



Changing Seasons

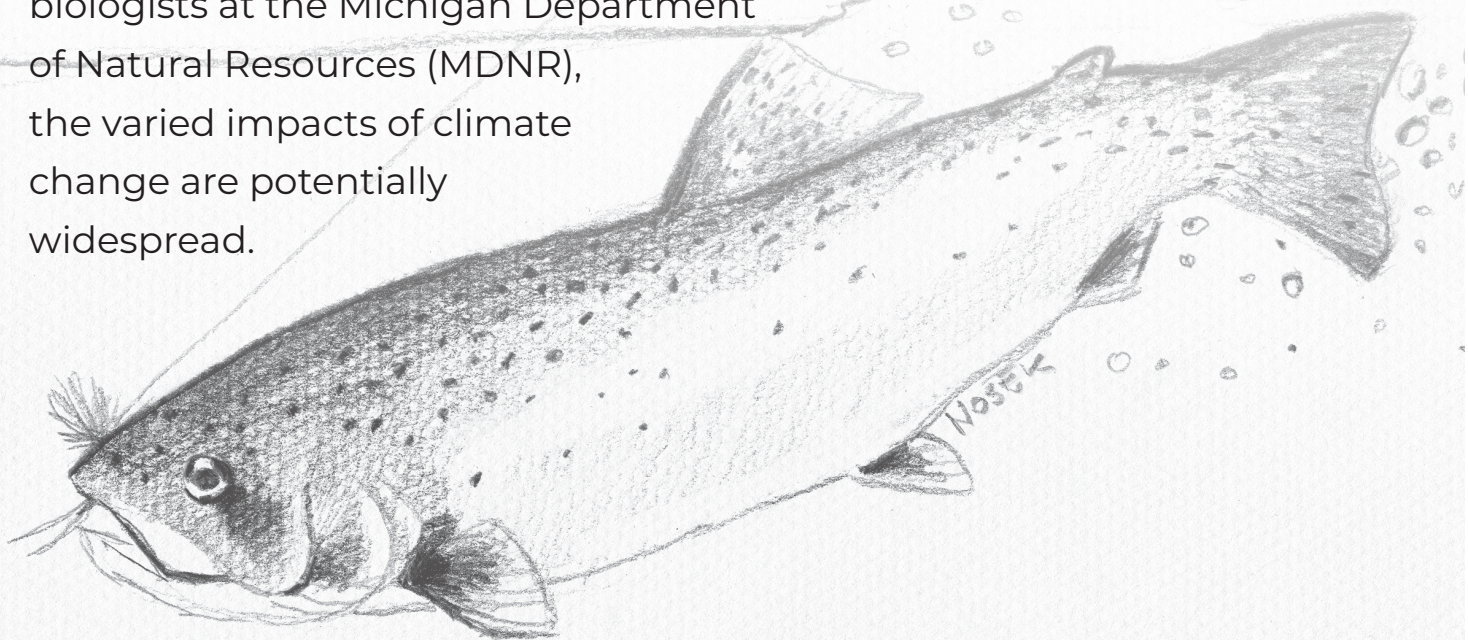




Foreword

Michigan's rich history of hunting and fishing helps the state maintain one of the most robust outdoor recreation economies in the country. Hunters and anglers in Michigan contribute more than \$11.2 billion annually to the state economy and support 171,000 jobs in retail, manufacturing, and conservation — putting the industry in the top ten for job creation in the state. Maintaining this economic driver and our outdoor heritage depends on healthy and sustainable populations of fish and wildlife both now and into the future.

