



U.S. Geological Survey
Midwest Climate Adaptation Science Center
Science Priorities
2021-2026

The mission of the Midwest Climate Adaptation Science Center is to deliver science to help fish, wildlife, water, land, and people adapt to a changing climate. The following list of MW CASC science priorities is the product of extensive input from natural and cultural resource managers and climate experts in the region. It also reflects guidance from the Department of Interior, partner priorities, and regional climate initiatives. These priorities will serve as the core of the MW CASC Strategic Science Plan, a document that guides the work of the MW CASC— via the consortium, research projects, and partnerships—for Cycle 1 (2021-2026). The MW CASC Strategic Science Plan will be completed in Spring 2023. The plan will also include the following concepts as integral to all MW CASC priorities:

- Direct and indirect effects of climate change
- Adaptive capacity
- Maladaptation
- Multiple ways of knowing, including Traditional Ecological Knowledge
- Diversity, Equity, and Inclusion

Management Challenge	Science Priority
1. Heavy precipitation events and drought. Heavy precipitation events, flooding, and drought alter the condition, structure, services, and management of natural resources	1.1. Assess the effects of extreme rainfall on at-risk fish, wildlife, ecosystems, and cultural resources.
	1.2. Identify aquatic fish, wildlife, and ecosystems vulnerable to the impacts of climate on water quality and quantity.
	1.3. Assess potential impacts of extreme rainfall on fish and wildlife management infrastructure.
	1.4. Determine optimal design and placement of culverts and fish passage structures to protect aquatic habitat and connectivity under future precipitation patterns.
	1.5. Evaluate the efficacy of management strategies to limit negative effects of flooding, sedimentation, and contaminants on aquatic fish, wildlife, ecosystems, and cultural resources.
	1.6. Evaluate and quantify the potential of natural lands to moderate the effects of extreme rainfall, protect natural resources, and provide co-benefits to society.
	1.7. Identify and evaluate management strategies to prepare refuges and parks for extreme rainfall and flooding.
	1.8. Identify, design, and evaluate management interventions to maintain ecological integrity and ecosystem services under future precipitation patterns.
	1.9. Identify fish, wildlife, and ecosystems vulnerable to variability in precipitation and novel drought conditions.
	1.10. Identify and evaluate methods to reduce the effects of drought on fish, wildlife, and ecosystems.
	1.11. Assess the effects of human adaptation on water quality and quantity for fish, wildlife, and ecosystems.
2. Loss of winter. Warming winters, altered snow patterns, and	2.1. Assess the population-level effects of warming winters on cool and cold-water fish in streams and lakes.
	2.2. Assess the vulnerability and adaptive capacity of boreal wildlife.

