forest

Habitat Description

Black ash (*Fraxinus nigra*) is the dominant canopy tree in deciduous wet forests statewide; yellow birch (*Betula alleghaniensis*), red maple (*Acer rubrum*), aspens (*Populus spp.*), and balsam poplar (*Populus balsamifera*) are common associates in the Laurentian Mixed Forest Province; and basswood (*Tilia americana*), elms (*Ulmus spp.*), paper birch (*Betula papyrifera*), and yellow birch in the Eastern Broadleaf Forest Province. Wet forests are also found to a lesser extent in the Prairie Parkland and Tallgrass Aspen Parklands Province. Conifer species, especially white cedar (*Thuja occidentalis*) and balsam fir (*Abies balsamea*) are sometimes present in the canopy and understory (and see the Coniferous Wetland Forest sub-chapter). See also the DNR's Trees and Forests website for an overview of forests in Minnesota.

In southeastern Minnesota, this habitat occurs as small patches in areas of groundwater seepage, usually at the base of steep slopes on level river terraces. In such settings, the water table is almost always within reach of plant roots but does not remain above the mineral soil surface for long periods during the growing season. In northern Minnesota, larger basins connected to shallow aquifers create more expansive ash swamps with occasional springs and moving groundwater.

Understories are characterized by patches of shrubs, including speckled alder (*Alnus incana)*, mountain maple (*Acer spicatum*), dogwoods (*Cornus* spp.), gooseberries or currants (*Ribes* spp), and winterberry (*Ilex verticillata*). Mosses and upland forest herbs occur on raised hummocks, down logs, and tip-up mounds, and sedges and wetland forbs occur in wet or mucky hollows. Soils in these wet forests are typically peaty or mucky mineral soils.

Black ash forests are considered old growth when they are at least 120 years old, with some trees being 200 years old or more. Old growth

Photo: Deciduous wet forest in St. Croix State Park, Grace Lehinger

black ash trees can grow to be 15-20 inches in diameter, with the size of trees varying with soil moisture and latitude (Characteristics of Old Growth).

Habitat Map

To depict Deciduous Wet Forest habitat (see Figure 3.11), we compiled spatial data from several sources: DNR's Native Plant Communities, the MN National Wetland Inventory, and the Midwest Terrestrial Habitat System created by the USFWS Midwest Landscape Initiative (for more information, see Habitat Map Methods in Chapter 3: Habitats). We note included sub-types below; underlined items have links to online descriptions.

Associated Native Plant Community Classes by Ecological Systems

Wet Forest (WF)

WFn55 Northern Wet Ash Swamp (PDF)

WFn64 Northern Very Wet Ash Swamp (PDF)

WFw54 Northwestern Wet Aspen Forest (PDF)

WFs57 Southern Wet Ash Swamp (PDF)

WFs55 Southern Wet Aspen Forest (PDF)

National Wetlands Inventory

From the National Wetland Inventory for Minnesota (NWI) Layer we included the Hardwood Wetland Simplified Plant Community Class type.

Midwest Terrestrial Habitat System

From the Midwest Terrestrial Habitat System we included the Eastern North American Ruderal Flooded and Swamp Forest group.

Photo: Northwestern wet aspen forest, Two Rivers Aspen Parklands Scientific and Natural Area, Kelly Randall

Conservation Overview

Deciduous wet forests are found in shallow depressions or in narrow zones along the margins of lakes, wetlands, and peatlands throughout Minnesota. These swamp forests have high plant species diversity. Due to their seasonally saturated conditions, most deciduous wet forest ecosystems have not been largely developed or degraded and are still generally intact. However, threats to these habitats include altered hydrology from a variety of sources (e.g., ditching, utility rights-of-way) and invasive species effects, especially including emerald ash borer (*Agrilus planipennis)* expansion. The emerald ash borer is an invasive insect from Asia (UMN, 2024) that has killed millions of ash trees throughout the eastern half of the U.S. and southeastern Canada.

The expanding presence of emerald ash borer in Minnesota may eventually lead to a significant reduction in black ash as a predominant tree in wet deciduous forests. The loss of ash that is not replaced by trees can lead to a transition from wet forest to a wetland dominated more by shrubs and herbaceous vegetation and result in declines in forest-dependent wildlife species (Grinde et al., 2021).