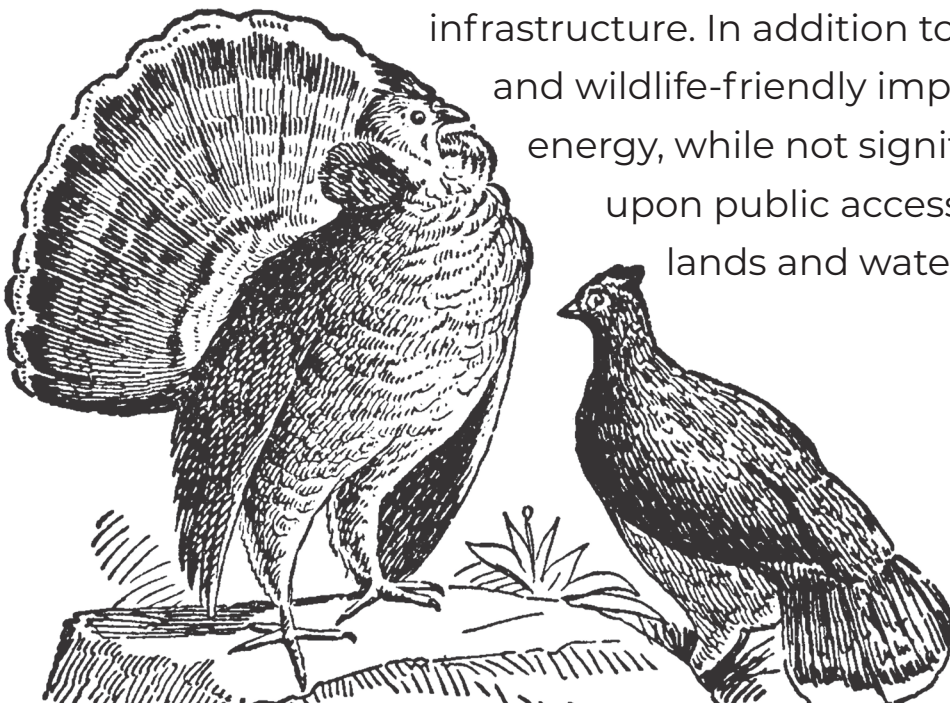
However, all is not well with the future of hunting and fishing in Michigan. Adding to the numerous challenges facing the health and abundance of Michigan's game species, changes in climate threaten to disrupt generations of fish and wildlife and their habitats. According to professional wildlife and fisheries biologists at the Michigan Department of Natural Resources (MDNR), the varied impacts of climate change are potentially widespread.



From white-tailed deer and grouse to salmon and steelhead, Michigan's iconic species are consistently and dynamically changing to adapt to new weather patterns and the long-term effects they have on habitat. Waterfowl migrations are happening later and becoming shorter than they once were, moose are being pushed further to the edges of their viable habitats, and grouse populations are shifting northward in response to climate-driven retreats by quaking aspen.

Wildlife disease outbreaks, like Epizootic Hemorrhagic Disease (EHD) in deer, are becoming more common and more widespread because warmer winter temperatures favor the biting insects that spread the disease. Warming stream temperatures threaten to push iconic, native trout from lower in their reaches towards the cooler headwaters of each waterway creating greater competition for habitat and food.

Addressing these growing challenges and mitigating their effects requires wise investments in habitat and infrastructure. In addition to thoughtful, deliberate, and wildlife-friendly implementation of cleaner energy, while not significantly infringing upon public access and use of public lands and waters.



All levels of government — as well as private and corporate philanthropy and market-based solutions — have essential roles to play ensuring that the high-quality natural resources that we enjoy today will be available for enjoyment by future generations. Hunters and anglers will play a critical role in this.

Because hunters and anglers are so closely connected to Michigan's fish, wildlife, and habitats, they are a wealth of information and can be sentinels for changes as they occur. Policymakers are encouraged to inform their decision-making with the unique insights that the hunting and angling communities stand ready to provide.



Since 1937, Michigan United Conservation Clubs has worked to unite citizens to conserve, protect and enhance Michigan's natural resources and outdoor heritage. MUCC is the nation's largest statewide conservation nonprofit.



The National Wildlife Federation is one of America's oldest and most respected hunting and angling conservation organizations. From our founding in 1936 to present day we have worked to safeguard fish, wildlife, and their habitats to ensure that our sporting traditions remain strong now and into the future.

