Climate vulnerability assessment: Northern lowland forests

Introduction: Climate change may bring higher temperatures, variable precipitation, and more frequent intense storms. This document provides a broad summary of potential impacts of climate change, and may provide a foundation for conservation planning in the face of an uncertain future.

Hydrology
Water is crucial to forested wetlands, and potential changes to hydrology are anticipated to have a large impact on northern lowland forests. Precipitation may become more variable in the future, with more rain instead of snow in winter, earlier snowmelt, and more rain falling in intense storms with longer dry spells in between. This could especially impact systems dependent on stable water levels like Northern Wet-mesic Forest (cedar swamps), Black Spruce Swamps, and Northern Tamarack Swamps, and may compound stress on sites where hydrology has already been altered. Milder and shorter winters may also reduce the feasibility of forest management in parts of the landscape that require frozen ground or heavy snowpack for harvest operations or access.

Invasive and aggressive species
Reed canary grass is already problematic in many sites and disproportionally benefits from longer growing seasons. Non-native invasive shrubs like glossy buckthorn and Eurasian honeysuckles may benefit from elevated levels of CO$_2$. In general, non-native invasives species respond well to rapid environmental changes, and are particularly problematic when coupled with the decline of key tree species like black ash from emerald ash borer. In addition, drought stress typically makes trees like tamarack and black spruce more vulnerable to pests like tamarack sawfly and spruce budworm.

Winners and losers
Many of the dominant trees in northern lowland forests are projected to decline under a range of climate scenarios. Black spruce, black ash, balsam fir, and northern white-cedar are all expected to experience moderate to large declines in suitable habitat by the end of the century, while tamarack may suffer habitat loss under high-change scenarios. However, many shrubs, like alder, willows, dogwoods, and hollies as well as the common trees of floodplain forests (e.g., silver maple, hackberry, swamp white oak, and boxelder) are widespread further south and may fare better.
Natural community vulnerability assessments

In 2013, the U.S. Forest Service conducted a climate change vulnerability assessment workshop in conjunction with researchers, managers, and conservation professionals to evaluate the impacts and adaptive capacity of nine forest types in northern Wisconsin and the Western Upper Peninsula of Michigan. The results of this assessment were crosswalked to Wisconsin’s Natural Heritage Inventory natural community types and are summarized in the table below.

Adaptive capacity

Lowland forests connected to the groundwater like Northern Wet-mesic Forests and Northern Hardwood Swamps may be less vulnerable to short-term drought. Communities already adapted to fluctuating water levels like Floodplain Forests may be better suited to changes in precipitation. Where lowland forests occur in low-lying portions of the landscape, frost pockets may help keep them cooler than the surrounding uplands. In addition, peatlands containing sponge-like Sphagnum moss, such as Black Spruce Swamps and Northern Tamarack Swamps, may have a built-in buffer against modest hydrologic changes. Highly acidic soils of peatland communities also tend to be somewhat resistant to invasive species.

Managing for uncertainty

Potential changes to hydrology could push some forest types to a tipping point, especially when combined with temperature-related stresses on vulnerable tree species. Management that seeks to maintain healthy watersheds, reduce runoff and erosion, and limit the spread of invasive species will be essential to maintaining the integrity of northern lowland forests. Actions such as the following are “win-win,” in that they represent sound practices regardless of potential climate change impacts. These and other voluntary actions can be found in Wisconsin’s Wildlife Action Plan on the Wisconsin DNR website.

Win-Win actions:

- **Approach non-native invasives strategically:** Develop a plan by making maps and setting feasible objectives, prevent invasions by following BMPs, control new invasions as early as possible, slow their spread when control isn’t feasible, and conduct regular monitoring.
- **Reverse wetland losses** by restoring converted wetlands to provide storage and filtration and to mitigate storm flows and nutrient loading downstream.
- **Develop management techniques,** silvicultural trials, and management plans to retain forest cover following loss of ash from emerald ash borer in ash-dominated hardwood swamps and floodplain forests.

For more information visit dnr.wi.gov and search keyword “natural communities”