The Impact of Land Use History on Monhegan Island's Flora

This summer, I established enduring plots to document vegetation change on Monhegan Island. Measuring long-term vegetation change provides us with reliable data, helping us understand complex ecological and environmental interactions. This information is especially valuable in an age of rapid environmental change characterized by a warming climate, increased storm intensity, forest fragmentation, and other anthropogenic disturbances. Monhegan is an interesting study site due to its unique history and its wildland conservation status.

Monhegan Island can be split into three sections with distinct land use histories: the old-growth Cathedral Woods, the village, and the secondary forest. I focused my study on the Cathedral Woods, which has been continuously forested, and the secondary forest, which was cleared in the 1800s and used as pastureland for sheep until the 1890s. In 1954, Ted Edison formed the Monhegan Associates, vowing to conserve 375 acres of the island (including the untouched Cathedral Woods) as "wildlands," allowing nature to take its course with minimal human intervention. Paradoxically, deer were also introduced to the island in 1954; the deer grazed in the wildlands (and in the village) and acted as "ecosystem engineers," significantly altering the plant communities. By 1999, deer were removed from the island largely due to their linkage to increased incidence of Lyme Disease. In 2002, only a few years after deer removal, Rick Dyer documented Monhegan's flora as a graduate student at the University of Maine. Dyer's plots have not been preserved, but his data provided an opportunity for comparison that can help illustrate vegetation change after a quarter of a century without deer.

We used computer software to randomly generate center points for ten $200m^2$ plots in the two forest types on the island. In each $200m^2$ plot, we geolocated the large trees (with a diameter at breast height, or DBH, greater than 10 cm), noting their species, DBH, crown class, and degree of mistletoe infection. In the central $100m^2$ of each plot, we recorded the species and DBH of all woody plant saplings taller than two meters and recorded the species of all woody plant seedlings under two meters. To document the herbaceous plants in each plot, we set up two one-meter square quadrats per site, three meters from the center of the plot, due east and due west. In each quadrat, we identified and estimated the percent cover of each species.

In both forest types, we observed increases in the basal area of deciduous trees since the last vegetation survey. In the secondary forests, this included red maple, paper birch, and mountain ash. In the Cathedral Woods, this included red maple, paper birch, and chokeberry trees. The recent success of broadleaf trees is likely due to the elimination of deer browsing, as the flat, broad leaves of deciduous trees are much more palatable to deer than the spiky and chemically defended needles of coniferous trees. At the seedling level, we observed several species that were not documented in any of the plots sampled in 2002 including chokeberries (*Aronia floribunda)* and smooth witherod (*Viburnum nudum)* in both forest types and bittersweet (*Celastrus spp.),* winter berry (*Ilex verticillata),* and honeysuckle (*Lonicera canadensis*) in the forests cleared by 1873. While none of these species are favored by deer, they are thought to be grazed upon if other food sources are scarce, especially when they're seedlings. As for herbaceous plants, we observed a distinct plant community compared to 2002. In the secondary forests, there was a large increase in species diversity; we observed 37 species in 2025 compared to 15 species in 2002. Some of the most noticeable shifts include the emergence of several fern species and an abundance of wild sarsaparilla (*Aralia nudicaulis)*. Red raspberry (*Rubus idaeus)* and swamp dewberry (*Rubus hispidus)*, which were widespread in 2002, were not found in any of the plots in 2025. Swamp dewberry and other species in the genus *Rubus* are thorny; thus, they are not desirable to deer. As a result, *Rubus* plants often dominate in the presence of deer. The absence of deer likely allowed other species to flourish and outcompete raspberry and swamp dewberry. The Cathedral Woods also saw the emergence of several fern species in 2025. Additionally, in 2025, thorny plants including Japanese barberry (*Berberis thunbergii*), swamp dewberry, and the common blackberry (*Rubus allegheniensis)* were not observed in any of the plots in the old-growth forest. Overall, our study helps us understand the impacts of forest clearing and herbivore grazing on plant communities. This is especially relevant given that deer densities have been increasing across the northeast due to climate change. Revisiting these sites in the future will allow us to monitor climate-caused shifts in plant communities in a place where other human impacts are limited. Comparing Monhegan's flora to that of other temperate/boreal forests that are not conserved as wildlands may also help us understand the impacts of additional human intervention.