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Michigan United Conservation Clubs
Lansing, Michigan

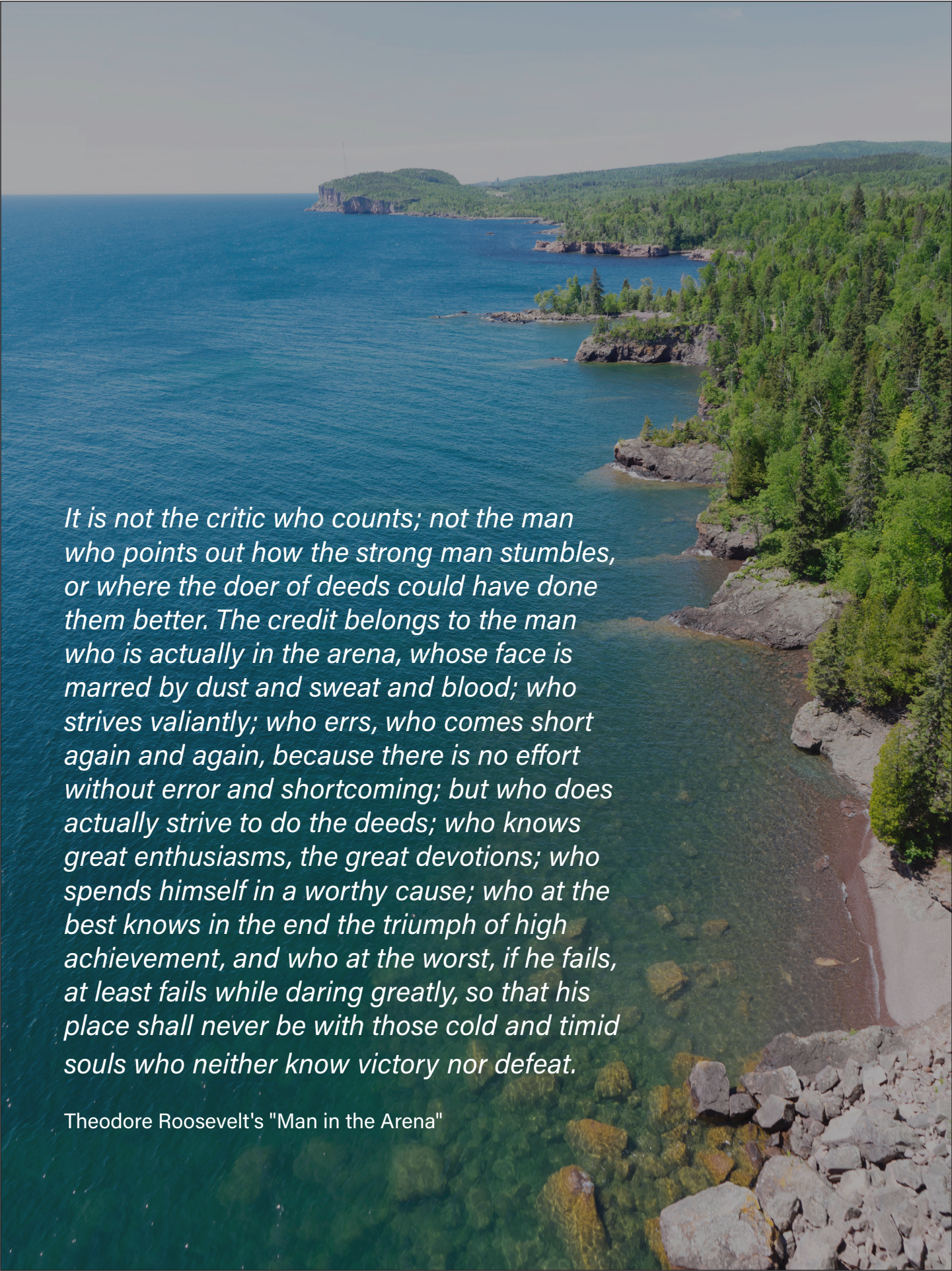
Amy Trotter, Executive Director
atrotter@mucc.org

Justin Tomei, Policy Assistant
jtomei@mucc.org



National Wildlife Federation
Great Lakes Office, Ann Arbor, Michigan

Marc Smith, Policy Director
msmith@nwf.org

A scenic view of a rocky coastline with dense green forest and a body of water under a clear sky. The foreground shows a rocky shore with large, grey boulders and patches of green moss or algae. The water is a deep blue-green color, and the forest on the right is lush and green. In the distance, a small island or headland is visible on the water. The sky is a pale, clear blue.