<p>increased variability affect fish and wildlife populations, habitat management, and nature-based recreation</p>	2.3. Assess the effects of decreased snow cover, rain-on-snow conditions, and ice storms on terrestrial wildlife and ecosystems.
	2.4. Determine the effects of variability in winter conditions on fish, wildlife, and ecosystems.
	2.5. Determine the indicators and effects of phenological mismatch and false springs on at-risk terrestrial species.
	2.6. Assess the effects of lake ice loss on fish, wildlife, and ecosystems.
	2.7. Identify management strategies to facilitate small-scale (e.g., microclimate), short-term, or long-term refugia.
<p>3. Altered hydrological regimes. Changes in temperature, flows, and connectivity alter high-value fish populations, at-risk aquatic organisms, and culturally important resources</p>	3.1. Evaluate fluctuations of water levels in stream, lake, and wetland ecosystems.
	3.2. Determine the future geophysical conditions of inland lakes.
	3.3. Determine groundwater contributions to stream refugia and potential impacts of climate-induced groundwater changes on ecosystems.
	3.4. Determine the future condition and ecological function of prairie pothole wetlands.
	3.5. Assess changes to aquatic connectivity and the subsequent effects on wetland/aquatic ecosystems.
	3.6. Determine the climate-driven establishment, spread, impact, and effectiveness of management of aquatic invasive species.
	3.7. Assess and predict changes in future abundance and distribution of high-value fish species and at-risk aquatic organisms.
	3.8. Evaluate the efficacy of in-lake, landscape, and watershed management to protect the quality and function of wetland, stream, and lake ecosystems.
	3.9. Assess the effects of climate change on recreational angling and subsistence fisheries.
	3.10. Identify and evaluate management strategies to reduce risk and impacts from climate to manoomin.
	3.11. Assess the effects of climate change on current and anticipated aquatic pathogens, including transmission, ecosystem impacts, and management options.
<p>4. Novel terrestrial landscapes. Shifts in vegetation and human responses to climate change alter the suitability of the landscape for priority and at-risk wildlife populations</p>	4.1. Determine changes in the composition, structure, disturbance, ecological function, and distribution of forests.
	4.2. Determine changes in the composition, structure, disturbance, ecological function, and distribution of grasslands.
	4.3. Determine the climate-driven establishment, spread, impact, and effectiveness of management of terrestrial invasive species.
	4.4. Advance climate knowledge for under-studied terrestrial species.
	4.5. Assess climate-driven changes in the abundance and distribution of priority wildlife species.
	4.6. Identify optimal future habitat (e.g., refugia, connectivity to) for at-risk or priority species.
	4.7. Assess the potential for range shifts to or from Tribal lands, or local extirpation of focal species from Tribal lands.
	4.8. Evaluate the effects of climate-induced changes in land use on aquatic and terrestrial fish, wildlife, and ecosystems.
	4.9. Evaluate the social and economic effects of climate change on hunting, gathering, fishing, and wildlife viewing opportunities, outdoor recreation, and Tribal livelihoods.
	4.10. Determine climate vulnerability in the non-breeding season for priority wildlife (e.g., migratory species).
	4.11. Assess the effects of climate change on current and anticipated terrestrial pathogens, including transmission, ecosystem impacts, and management options.

5. Barriers to and opportunities for adaptation. Climate change alters the feasibility of management goals and suitability of management tools	5.1. Assess the feasibility and effectiveness of current and potential ecological restoration goals under future conditions.
	5.2. Advance climate-informed optimization of protected lands for fish, wildlife, ecosystems, and cultural resources.
	5.3. Conduct assessments to reduce the risks and measure the effectiveness of assisted migration activities.
	5.4. Provide climate-informed decision science in the selection, application, and siting of restoration and ecosystem management (e.g., prescribed burning, water control, grazing, siting, and seed selection/planting).
	5.5. Determine perceptions of and acceptance for climate adaptation for fish, wildlife, and ecosystems, including by private landowners and indigenous communities.
	5.6. Identify and assess the risks of laws, policies, regulations, and practices that are maladaptive or exacerbate the effects of climate change on fish, wildlife, and ecosystems.
	5.7. Identify climate adaptation practices for fish, wildlife, and ecosystems that yield co-benefits (e.g., carbon mitigation, economic gain, social resilience, well-being of at-risk communities).
	5.8. Inform the design of monitoring programs and early warning systems to detect and respond to climate change.
	5.9. Identify barriers to and opportunities for the integration of climate adaptation in existing natural resource policies, program, and practices.

Definitions:

Natural Resources: land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the U.S., any state or local government, any Indian Tribe, or, if the resources are subject to a trust restriction on alienation, any member of an Indian Tribe.

- Fish and wildlife are specified in many of the above priorities and includes: life history and population dynamics; interspecific interactions and community dynamics; aquatic and terrestrial environments; current and future habitat and landscape dynamics;
- Ecosystems is specified in many of the above priorities and includes: system components, processes, function, services, and benefits (to humanity).

Cultural resources:

- Aspects of a cultural system that are valued by, or significantly representative of, a culture or that contain significant information about a culture.
- Cultural resources may be tangible entities or cultural practices.
- Tangible cultural resources are categorized as districts, sites, buildings, structures, and objects for the National Register of Historic Places and as archaeological resources, cultural landscapes, structures, museum objects and archives, and ethnographic resources for Federal management purposes.
- Also includes cultural items as that term is defined in Section 2(3) of the Native American Graves Protection and Repatriation Act [25 USC 3001(3)]; and archaeological resources, as that term is defined in section 3(1) of the Archaeological Resources Protection Act of 1979 [16 USC 470bb(1)]
- Historic properties are any prehistoric or historic district, site, building, structure, or object included, or eligible for inclusion, in the National Register of Historic Places.
- Historic properties also include artifacts, records, and material remains, which are related to such districts, sites, building structures, or objects.