Old growth forests are recognized in Minnesota for their ecological, scientific, educational, aesthetic, and spiritual significance, including biological features that have developed over centuries (see DNR's Old Growth Forests). In addition to the presence of taller, older trees, these forests include relatively complex stand structure with more snags (dead standing trees), fallen logs and woody debris, all of which contribute to providing nesting, foraging, and denning sites for wildlife including more than 40 species of birds and mammals. The DNR manages network of old growth forest sites on state lands (estimated at 44,000-acres across all types in 2025) with the goal of maintaining "a viable network of high-quality old growth forest sites along with relatively undisturbed, natural-origin younger forests that will be managed to promote old growth characteristics in the future (i.e., future old growth)" (Old Growth Forests). In general, stands of old growth forest are protected from harvest, road-building, and other similar disturbances, unless for ecological benefit. Site-level management decisions in old growth forests typically mimic natural processes to promote regeneration and maintain and restore ecosystem integrity, and use the least intensive methods available, such as hand tools rather than mechanical equipment (Managing Old Growth Forests).

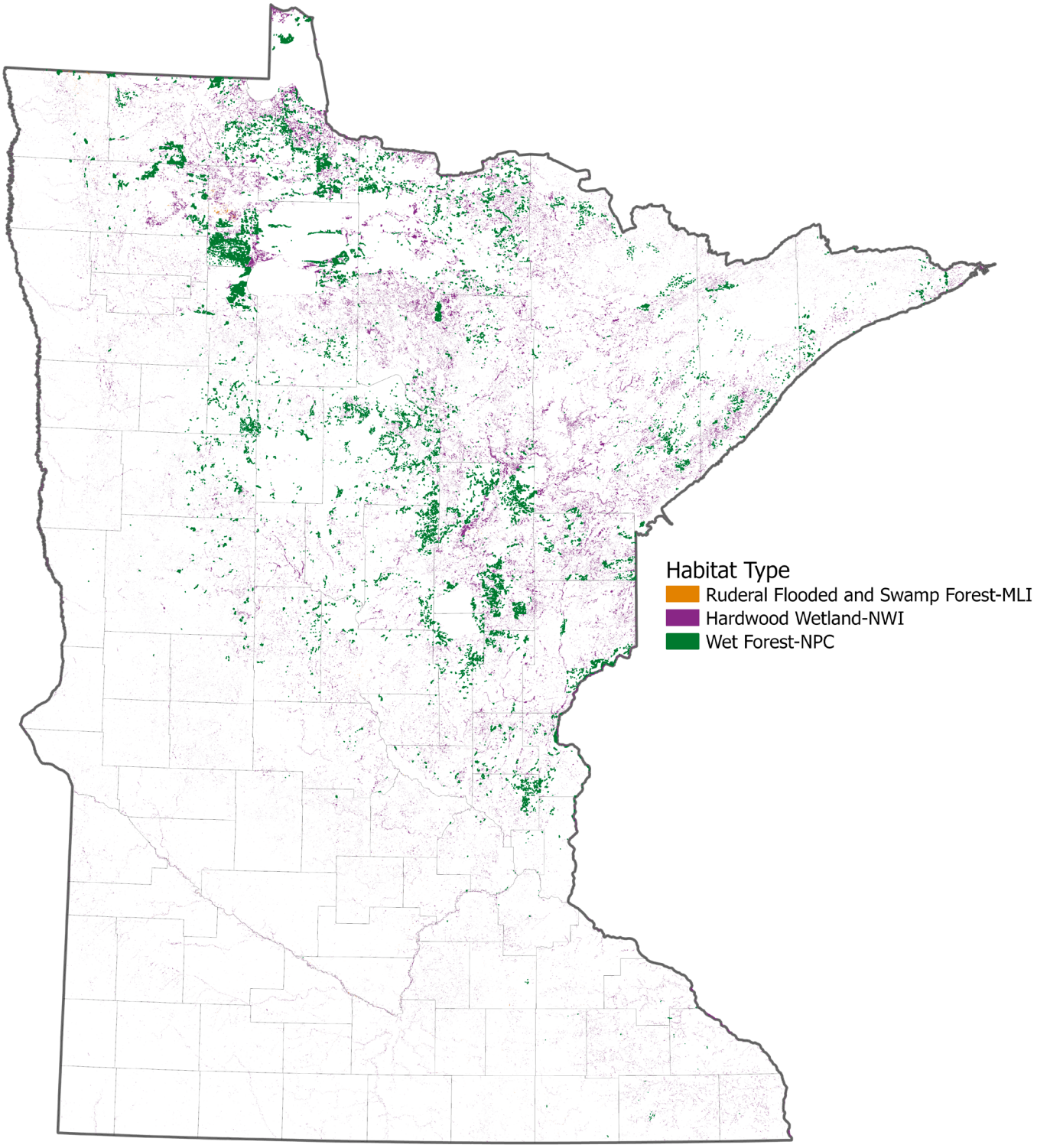

Figure 3.11. A map depicting Deciduous Wet Forest habitat in Minnesota, including DNR Native Plant Community Classes in the Wet Forest Ecological System, Hardwood Wetland Simplified Plant Community Class from the National Wetland Inventory, and Eastern North American Ruderal Flooded and Swamp Forest from the Midwest Terrestrial Habitat System.

Climate Profile for Deciduous Wet Forest

Climate effects on Deciduous Wet Forest are described in the section on the Laurentian-Acadian Alkaline Swamp in the report "Effects of Climate Change on Midwestern Ecosystems: Temperate Flooded and Swamp Forest" published by the Midwest Climate Adaptation Science Center (Ratcliffe et al., 2025). The most impactful changes in climate for this system include increases in spring rainfall of 25% over historical by late century, with more frequent and larger flood events to increase the duration of and level of flooding in these forests. Additionally, higher temperatures combined with less summer precipitation creates vapor pressure deficits (VPD; driven by higher evapotranspiration) projected to be 72% higher by end of century over historical (1971-2000). The most impactful changes in climate for this system include more frequent and larger flood events, also with more frequent late summer drought periods.