It is not the critic who counts; not the man who points out how the strong man stumbles, or where the doer of deeds could have done them better. The credit belongs to the man who is actually in the arena, whose face is marred by dust and sweat and blood; who strives valiantly; who errs, who comes short again and again, because there is no effort without error and shortcoming; but who does actually strive to do the deeds; who knows great enthusiasms, the great devotions; who spends himself in a worthy cause; who at the best knows in the end the triumph of high achievement, and who at the worst, if he fails, at least fails while daring greatly, so that his place shall never be with those cold and timid souls who neither know victory nor defeat.

Theodore Roosevelt's "Man in the Arena"



White-tailed Deer and Moose

Deer in Michigan have a rich history of management and are a 20th-century conservation success story. Virtually extirpated at one point, deer now occupy every county of the state.

According to the 2019 Deer Harvest Survey Report, the Michigan Department of Natural Resources estimated that 540,147 hunters pursued white-tailed deer and spent 7.5 million days afield.

With shorter and less severe winters, weather-induced deer mortality is declining. Population increases provide more recreational opportunity but also yield more agricultural and forest damage,

especially in certain areas of the Upper Peninsula. This damage is exacerbated by changes to the composition of plant communities that deer rely on for food.

Understory plants used by white-tailed deer for food and cover are often the first to be stressed by severe drought and altered temperature regimes. The understory is especially sensitive to and negatively affected by increasing carbon dioxide levels. Woody species like trees and shrubs benefit from changes to atmospheric carbon dioxide, frequently resulting in a decline in the ecological complexity needed for abundant wildlife populations to thrive.



At the same time, tree species critical for winter thermal cover, in more harsh northern ranges may be impacted, not by climate directly, but by the increasingly prevalent invasive insects impacting key species. Lacking natural enemies, the hemlock woolly adelgid (HWA) can kill a hemlock tree in as little as four years. Cold, hard winters lower the survival rate of HWAs, but rising temperatures due to climate change will likely allow the HWA to expand northward throughout the hemlock's range or survive longer during winters in its current range.

Parasites and vector-borne diseases, such as Epizootic Hemorrhagic Disease (EHD), are having ever-greater impacts on local populations of deer. At another level, deer are a preferred host to invasive black-legged and Lone Star ticks that present threats to human health and safety. The cause of EHD, a parasitic midge, thrives in conditions with changing weather patterns

– especially those that include extreme swings from drought to heavy rain events, as these insects mainly occur in muddy riparian areas. As temperatures continue to increase globally, these insects are moving northward in North America presenting additional risk to the long-term health of Michigan deer herds.

Unlike deer or elk, moose numbers are declining mainly because they struggle to adapt to increasing summer temperatures. These large ungulates are adapted to temperatures well below freezing and lack the physiological ability to cool themselves during increasingly common hotter weather. With an increase in the deer herd from warmer temperatures, this can stress the moose population leading to an increased rate of brainworm and liver fluke in moose.



Populations are expected to become less healthy, resilient and older resulting in moose populations that will continue to shrink and shift northward until there are only a few individuals confined to the northernmost points in the Upper Peninsula.

According to Jim Hammill, owner of Iron Range Consulting & Services, Michigan is uniquely set up to combat increasing temperatures affecting our herds through habitat efforts, including wooded wetlands.

"In addition to the obvious and well-known long-term fixes to global conditions, there are steps we can take that are specific to Michigan conditions. These actions are likely to help reduce the impact of climate change on deer, elk, and moose."

Jim Hammill, Iron Range Consulting and Services



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"Improving wooded wetlands has the potential to be effective because of our unique land ownership patterns and the desire of Michigan's citizens to manage wildlife to the benefit of current and future generations of Michigan citizens," Hammill said. "The strongest recommendation is that we develop a plan to retain and manage wooded wetland forests throughout the northern half of Michigan."

Moving Forward:

Provide private landowners with the resources to maintain and improve wooded wetland habitats on their land and implement a no-net-loss policy for wooded wetlands on state lands.

