Pew

Factsheet: The Critical Role of Minnesota's Peatlands

Overview

Known by many names—from fen, bog, and marsh to mire and swamp—peatlands are a type of wetland that plays important roles in the environment, including absorbing carbon from the atmosphere and supporting an abundant array of wildlife. Minnesota's vast peatlands, stretching from the northern forested Lake Agassiz bogs to the southern fens, are the most extensive in the continental United States.[1] Formed over 5,000 years ago following the last ice age, these wetlands lock away billions of tons of carbon in their thick, spongy soils.[2] Peatlands are characterized by waterlogged conditions that prevent plant matter from fully decomposing, creating dense peat layers that can reach depths of up to 35 feet.[3] **These ancient wetlands are vital for reducing carbon pollution and helping Minnesota adapt to climate impacts such as increased flooding and wildfires**.[4, 5] To fully leverage this potential, peatland protection and restoration should be comprehensively integrated into the state's climate action strategies for reducing emissions and enhancing resilience.

Peatlands: By the Numbers

6 million acres: The total area of peatlands in Minnesota, including 3 million acres of forested peatlands. Peatlands cover more than 10% of the state, the most of any state in the Lower 48.[6, 7]

37 percent: Percentage of overall terrestrial carbon in Minnesota stored by peatlands.[8]

4 billion metric tons: The amount of carbon stored in Minnesota's peatlands. In 2018, Minnesota's total greenhouse gas emissions across all sectors amounted to 161 million tons. The carbon stored in the state's peatlands is equivalent to roughly 27 years' worth of those annual emissions, at the current rate.[9, 10]

5.83 billion cubic feet: The volume of peat lost in the past 100 years along almost 2,500 miles of ditches, releasing over 4 million tons of carbon into the atmosphere—equivalent to the annual emissions released by about 3 million cars.[11, 12]

800,000 acres: The estimated area of peatlands drained over the past century for crops or pasture. According to a report by the Minnesota Pollution Control Agency, drained peatlands are the state's fourth-largest source of greenhouse gases.[13]

500,000 acres: The amount of potentially restorable peatlands on public and private lands impacted by past drainage efforts that are currently contributing to greenhouse gas emissions.[14]

$114 million per year: The value of ecosystem services, such as water storage and recreational uses, preserved by maintaining healthy wetlands including peatlands. Restoration efforts further amplify this impact, generating an additional $210 million per year in ecosystem services, underscoring the value of safeguarding these natural assets.[15]

The Benefits of Peatlands

Intact peatlands offer myriad benefits to people and nature alike. They help mitigate climate change by storing large amounts of carbon. These wetlands also improve water quality by filtering pollutants; regulate water flow by storing water, acting as a natural defense against floods and droughts; and protect biodiversity by providing essential habitats and migration corridors for species, such as the great grey owl.[16, 17, 18] Minnesota's calcareous fens, among the rarest wetland types in the United States, are home to highly diverse and unique rare plants.[19] Additionally, healthy peatlands hold significant cultural value for local communities and Tribal Nations and support activities like hunting and fishing.[20, 21]

From left to right: A sample taken from one of Minnesota's northern peatbogs shows the dark carbon rich soils and mosses special to these areas. Scientist with The Nature Conservancy conducting measurements of carbon in the state's northern peatlands. (Photo credit: Jazmin Dagostino)

Threats

Despite their numerous benefits, Minnesota's peatlands face threats from historic drainage and conversion to other land uses like agriculture.[22] Although small in scale, peat mining for horticultural uses is an on-going activity that degrades ecosystem services like carbon and water storage.[23] In addition, activities in adjacent areas, such as clear-cut logging and mining for minerals, as well as the widespread dying of Tamarack and ash trees, can alter the waterflow patterns that healthy peatlands rely upon.[24]

When peatlands are drained and their soils are exposed to air, oxygen drives the decomposition process, releasing carbon pollution.[25] These disruptions can alter water flow, causing leaching of sediments and harmful chemicals like methylmercury—a highly toxic form of mercury that bioaccumulates in aquatic food chains—into the surrounding soils and waterways, posing dangers to both the environment and human health.[26, 27] Degraded peatlands are also more prone to catastrophic wildfires, such as the 2021 Greenwood Fire in Northern Minnesota, which further accelerates greenhouse gas emissions and decreases air quality.[28, 29] As peatlands degrade, wildlife often suffers from habitat fragmentation, threatening connectivity and resilience and reducing hunting opportunities.[30]