A major concern for Deciduous Wet Forests is more frequent and more intense flooding events. More precipitation will mean more sediment deposition as well as habitat changes. This projected increase in flooding will favor pioneer and early successional species, while limiting the growth of more stable species. Further habitat change will occur during more frequent summer droughts, which will affect plant growth and favor drought dependent species. These climate-induced changes may promote the spread of invasive species. Last, pests and pathogen outbreaks may have a greater effect on Deciduous Wet Forests as pest ranges expand, populations increase, and hosts become more susceptible to infection. Large increase in flood frequency and intensity is projected to occur in the spring, as both winter and spring precipitation is projected to increase. Coupled with warmer temperatures leading to an earlier snowmelt, large floods are predicted to continue to greatly affect Deciduous Wet Forests.

This habitat will also be affected by warmer and dryer summers, which will cause soil drying and an overall reduction of habitat in these water-dependent ecosystems.

Key Climate Change Effects:

- **Habitat Structure:** More frequent flood and droughts will alter species composition in this habitat type, especially among wetland adapted species. Windthrow events may become more frequent due to more flooding, less frozen soils, and more pest pressure.
- **Community Composition:** Plant communities will be greatly affected by drier summer and more frequent flooding. Regeneration will become increasingly difficult under these conditions, and better adapted species will begin to dominate these habitats.
- **Invasive Species:** Flooding events create opportunities for invasive species to establish their populations, and as these flooding events become more common, so do the invasive species.
- **Pests and Pathogens:** Climate change will both increase the number of pests and pathogens and will make hosts more susceptible to the pests and pathogens. In some cases, like heatwaves, pests and pathogens may also see declines in population.
- **Herbivory:** Deer populations are expected to grow as climate change brings warmer winters and greater food availability. This increase in deer population will favor browse-tolerant species as well as disrupt tree regeneration.

Species in Greatest Conservation Need

Deciduous wet forests provide primary or secondary habitat for 28 animal and 7 plant SGCN (see Table 3.11). Primary habitats are those that species rely on and use most consistently; loss or degradation of these habitats would have the most significant negative effect on their populations. Secondary habitats are used by the species less frequently.