Continue to prioritize and increase financial and technical assistance to address increases in invasive species like HWA.

Urge the MDNR to develop and implement a moose management plan.

The Michigan Natural Resources Trust Fund should continue to prioritize public acquisition of key deer wintering complex areas and ensure they are managed for wildlife benefits to help mitigate the impacts of climate.

Waterfowl



Wetlands produce essential and irreplaceable ecosystem services. They naturally filter our drinking water, contain sediments and chemical runoff, and buffer floodwaters, while simultaneously providing critical habitat to many game and nongame species. Ducks, geese, swans, and sandhill cranes all rely on wetlands for nesting grounds, migration stopovers, and sources of food. Waterfowl hunters in Michigan know how important healthy and abundant wetlands underpin the overall success and experience of the hunt.

Unfortunately, research on land use tells us that wetlands are still shrinking, with some of the rarest types, including Great Lakes marshes, disappearing at a frightening pace. While much of the loss of Michigan's wetlands is a result of intentional

draining and tiling, those wetlands that remain also face the threat of unpredictable and changing water levels and increases in invasive species that benefit from these dramatic changes.

At the regional and North American scale, waterfowl migration patterns are changing. This is because migrations are cued by a combination of photoperiod (day length) and weather. Warming temperatures later in the winter seasons have caused waterfowl to migrate later than usual, or have their migrations cut short. This impact is felt deeply in southern states, especially Arkansas and Louisiana, where Michigan's waterfowl traditionally have ended their fall migration. In recent years, the birds no longer travel that distance, as there tends to be open water further north.



Steve Wyckoff, a lifelong waterfowler, touches on the threats of changing migratory patterns.

"Migration periods seem to be happening later in the fall. Add to that that both ducks and geese aren't going as far south as in the past. This situation can be seen as good for hunters farther north in the short term and frustrating for southern hunters," Wyckoff said.

Wyckoff suggested variable weather patterns have impacted waterfowl hunting seasons in previous years. "Of course, there have been colder periods that may come earlier than usual. Examples in Michigan include the last two seasons when cold fronts dropped from Canada in early to mid-November, literally halting the seasons in mid-November because the area was frozen."

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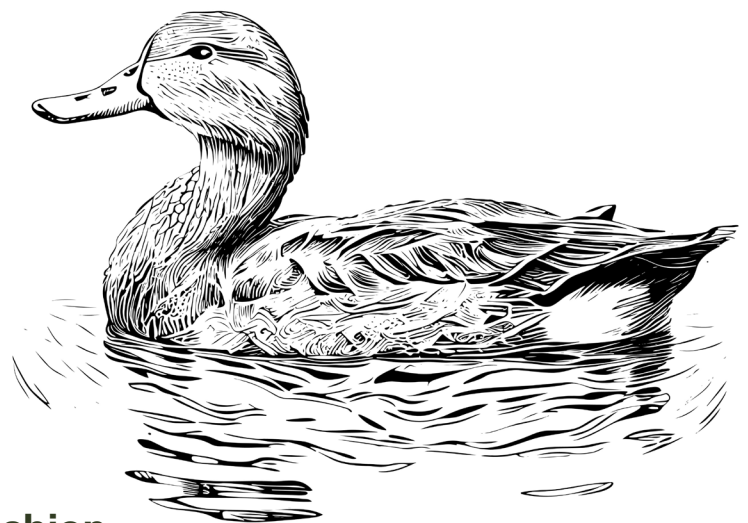
Steve Wyckoff, a lifelong waterfowler



Changes in the distribution and timing of waterfowl migration may result in hunters seeing fewer birds in the coming years. In addition, continued wetland loss may lead to waterfowl population declines, which could trigger shorter hunting seasons and reduce daily bag limits.