In August 2021, the Greenwood Fire near Isabella, Minnesota, left a mixed conifer swamp with peatland burned to a depth of nearly 50 centimeters. (Photo credit: Jeff Kroll, USDA Forest Service)

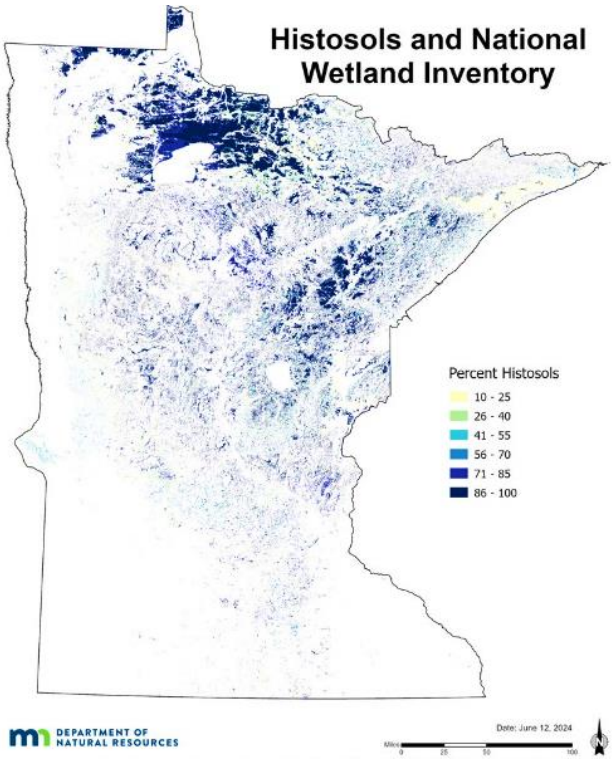
Opportunities for Advancing Peatland Conservation and Restoration

Minnesota has a significant opportunity to accelerate protection and restoration of its peatlands, which can help curb emissions, restart carbon sequestration, and contribute to long-term climate resilience.

Minnesota Climate Action Framework: In 2022, Minnesota released a framework to address climate change by outlining strategies for mitigation and adaptation. Peatland protection restoration and management were highlighted as priority actions for carbon sequestration under the Natural and Working Lands goals and strategies.[31] With the 2025 framework update underway, Minnesota has an opportunity to elevate peatland protection and restoration for climate mitigation and resilience benefits. For example, the state can set measurable acreage targets to protect existing peatlands from disturbance and restore degraded peatlands and commit to tracking these goals over time. The Framework update can highlight specific strategies and enabling conditions to achieve these goals, for example, incentives for private landowners and allowing for additional uses on public lands that leverage ecosystem services markets like carbon and biodiversity protection.