Animals with more general habitat requirements are associated with multiple habitat types, while specialists are associated with one or few. Habitat associations for insects were not differentiated into primary and secondary habitats and are shown in the total column. Plant species were only associated with their single most primary habitat. Detailed tables associate each SGCN with the 15 habitats identified in the 2025-2035 SWAP can be found in Appendix D (animals) and Appendix E (plants).

Of the 130 terrestrial vertebrate SGCN identified in the 2025-2035 SWAP, 18% (24) occur in deciduous wet forests. Of the 31 mammal SGCN, 38% occur in this habitat. The seven plant SGCN found in this wet forest habitat represent less than 2% of all plant SGCN. Examples of selected SGCN are described below; state-listed species are linked to their account in the Rare Species Guide.

Amphibians

Two salamander SGCN – spotted salamander (*Ambystoma maculatum*) and four-toed salamander (*Hemidactylium scutatum*) – are associated with vernal pools (see Vernal Pool sub-chapter) and the mature Deciduous Wet Forests. The forests were identified as secondary habitat for the salamanders who breed in these areas each spring. Eggs are laid in or near the water, and larvae remain in the pools until metamorphosis occurs. Four-toed salamanders specifically lay their eggs in moss hummocks next to wetlands. Four-toed salamanders occur most frequently in mature upland forests on glacial moraine landscapes with frequent isolated wetlands that include an alder margin and moss hummocks adjacent to pockets of open water.

Table 3.11. Numbers of Species in Greatest Conservation Need associated with the Deciduous Wet Forest as either primary or secondary habitat.

Species Group	Primary Habitat	Secondary Habitat	Total
Amphibians	0	3	3
Birds	0	5	5
Mammals	1	11	12
Reptiles	3	1	4
Dragonflies & damselflies	-	-	1
Moths	-	-	1
Snails (terrestrial)	0	1	1
Spiders	0	2	2
Plants	7	-	7
Total	**11**	**23**	**36**

Birds

Most SGCN birds found in other deciduous forest types may also utilize Wet Forests, but none exclusively. Cerulean warblers (*Setophaga cerulea*), Louisiana waterthrushes (*Parkesia motacilla*), and red-shouldered hawks (*Buteo lineatus*) may be present in Wet Forests, but primarily when part of a mosaic of large tracts of mature Floodplain or Mesic Hardwood forests. In such cases, key habitat features such as flowing streams or seepage channels for Louisiana waterthrushes, or large-diameter trees near wetland openings for red-shouldered hawks, must be present. Red-headed woodpeckers (*Melanerpes erythrocephalus*) may frequent black ash Deciduous Wet Forests when suitable dead trees are present.

Mammals

Eleven of the twelve mammal SGCN that occur in Deciduous Wet Forest were found in multiple other habitats ranging from upland fire-dependent communities and riparian forests to prairies and other grasslands, savannas, and even urban and other developed lands. These habitat generalists include five bat species: the big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), Eastern red bat (*Lasiurus borealis*), Hoary bat (*Lasiurus cinereus*) and little brown myotis (*Myotis lucifugus*). A cave-hibernating species, the little brown bat has been heavily affected by white-nose syndrome.

Photo: Woodland vole, Mike Mossman

The woodland vole (*Microtus pinetorum*) is the only species for which Deciduous Wet Forest has been designated its primary habitat. Other primary habitats for the species include Mesic Hardwoods and Riparian and Floodplain Forests. They prefer loose, well-drained soils and humus layers to construct burrows and sub-surface runways. Grazing by cattle, which compacts the soil, and the presence of invasive non-native earthworms, which destroy the humus, may make forests within its limited range in southeastern Minnesota unsuitable for this species.