Moving Forward:

- **Strengthen federal, state and local protections for existing wetland habitats.**
- **Promote wetland restoration efforts that leverage public and private investments.**
- **Continue to streamline wetland restoration permitting processes to ensure projects advance in a timely fashion.**





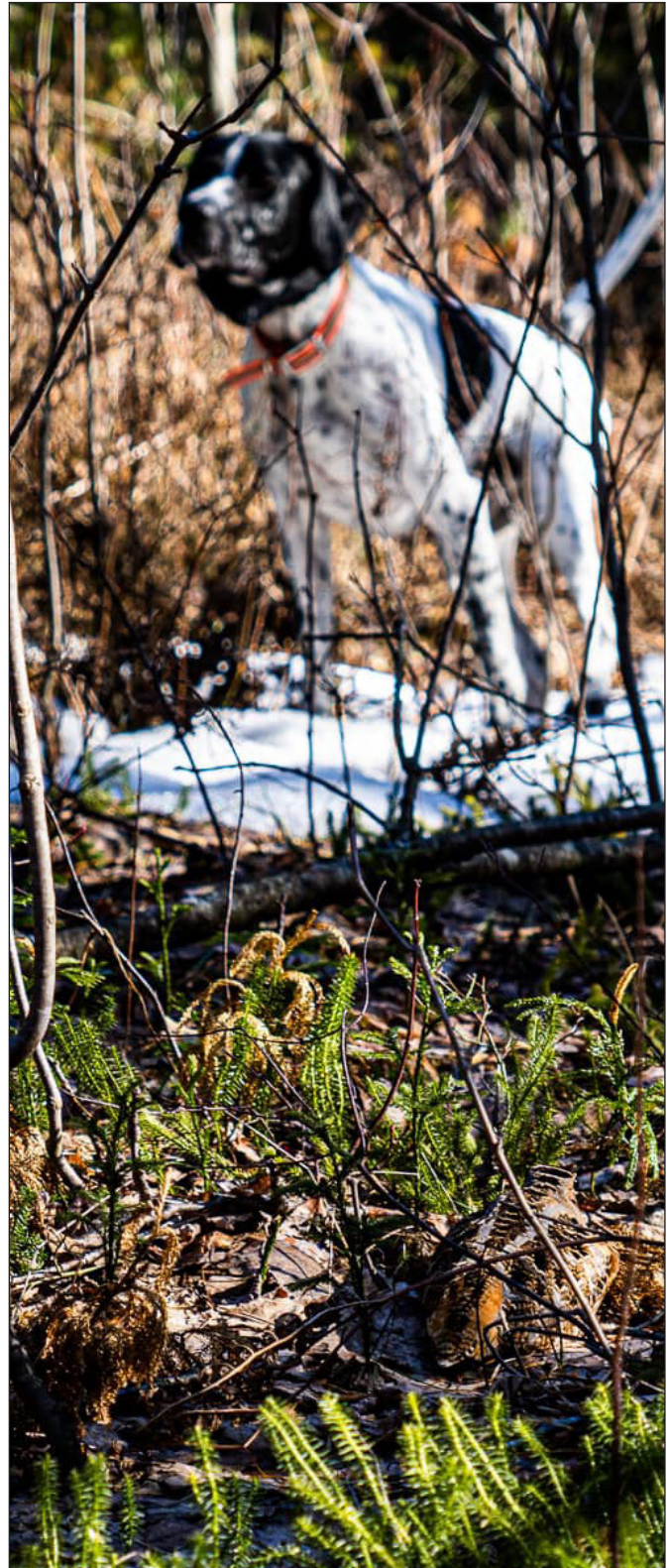
Upland Birds



Pheasants, grouse, and woodcock are dependent on unique habitat types in Michigan — habitats that are quickly disappearing.

Intense spring rain events are expected to increase, with high volumes of precipitation occurring during relatively short periods of time. These events flood or wash out upland bird nests. Even when conditions allow renesting, upland birds lay smaller clutches of eggs when initial nests are lost. Increasing summer droughts are expected to expand hot and dry summer conditions to more northward latitudes in Michigan and across North America. Already, nesting and recruitment rates are being impacted by the droughts. This reduces the insect populations that upland birds feed on, while simultaneously reducing vegetative cover, leaving broods particularly susceptible to predators.

Aspen stands provide some of the best habitats for grouse and woodcock, and their historic abundance in the Great Lakes have traditionally caused the region to lead others in population abundance and hunter harvest levels of these species. Research conducted by the MDNR and faculty at Michigan State University suggests that aspen stands are being consistently replaced by birch, maple and beech trees. This, coupled with inconsistent snow cover regimes during winter, will have increasingly profound effects, particularly on populations of ruffed grouse.