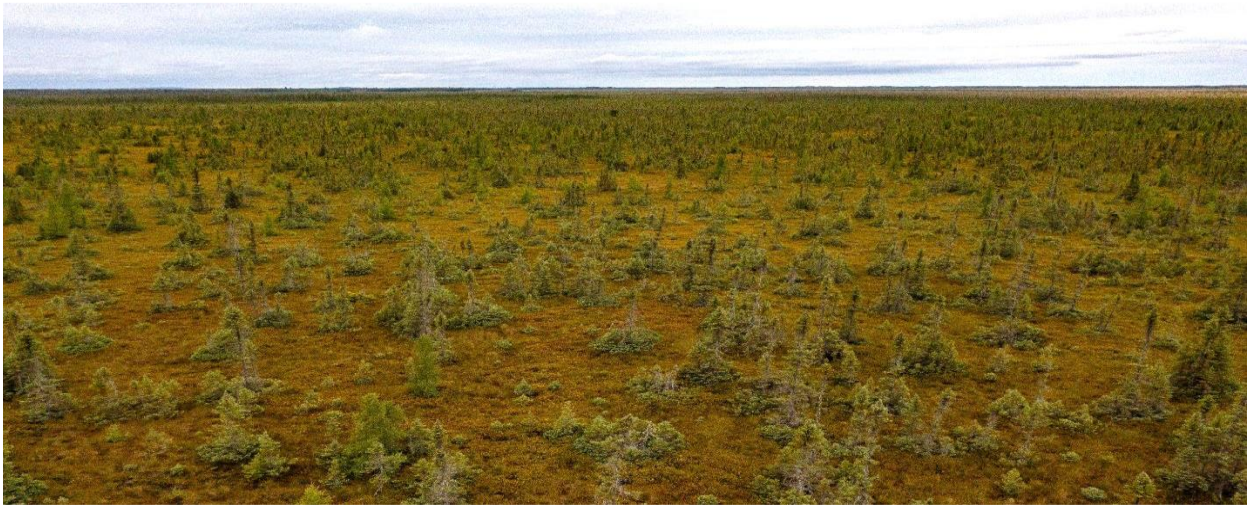
Manage State-Owned Peatlands for a Resilient Future: Many drained peatlands have been abandoned and transferred to local or state ownership, presenting significant restoration opportunities.[32] In addition, the Office of School Trust Lands, in concert with Minnesota Department of Natural Resources (DNR), oversees approximately 2.5 million acres of public lands managed for long-term revenue in support of Minnesota's schools.[33] Currently, income from school trust lands is generated mainly from mining and some timber harvest.[34] Approximately 1.4 million acres of school trust lands have peat soils, indicating the presence of peatlands. As the state contemplates strategies to better mitigate and adapt to climate change, new management practices and uses on school trust lands should be considered that build resilience of these areas to disease, changing precipitation patterns that lead to both drought and flooding, and wildfire.[35] Prioritizing peatland health through protection and restoration would help mitigate these impacts while also reducing and avoiding carbon pollution.[36] Minnesota's Office of School

Trust Lands has identified payments for carbon sequestration as an opportunity for new revenue streams, which could support new approaches to management.[37]



Peatland extent across Minnesota. Map by Katie Rossman, MNIT.

***Legislative Opportunities*:** With support from the Legislature, Minnesota has made meaningful progress toward peatland protections through the Wetland Conservation Act of 1991, the designation of Scientific and Natural Areas (SNA), and recent funding for research, easements, and a new Peatland Resilience Project Planner at the DNR.[38, 39, 40] Looking forward, the Legislature can support additional efforts to ensure peatlands continue to provide benefits to communities, nature and the climate. For example, the Legislature can fund an assessment of the full suite of ecosystem benefits (e.g., water quality, fire mitigation, carbon storage) that peatlands provide to help inform climate smart management strategies on state-owned lands and provide a foundation of knowledge for accessing ecosystem services markets. The Legislature can also help managers better understand current and future threats to forested wetlands that cover peatland areas. The Minnesota Wetlands Status and Trends report, released in January of 2024, found that the state is losing forested wetlands.[41] The Legislature can provide support for state agencies to better understand drivers of forested wetlands loss, impacts of these losses to ecosystem health including peatlands, and measures to mitigate these losses. Finally, the Legislature can ensure sustained support for Minnesota's Department of Natural Resources' new Peatland Resilience Initiative that seeks to sustain and restore peatlands as part of a multifaceted climate mitigation strategy.[42]



Forested peatland bog in Minnesota. Photo Credit: © Derek Montgomery

Contacts

Sylvia Troost | Stroost@pewtrusts.org | U.S. Conservation Project
Andrew Menaquale | amenaquale@pewtrusts.org | Government Relations