Reptiles

Deciduous Wet Forest provides primary habitat for three reptile SGCN: wood turtle (Glyptemys insculpta), Eastern hog-nosed snake (*Heterodon platirhinos*), and Western ratsnake (Pantherophis obsoletus), and secondary habitat for Blanding's turtle (*Emydoidea blandingii*). Wood turtles use Deciduous Wet Forest as one of 5 forested habitats that can provide primary habitat when including fast-moving rivers and streams. Even though the Eastern hog-nosed snake feeds almost exclusively on amphibians it also is not restricted to wet habitats but occupies forest edges and sites with sandy soils where the ground is conducive to burrowing. The Western ratsnake uses Deciduous Wet Forest along with Upland Deciduous Forest, Mesic Hardwoods, and Savanna in Fillmore and Houston counties where the species resides. Blanding's turtles will also use Deciduous Wet Forest habitat for terrestrial movements in the spring and summer related to breeding, foraging, and nesting, as well as hatchling movements in the fall.

Plants

The relatively nutrient rich and seasonally saturated soils of deciduous wet forests present a challenging and competitive habitat for plant species. These sites can host some unique and rare plants that occupy specific niches in the ground layer of swamps and seepages. Bog bluegrass (*Poa paludigena*) occurs only

in groundwater-connected forested wetland habitats, where it grows on mossy logs and hummocks above deeper mucky pools under shady black ash canopies. The annual, spring ephemeral forb, false mermaid (*Floerkea proserpinacoides*) grows in localized seepage habitats beneath mature black ash, basswood, and American elm overstories. Both species and their respective wet forest habitats are sensitive to changes in local hydrology as well as effects from non-native invasive species.

Lichens

Deciduous wet forests are also home to unique lichen species. Lichen "species" are complexes that consists of two or more, typically obligate, symbionts. The dominant partner is a fungus, which creates the main body of the organism. The endosymbiont is either a green alga or a cyanobacteria that lives within the fungal tissue. *Caloplaca parvula* is a Minnesota State Endangered species endemic to the Great Lakes region. It has been documented in two counties in Northeast Minnesota and is found almost exclusively on black ash trees. This species is at risk of being lost from the state as emerald ash borer continues to spread throughout Minnesota.

Case Study: Habitat connectivity solutions for wood turtles

Wood turtles, which rely on deciduous wet forests and edge habitats found along rivers and streams in eastern Minnesota, are stressed by a variety of a factors including loss of habitat connectivity and flooding from changes in land use and climate. The cumulative result of these threats is a species that is declining across most of its range and is listed as a state threatened species and a candidate for federal listing. Wood turtles need nesting habitat, foraging habitat, and hibernacula sites connected within the river corridor. Roads, trails, bridges, culverts, dams, and fragmented habitats and create obstacles to movement within their full range. When natural nesting sites are degraded or unavailable, female turtles often nest along road shoulders where they are vulnerable to being hit by traffic or poached by collectors.

As part of the State Wildlife Grants Program, a partnership including the Minnesota, Wisconsin and Iowa Departments of Natural Resources, the University of Minnesota and the Conservation Corps set out to address some of the habitat degradation and connectivity issues for Wood Turtles within the region (Minnesota DNR 2020). With roads recognized as one of the primary threats for this species, temporary road barriers were installed in four areas to deter access, and 24 nesting sites were created or restored away from roads to provide alternative, less risky, nesting opportunities. To reduce the effect of increased flooding, all restored or enhanced nesting habitats were located in flood-safe locations.

The successful creation of suitable nesting sites is just the beginning. We are also invested in determining the effectiveness of these conservation actions by monitoring turtle habitat use through field surveys, habitat assessments, radio telemetry, and remote cameras. Through these initial monitoring efforts, a comprehensive monitoring program was established, and a population model was developed to allow us to assess the long-term effectiveness of the conservation actions on the population over time.

While these conservation actions are showing signs of progress, wood turtles and other native turtles continue to suffer from road mortality even where road barriers were erected. New designs for more effective barriers, such as extending them out longer, using more sturdy materials such as half-culverts, or considering passages under bridges are needed. Wood turtles also lose many nests to predators. Nest success increased from 5% to 48% when predators were excluded, (see Case Study: Wood Turtle Nest Success in chapter 2, Reptiles subsection) so protection of nests using electric fences will likely boost recruitment of young turtles in the future.

Photo: DNR biologist prepares to uniquely mark a wood turtle's shell for a mark-recapture study, part of the DNR's long-term monitoring efforts.