Can you spot the woodcock?



In addition to habitat loss, ruffed grouse face the additional threat of climate-influenced diseases like West Nile Virus (WNV). Habitat loss and degradation leave the ruffed grouse population less stable and resilient, amplifying the impacts of these invasive diseases vectored by mosquitoes whose populations are increasingly favored by significant rain events and earlier springs. Over the last several years, Michigan has invested heavily in managing its state public lands to improve grouse habitat. In addition, the state has increased access opportunities for hunters via Grouse Enhanced Management Sites (GEMS) throughout the state. Climate change could potentially undermine these

investments and negatively impact the overall hunter experience.

Pheasants rely on prairies and other lands with grass ditches, hedges, marshes, and bushy groves interspersed. These heterogeneous landscapes allow for greater resilience to impacts related to changing climate and agricultural practices. Prior to the 1980s, pheasants thrived throughout Michigan. As farmland became less dispersed and increased temperatures impacted nesting success, pheasant populations saw a drastic decline — to the point where spotting a wild pheasant became an anomaly in many areas. “Game birds are not long-lived species,”

said Brent Rudolph, Pheasants Forever director of sustainability. “They can ordinarily tolerate booms and busts in mortality or productivity and populations can persist over the long-term. As these changing conditions lead to more severe and more frequent ‘bad years,’ those effects combine with habitat fragmentation and loss so that outlier conditions that these species used to tolerate are leading to population declines.”

As bird populations decline, hunters lose interest and often quit the sport, leaving fewer birds, less hunters, and diminished habitat on the landscape.

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- Brent Rudolph, Pheasants Forever Director of Sustainability Partnerships

Moving Forward:

- **Leverage private investments in habitat restoration with state and federal resources.**
- **Encourage active forest management on public and private lands to increase young forest and shrubland habitat and promote diversity of age classes within aspen stands.**
- **Increase public education on the benefits of active forest management.**
- **Increase the cost-share program and develop other initiatives that provide technical and financial assistance to private landowners to improve forested and grassland habitat types.**



Salmon

Since their introduction to the Great Lakes, salmon have become a key target for anglers from around the world. When they were originally brought to Lake Michigan in 1966 by the MDNR, their main purpose was to control invasive alewives. These small baitfish experienced huge population growth then die-offs that would cover beaches from Chicago to the Traverse Bays. Salmon predation on alewives essentially eliminated these die-offs, but native prey species have failed to recover due to changing lake dynamics. Without the forage base, salmon populations have shrunk, thus significantly impacting the overall fishing experience and economic well-being of many outdoor

recreation businesses across the state.

It is also becoming harder and harder for anglers to reach salmon due to increasingly unpredictable and rough weather on the Great Lakes. According to Captain Denny Grinold and other charter captains, “blow days” – times where boats cannot travel safely due to high winds – on the lakes are happening more frequently. “Last year I had to cancel 59 trips due to windy days or bad weather” said Capt. Grinold. “Comparing it to twenty or thirty years ago, we would have maybe had fifteen to twenty trips cancelled. The wind seems to pick up in mid-August and doesn’t want to stop until late September, if we’re lucky.

We're getting a lot more Northeast winds compared to just the eastern winds, and this shift in weather patterns has hurt a lot of charter guys."

Capt. Grinold also mentioned that these winds cause major shifts in water temperatures and thermoclines. "The thermocline could be at 70 feet, and not even 12 hours later it shifts to 40 feet," said Grinold. "These shifts in temperature on large water bodies are concerning, and make it hard to fish consistently. We would see shifts like this years ago, but not at these speeds."

Salmon and other pelagic fish in the Great Lakes maintain a large piece of Michigan's outdoor recreation economy. There are more than 1.4 million licensed anglers in Michigan, and fishing in the Great Lakes state comprises a \$2.3 billion industry.

Port towns such as Grand Haven, Bay City, Holland, and Ludington rely heavily upon the tourism dollars that are brought from traveling anglers. With increasing unpredictable weather events causing more missed opportunities to get out on the lakes, anglers are expected to book less fishing trips leading to an impact on the charter boat industry and towns in which they operate.