---

[1] Minnesota Department of Natural Resources, "Minnesota Scientific and Natural Areas Patterned Peatlands," accessed 8/26/24, https://www.dnr.state.mn.us/snas/peatlands.html.
[2] H.D. Mooers L.S. Severson, and T.J. Malterer, "Inventory of Peat Resources - Koochiching County, Minnesota," Minnesota Department of Natural Resources, 1980, https://files.dnr.state.mn.us/lands_minerals/peat/KoocPeatRep.pdf.
[3] Jennifer Bjorhus, "A Climate Conundrum beneath Our Feet: Minnesota's Farmed Peat Soil Releases Greenhouse Gases," 2/12/22, https://www.startribune.com/a-climate-conundrum-beneath-our-feet-minnesotas-farmed-peat-soil-releases-greenhouse-gases/600146107?refresh=true.
[4] Rebecca Beduhn Jim Anderson, Dean Current, Javier Espeleta, Cinzia Fissore, Bjorn Gangeness, John Harting, Sarah Hobbie, Ed Nater, Peter Reich "The Potential for Terrestrial Carbon Sequestration in Minnesota," Minnesota Department of Natural Resources, 2008, https://files.dnr.state.mn.us/aboutdnr/reports/carbon2008.pdf.
[5] Ayla Norris Smith, "Cool Green Science: Peatlands Are One of Earth's Most Underrated Ecosystems," https://blog.nature.org/2024/04/22/peatlands-are-one-of-earths-most-underrated-ecosystems/.
[6] "Peatlands - a Restorable, Carbon-Rich Resource," Minnesota Board of Water and Soil Resources, 8/26/24, https://bwsr.state.mn.us/node/9861#:~:text=Why%20do%20Peatlands%20Matter%3F,at%20current%20rates%20of%20warming.
[7] Jennifer Bjorhus, "The State Is Unsure How to Address Emissions from the Soil."
[8] Minnesota's Legacy: Track the Progress, "Restoration Strategies for Ditched Peatland and Scientific and Natural Areas," accessed 8/26/24, https://www.legacy.mn.gov/projects/restoration-strategies-ditched-peatland-and-scientific-and-natural-areas.
[9] Rebecca Beduhn Jim Anderson, Dean Current, Javier Espeleta, Cinzia Fissore, Bjorn Gangeness, John Harting, Sarah Hobbie, Ed Nater, Peter Reich "The Potential for Terrestrial Carbon Sequestration in Minnesota."
[10] Abby Rogerson, "Real Climate Solutions Protect Peatlands," Minnesota Center for Environmental Advocacy, accessed 8/26/24, 5/26/22, https://www.mncenter.org/real-climate-solutions-protect-peatlands.
[11] Liam Krause et al., "Impacts of Historical Ditching on Peat Volume and Carbon in Northern Minnesota USA Peatlands," *Journal of Environmental Management* 296 (2021): 113090, https://www.sciencedirect.com/science/article/pii/S030147972101152X.
[12] Dan Kraker, "Digging into Minnesota's Peat, an Underappreciated Climate Superhero," *MPRnews*, 10/10/2022, https://www.mprnews.org/story/2022/10/10/digging-into-minnesotas-peat-an-underappreciated-climate-superhero.
[13] Minnesota Pollution Control Agency, "Minnesota Priority Climate Action Plan: Climate Pollution Reduction Grants," 2024, https://www.pca.state.mn.us/sites/default/files/aq1-70.pdf.
[14] Marissa Ahlering; Kristen Blann; Meredith Cornett; Sachiko Graber; Chris Lenhart; and Mark White, "Nature and Climate Solutions for Minnesota," 2021, https://www.nature.org/content/dam/tnc/nature/en/documents/NCSinMinnesotaReport_01.11.2021.pdf.
[15] Erin Mackey, "The Economic Benefits of Natural Climate Solutions in Minnesota," Earth Economics, 2023, https://www.nature.org/content/dam/tnc/nature/en/documents/EarthEconomics_2023EconomicBenefitsofNaturalClimateSolutions.pdf.
[16] Ayla Norris Smith, "Peatlands Are Incredible Natural Climate Solutions. They Cover Only 3% of Earth's Surface, but Store around 30% of All the Carbon on Land."
[17] Minnesota Department of Natural Resources, "Wetlands," accessed 8/26/24, https://www.dnr.state.mn.us/wetlands/index.html.