Primary Stressors in this Habitat

Throughout Minnesota, habitats have been lost and degraded due to pressures associated with human settlement, subsistence, livelihoods, and recreation. Indeed, habitat loss or alteration remains the primary threat to most, if not all, SGCN. In this section, we identify key "stressors" that may continue to contribute to habitat degradation and loss. The list is adapted from a globally recognized threats lexicon developed by the International Union for the Conservation of Nature (Salafsky et al., 2024). For additional details, see the "Stressors" section in Chapter 1: Species in Greatest Conservation Need.

It is important to note that some of the factors listed as "stressors" can also be used to advance conservation goals. Broad terms such as "fire management" reflect the dual nature of these factors as they may function as stressors in some contexts while serving as valuable conservation tools in others. For example, an intense wildfire following prolonged fire suppression may cause significant stress for the habitat and species affected, while prescribed fire, when planned appropriately, can enhance ecosystem health and resilience.

Information about a subset of primary stressors specifically affecting this habitat is included below, followed by a set of conservation actions addressing those stressors.

Roads, Trails, and Railroads

Roads, trails, and railroads can create fragmentation and edge effects. Increase in the number of roads and trails increases human disturbance and the potential for introduction of invasive species into forests. Repeated use and soil compaction associated with roads and trails also can modify the vegetation and hydrology in the area.

Utility Corridors

Utility corridors transect deciduous wet forests throughout the state. These corridors can contain a variety of utility infrastructure. This includes pipelines, telephone lines, and power lines. These lines can be above ground, or below ground. Regardless of type, utility corridors can cause fragmentation and habitat degradation based on their size, purpose, and the upkeep that is required to maintain them.

The initial construction of the associated utility infrastructure as well as the long-term maintenance of that infrastructure can have lasting effects on native plant communities and the SGCN associated with them. Pipelines have the potential to change the hydrology of deciduous wet forests through impoundment of water and changing of surface and groundwater flow.

These corridors and the increased travel from vehicles and equipment that they require act as vectors for invasive plant species. The required vegetative management practices often include herbicide applications, removal of woody vegetation, and/or mowing. This increased disturbance increases the likelihood of establishing invasive plant species within the corridors and then spreading to adjacent lands.

Timber Harvest

Timber harvest is a forest management tool that can affect wildlife habitat by changing forest and woodland structural and compositional diversity. Forest management decisions, including inaction, typically have positive effects for some species and negative effects for others. Timber harvest activity in deciduous wet forest habitats has generally been limited in scope and intensity due to the constraints of operating on saturated soils that don't reliably freeze in winter. When timber harvesting does occur, uneven aged silvicultural practices are generally applied (e.g., strip or gap harvest, hardwood thinning) and retain greater amounts of canopy trees to maintain evapotranspiration rates and local hydrologic conditions. Pre-salvage timber harvest of ash has increased with the spread of EAB (Holt et al., 2021) and is used as a strategy to retain some timber value before EAB-driven disturbance. Supporting

forest regeneration, including ash regeneration, after timber harvest remains critical (Higgins et al., 2025; Kolka et al., 2018).

Recreation

Recreation can spread invasive species, inadvertently being moved on people's shoes or gear. Moving wood for campfires can inadvertently move pests such as emerald ash borer in the firewood, so firewood is not to be moved across the state.

Invasive Species (Problematic Non-native Species)

Invasive species are ongoing stressor in forest and woodland systems. Specifically pertinent to black ash forests, emerald ash borer is an invasive insect from Asia (UMN 2024) that has killed millions of ash trees throughout the eastern half of the U.S. and southeastern Canada. The expanding presence of emerald ash borer in Minnesota may lead, eventually, to a significant reduction in black ash as a predominant tree in wet deciduous forests. Minnesota's deciduous wet forests can contain nearly pure stands of black ash trees, where they help maintain the water table. Black ash trees often form dense stands and have a relatively high rate of evapotranspiration (releasing water vapor from their leaves into the atmosphere) and this draws down the water table. Loss of these trees, such as by emerald ash borer mortality, can cause the wet forest habitat to become more inundated and change over to grass, cattails, and shrubs, threatening the plants and animals that rely on black ash forest habitats.