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- Denny Grinold, Charter Captain



Moving Forward:

- **Protect game fish populations and sportfishing by maintaining or increasing stocking rates where biologically sustainable.**
- **Increase energy efficiency at hatcheries, which will help contain or lower overall costs of stocking while also decreasing energy consumption.**
- **Site future energy generation, like solar and wind turbines, in places with low impact to fisheries, wildlife, and recreational access.**

Trout

Michigan boasts some of the best coldwater stream fishing east of the Mississippi River, with many of these bodies of water becoming hotspots for anglers from around the country. Unfortunately, trout in Michigan are threatened by a myriad of factors, including warming stream temperatures, dams, and inflexible infrastructure.

Trout species in Michigan are a keystone species in coldwater streams. Often described as the “canary in the coal mine,” trout are an indicator species of the overall health of the water ecosystem and are often the first species to be impacted by

changes in stream temperatures. One of the culprits to stream temperature changes and fish passage blocks are dams. Many dams in Michigan are aging and provide limited benefits such as hydroelectric power — which pose challenges to fish-spawning migrations.

Removing a dam has the potential to decrease stream temperatures by as much as eight degrees, leading to more suitable habitat for trout populations. The benefits of dam removals for fish passage also outweigh the maintenance costs of alternatives like fish passages and barges.



Dams aren't the only reason for impacted trout populations, however. Fluctuations in weather patterns and extreme rain events followed by severe drought perpetuate conditions that reduce the survival rate of eggs, larvae, and fry.

“As climate change brings about increasing water temperatures, through warmer seasonal averages and large rain events that heat coldwater fisheries, we will begin to lose trout



streams that are already teetering on the edge of supporting trout species,” said Bryan Burroughs, Executive Director of Michigan Trout Unlimited. “This is particularly important as trout seek

thermal refuge in tributaries of major rivers that become too warm in summer months; without those refuges, trout will struggle to find forage and suitable spawning habitat.”

Moving Forward:

- **Invest in dam removals to restore trout habitats and lower stream temperatures.**
- **Encourage reforestation and streambank protection of riparian areas to maintain temperature regulation.**
- **Streamline streambank restoration permitting process to ensure projects advance in a timely fashion.**



Conclusion

Michigan's wildlife, fisheries, land, and water are changing at an ever-accelerating rate driven by climate-induced changes to temperature and precipitation. Whether it's the northward expansion of upland birds, shorter migrations of waterfowl, or a vanishing moose population, Michigan's outdoor enthusiasts are well aware of what's happening and are worried for the future. Michiganders want to pass the rich legacy of hunting and fishing onto their children and grandchildren. Our progeny deserve to inherit an outdoor heritage that current sportsmen and sportswomen have historically enjoyed. Protecting clean water to fish, having access to public land to hunt, and addressing the impacts of climate change on fish and wildlife are fundamental if we are to ensure that our children and grandchildren will enjoy the same outdoor heritage that helped shape our lives.

Public and private investment in conservation and restoration work will be critical to maintaining Michigan's iconic species described here, and the habitats on which they rely. In the coming years, it will be essential to make investments in wildlife habitat restoration, adaptive management techniques, and resilient infrastructure to maintain the health of Michigan's fish and wildlife populations and unique natural spaces. As Michigan endeavors on a novel "healthy climate plan," the hunting and angling community stands ready to provide guidance, resources, and relevant testimonials to ensure that all planning and action is responsive to the needs of Michigan's vulnerable fish and wildlife populations and protecting its outdoor legacy for years to come.

While conservation organizations work to restore wildlife habitat and advance dam removals in an effort to mitigate the impacts of climate change in the short-term, supporting new incentives and investments into long-term, climate-related policies need to be a priority for Michigan's policymakers.

Michigan hunters and anglers hold a wealth of knowledge and experience in the field and on the water. Involving them in policy decisions that deal with managing energy and wildlife will be critical moving forward so that future generations will enjoy the hunting and fishing experiences central to Michigan's outdoor legacy.



