Promoting Forest Complexity for Biodiversity and Climate Change Resilience and Resistance: General Suggestions

February 2025

Dr. Greg Corace
greg.corace@macd.org, 989.356.3596x102

The Alpena-Montmorency Conservation District serves, educates, and advises the people of both counties and advocates for the restoration, conservation, and preservation of natural resources.

The mission of the Forestry Assistance Program is to support family forest owners in realizing the economic, social, and ecological sustainability of their forests.

Private, non-industrial, forest landowners consistently rank wildlife as a management priority. However, many landowners are unaware that the term "wildlife" is a general term meaning the variety of animals inhabiting their property, not only game species. Most landowners also appreciate plant diversity and rely on this diversity to meet ownership goals. Therefore, the overall interest of many forest landowners more accurately encompasses biodiversity.

This document outlines steps forest landowners can take to enhance existing conditions to promote biodiversity within the context of climate change. This document suggests new (not traditional) approaches to forest management. The suggestions below are derived from peer-reviewed, scientific literature, with detailed summaries found in: a) Franklin, J.F. et al. 2018. *Ecological forest management*. Waveland Press. and b) Fahey, R.T. et al. 2018. Shifting concepts of forest complexity in forest management and silviculture. *Forest Ecology and Management*. 421:59-71.

PLANNING PHASE

1. Forests are much more than trees or any single output, be it timber or a wildlife species. Forests are complex ecosystems.
2. Take the landscape into account. Surrounding properties influence adjacent forests. Forest stressors can differ if the landscape is agriculturally-dominated vs forest-dominated, for instance.
3. Some tree species will benefit from climate change, while others will not. See the U.S. Forest Service Tree Atlas for more information: https://www.fs.usda.gov/nrs/atlas/tree/.
4. Plan and manage for complexity within the given forest types your soils produce (see below).
5. Current conditions on a site are a product of local climate, local soils, and past management activities. Climate and soils cannot be easily changed by a landowner, and past management has a legacy effect. Know what opportunities and limitations exist regarding all the above, especially soils, and know the history of the land. Do not work against your site conditions, but try to manage forests your site is best suited for.
6. Consider desired future condition. Focus beyond what you want to take out (timber products) or put into your forest (plantings) during management, and instead have a desired future condition that considers the issues above. Think about what you want your forest to look like and how it should function over future decades (20+ years) and proceed with management.
7. Plan for the maintenance of both living and dead trees in a forest; dead trees, standing and downed, drive biodiversity.
8. Understand the difference between consulting foresters, industry foresters, and loggers and expect a detailed (4-6 page) contract to do work, with surety bond or insurance lean placed on those doing the work.

TREATMENT PHASE

1. Incorporate more modern silvicultural treatments. Clearcuts, “select cut,” seed tree, shelterwood, single tree selection, group selection, and other traditional treatments were designed without consideration of biodiversity or climate change. Modern methods, such as variable retention harvesting, consider more natural forest patterns and future forest adaptation. These treatments create complexity (Figure 1).

Figure 1. Structural patterns from wildfire (center-left) vs plantations in jack pine ecosystems. Traditional forest management practices struggle to create the complexity of natural disturbances.

2. Clearcuts poorly emulate structural patterns of natural disturbances and can reduce biodiversity and future management options. Instead of harvesting all trees, create irregular patches of trees to retain. If some blowdown after harvesting occurs, consider this a benefit for wildlife that use such areas, such as ruffed grouse.

3. Maintain native plant species diversity. Adapting to climate change may best be achieved by having future options in a forest and more options are available with more native diversity. If soils information suggests plant species diversity has declined, consider restoring species by direct planting and protecting with fencing or tree tubes. Do not harvest all individuals of any single tree species.

4. Create retention areas that see no active management. Let some areas develop on their own. Do not actively manage an entire property (Figure 2).

Figure 2. Live and dead trees retained after a harvest represent the conditions of the pre-treated stand and provide a refugia for many organisms while also providing a seed source for the future forest.

5. Manage deadwood in the form of brush/slash piles, downed logs, or standing dead trees (snags, Figure 3). These structures can drive biodiversity and provide habitat for a range of organisms. Brush/slash piles can also protect seedlings from ungulate browse. Have loggers create snags distributed across the stand and in small groups.

Figure 3. Snags—or standing dead trees—provide habitat for many wildlife species, such as Endangered bats and this gray treefrog.

6. At minimum, adhere to Michigan Best Management Practices as they apply to soil and water resources (see Michigan Department of Natural Resources for more information).

7. Extend time between harvests. Complexity takes time to develop. Forests are not crops. Consider letting more time go by between treatments so that the forest can better recover from past treatments.