Changes in Temperature related to Climate

Minnesota has experienced a clear warming trend over the past century. Between 1895 and 2020, average statewide temperatures increased by 3.0 degrees Fahrenheit (°F; Climate Trends). This warming has become more pronounced in recent decades and during the winter months. Since 1985, average winter temperatures in Minnesota have risen by 5.4°F, with average winter low temperatures increasing even more significantly by 6.8°F (Climate Change in Minnesota). These changes have led to a shortened season of snow cover and a reduction in lake ice duration by 10-14 days over the past 50 years (Minnesota Pollution Control Agency and Minnesota Department of Commerce 2025). Furthermore, these shifts in thermal regimes are ecologically significant. Many species are adapted to narrow temperature ranges, and such rapid changes can result in increased thermal stress, the spread of invasive species, and heightened disease and pathogen risks (Ratcliffe et al., 2025).

This warming trend is expected to continue. By mid-century (2040-2059), Minnesota's average annual temperature is projected to rise by an additional 3.8 - 4.5 °F, depending on future greenhouse gas emissions scenarios (Liess et al. 2022; Climate Change in Minnesota). Higher growing season temperatures combined with less summer precipitation creates vapor pressure deficits (VPD; driven by higher evapotranspiration) projected to be 72% higher by the end of the century compared to historical levels (1971-2000; Ratcliffe et al., 2025). Climate change does not act in isolation, interacting with invasive species dynamics, land-use change, and shifts in water quality and quantity, compounding ecological effects (He et al., 2019; Finch et al., 2021). For additional context and resources, refer to the Climate Adaptation section in Chapter 6: Implementation.

Changes in Precipitation and Hydrology related to Climate

From 1895 to 2020, Minnesota's average annual precipitation increased by 3.4 inches (Climate Trends). The state has also seen a notable rise in the frequency and intensity of heavy precipitation events. Since 2000, very heavy rains (6 inches or more in a single day) have occurred two to three times more frequently than during the 20th

century (Williams-Sether & Sanocki, 2025; NOAA National Centers for Environmental Information State Climate Summaries 2022: Minnesota). These extreme events have led to a corresponding increase in flooding, which can disrupt ecosystems, human infrastructure, and water quality (Williams-Sether & Sanocki, 2025).

Future projections indicate continued increases in annual precipitation, especially during the winter and spring months (as much as 25%), which are likely to exacerbate flooding risks. The same climate models also forecast an increase in late summer drought events, underscoring the variability and unpredictability of hydrologic patterns under a changing climate (Climate Change in Minnesota). By mid-century (2040-2059), average annual precipitation is projected to increase by up to 1.2 inches, depending on emissions scenario (Liess et al., 2022; Climate Change in Minnesota). This seemingly counterintuitive pattern — wetter winters and springs, punctuated by hotter, drier late summers — has profound implications for water availability, wetland health, soil stability, and species dependent on seasonal hydrologic cycles (Runkle et al., 2022). For more information and resources for climate-adapted management strategies, see the Climate Adaptation Section in Chapter 6: Implementation. Also see Climate Profile inset for more information.

Photo: DNR Biologist conducting ecological monitoring in deciduous wet forest, Allen Lake Aquatic Management Area, Katie Reisinger

Priority Habitat Conservation Strategies

To implement the Habitat Goal of this Plan (Protect and enhance the resilience, function, and ability of habitats to support biodiversity, especially for SGCN), five strategies were identified:

Strategy 1. Protect, buffer, and connect high quality habitats to optimize biodiversity, SGCN, and landscape benefits, particularly across the Conservation Action Network.

Strategy 2. Restore, enhance, and maintain lands and waters to benefit SGCN, biodiversity, and ecosystem resilience.

Strategy 3. Collaborate with conservation partners and landowners to enhance conservation delivery, particularly in the Conservation Action Network and Conservation Opportunity Areas.

Strategy 4. Monitor SGCN, native plant communities, habitats, and ecosystems for changes through time including responses to natural disturbances, conservation actions, and climatic conditions.

Strategy 5. Connect to develop, innovate, incentivize, and disseminate evidence-based habitat management practices to benefit SGCN.