[18] The Nature Conservancy, "Rinse and Re-Peat: Restoring Minnesota's Peatlands for Climate & Water," accessed 8/26/24, https://www.nature.org/en-us/about-us/where-we-work/united-states/minnesota/stories-in-minnesota/peatland-restoration-study/.
[19] "Calcareous Fens: Amazing, Rare and Irreplaceable," Minnesota Department of Natural Resources, https://www.dnr.state.mn.us/wetlands/calcareous-fens.html.
[20] Minnesota Department of Natural Resources, "Wetlands."
[21] The Nature Conservancy, "Rinse and Re-Peat: Restoring Minnesota's Peatlands for Climate & Water."
[22] Liam Krause et al., "Impacts of Historical Ditching on Peat Volume and Carbon in Northern Minnesota USA Peatlands."
[23] College of Food University of Minnesota, Agricultural and Natural Resources, "Not So Renewable: Implications for Continued Peat Mining in Minnesota," 2021, https://conservancy.umn.edu/server/api/core/bitstreams/b8ecf56f-7346-4317-b81c-17bcf123659c/content.
[24] Greg Stanley, "Climate Change Upsets an Ancient Balance, Felling Forests," *Star Tribune*, Climate change upsets an ancient balance, felling forests, 12/9/2022, https://www2.startribune.com/tamarack-trees-eastern-larch-beetles-minnesota-extinction-endangered-species/600233177/.
[25] Daniel Zarin, "The World's Peatlands Are Climate Bombs Waiting to Detonate," *The New York Times*, November 5, 2022, https://www.nytimes.com/2022/11/05/opinion/climate-warming-peatlands.html.
[26] WaterLegacy, "Polymet Mine: Mercury & Health Risks," accessed 8/26/24, https://waterlegacy.org/mercury-and-health/.
[27] Kristine M. Haynes et al., "Mobility and Transport of Mercury and Methylmercury in Peat as a Function of Changes in Water Table Regime and Plant Functional Groups," *Global Biogeochemical Cycles* 31, no. 2 (2017): 233-44, http://dx.doi.org/10.1002/2016GB005471.
[28] The Nature Conservancy, "Rinse and Re-Peat: Restoring Minnesota's Peatlands for Climate & Water."
[29] "Measuring the Effects of Fire in Northern Minnesota Peatlands," Gretel Weiskopf, Forest Service U.S. Department of Agriculture, https://www.fs.usda.gov/inside-fs/delivering-mission/sustain/measuring-effects-fire-northern-minnesota-peatlands.
[30] Abby Rogerson, "Real Climate Solutions Protect Peatlands."
[31] Minnesota Pollution Control Agency, "Minnesota's Climate Action Framework: Summary of Climate Actions," 2022, https://climate.state.mn.us/sites/climate-action/files/State%20action%20steps.pdf.
[32] Minnesota Pollution Control Agency, "Minnesota Priority Climate Action Plan: Climate Pollution Reduction Grants."
[33] Minnesota Office of School Trust Lands, "School Trust Lands Overview," accessed 8/26/24, https://mn.gov/school-trust-lands/lands/overview/.
[34] John Myers, "Battle Is on over 2.5 Million Acres of School Trust Land in Northern Minnesota," *Duluth News Tribune*, 2/15/2012, https://www.duluthnewstribune.com/news/battle-is-on-over-2-5-million-acres-of-school-trust-land-in-northern-minnesota.
[35] The Nature Conservancy, "Playbook for Minnesota Peatlands: Protecting and Restoring Minnesota's Peatlands as a Natural Climate Solution," 2024, https://drive.google.com/file/d/1QSqaOubBoyyR_7NR8Qm03gcEIAEE0dw9/view?pli=1.
[36] Samuel P. Reed, "Minnesota's School Trust Lands Help Fund Public Education. Climate Change Is a Challenge to That.," *Star Tribune*, 2/20/2024, https://www.startribune.com/minnesotas-school-trust-lands-help-fund-public-education-climate-change-is-a-challenge-to-that/600344862.
[37] Minnesota Office of School Trust Lands, "Carbon Credits," accessed 8/26/24, https://mn.gov/school-trust-lands/projects/eco-services/carbon-credits.jsp.
[38] Minnesota Department of Natural Resources, "Minnesota Scientific and Natural Areas Patterned Peatlands."
[39] "Peatlands - a Restorable, Carbon-Rich Resource," Minnesota Board of Water and Soil Resources.
[40] US Environmental Protection Agency, "Epa Announces Nearly $200 Million to Minnesota for Community-Driven Solutions to Cut Climate Pollution," news release, 7/22/24, https://www.epa.gov/newsreleases/epa-announces-nearly-200-million-minnesota-community-driven-solutions-cut-climate.

[41] Kendig A.K. et al., "Status and Trends of Wetlands and Deepwater in Minnesota: 2006 to 2020," Minnesota Department of Natural Resources,, 2024, https://files.dnr.state.mn.us/eco/wetlands/mn-wetland-status-2006-2020.pdf.

[42] "For the Sake of Peat: Peatland Resilience Initiative in Minnesota," Minnesota Department of Natural Resources, https://www.dnr.state.mn.us/wetlands/peatland-resilience-initiative.html.