Examples of conservation actions are grouped below under these five strategies and tagged with icons for the stressor(s) that they address. Some of these actions are widely in place as best practices while others may be more novel. Some actions will combine multiple strategies, in which case we present it under the one it fits best. Also note that some strategies, such as Strategy 3, collaborating with partners, could truly be applied to all actions to most broadly and effectively implement them. Other actions, such as those related to monitoring, might be difficult to relate to a specific stressor, in which case they are marked as not applicable (NA).

Potential Conservation Actions for Deciduous Wet Forest

Strategy 1. Protect, buffer, and connect high quality habitats to optimize biodiversity, SGCN, and landscape benefits, particularly across the Conservation Action Network.

Stressor	Action
	Engage in forest planning to collaborate and share interdisciplinary knowledge, supporting conservation of SGCN habitat and addressing values of biodiversity, rare features, structural and compositional plant diversity and wildlife needs. Maintain, adapt, or develop policies and procedures guiding habitat management that are based on the best available science. On state lands, all actions must align with existing Minnesota statutes and policy guidance, such as in the case of School Trust Lands that must be managed “for maximum long-term economic return…consistent with…sound natural resource conservation and management principles” (Minn. Stat. sec. 127A.31).

Strategy 2. Restore, enhance, and maintain lands and waters to benefit SGCN, biodiversity, and ecosystem resilience

Stressor	Action
	Explore a range of options relative to managing forests with emerald ash borer. When harvesting mature ash trees and promoting other tree species in wet forests, avoid removing all trees in a stand, as the maintenance of some larger trees will maintain site hydrology. Removing groups of ash (0.1 to 0.5 acre in size) is best, and strip clearcuts and strip shelterwoods are methods successful at promoting other species if those other species are present (e.g., red maple and balsam fir) (DNR, 2025). Retain some ash, since they will provide habitat for wildlife when they die. Field studies on the Chippewa National Forest concluded that group selection, individual tree selection, and shelterwood harvest are good options. See also this handbook for private landowners managing ash woodlands (UMN, 2019). Seek opportunities to support the natural retention of ash forests, such as by supporting naturally resistant ash trees and applying biological controls.
	For forests depleted by emerald ash borer, encourage more diverse tree species regeneration in an effort to maintain ecosystem functionality into the future. Consider the use of more southern species when establishing new species in black ash stands affected by emerald ash borer, such as swamp white oak and hackberry (Palik et al., 2021).
	Buy local and burn local - be careful not to move firewood across the state (DNR, 2025b), because that can inadvertently move invasive pest species such as emerald ash borer that can be in the firewood. Follow best practices and buy firewood adjacent to where it will be burned.
	Managing for forests that are resilient to pathogens and invasive species may require additional dedicated and stable funding. Implementing control strategies for invasive species, such as buckthorn, requires a sufficient timeframe for follow-up management that extends for many years. Support funding for these activities and consider expanding restoration resources to make sure they can be applied to woodland systems, which are sometimes in between funding opportunities aimed at prairies or forests.
	Manage for an increased diversity of dominant species to assist in establishing resiliency toward future disease outbreaks, susceptibility to some pathogens, and invasions by invasive species. In response to emerald ash borer dieback, promote a diversity of trees. Increasing forest diversity while maintaining water regulation and groundwater conditions suitable for forest growth are key strategies.

Strategy 3. Collaborate with conservation partners and landowners to enhance conservation delivery, particularly in the Conservation Action Network and Conservation Opportunity Areas.

Stressor	Action
	Encourage collaboration among all stakeholders and across ownerships to promote effective management for the health and resilience of forests and their ability to provide ecological, wildlife habitat, and other values.

Strategy 5. Connect to develop, innovate, incentivize, and disseminate evidence-based habitat management practices to benefit SGCN

Stressor	Action
	In places where people recreate, conduct outreach and education on cleaning gear and equipment to reduce the introduction and spread of invasive species. At trailheads for motorized and non-motorized recreation, add invasive species prevention messages, such as those on the boot brush kiosks developed by the PlayCleanGo: Stop Invasive Species in Your Tracks program. The DNR's Prevent the Spread webpage includes specific actions for different land based activities like biking, hiking and off-highway vehicle riding.

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