Department of Natural Resources
SCI-MIC Supported Research Projects
2020 Progress Reports

Deer and Northern Hardwoods in Michigan

Project Background - White-tailed deer are arguably the most important terrestrial wildlife species to the economy of the Great Lakes region. About 700,000 hunters pursue deer in Michigan each year, spending an estimated 9.75 million hunting days and generating over $1 billion in revenue. In general, the hunting community equates high deer densities to an improved hunting experience, thus harvest season quotas and land management practices that reduce deer numbers attract considerable public criticism. However, high deer densities can have negative economic and ecological consequences. For example, deer have been implicated in the decline of desirable northern hardwood forests (like oak, yellow birch and hemlock) in Michigan through browsing of tree seedlings and saplings. In some areas, herbivory by deer (and potentially snowshoe hare) undoubtedly have negative impacts on forest regeneration, which ultimately impacts future forest composition and deer habitat. However, the explanation for the decline of northern hardwood forests in many areas of Michigan is likely more complex than just deer herbivory. Other factors like past forest management (e.g., selection silviculture), forest insect and disease outbreaks, and a rapidly changing climate are also implicated in the decline.

Northern hardwood forests are one of the most valuable timber types in Michigan, both economically and for wildlife habitat. The Michigan Department of Natural Resources (MDNR) and forest products industry are interested in evaluating innovative silvicultural approaches to ensure desirable hardwood tree regeneration while minimizing deer browsing impacts. This project evaluates innovative silvicultural approaches to forest management that alter deer behavior in northern hardwood management areas to reduce browsing effects on tree regeneration. The premise is that these innovative prescriptions can be used to help mitigate deer herbivory impacts, improve seedbed quality, and provide competitive advantages for desirable tree species. The goal of the research is to identify cost-effective silvicultural techniques that allow regeneration of diverse northern hardwood forests in the presence of deer at densities that offer hunters reasonable opportunities for success.

Progress (2020) - Recall that 140 30-ac sites, ranging from Grayling to the base of the Keweenaw Peninsula, were timber harvested in the winter of 2017-2018, so vegetation on the treatment sites is entering the 4th growing season in summer 2021. Post-treatment vegetation data were collected on the sites during the summer and fall of 2019. In 2020, approximately half of the sites were sprayed with herbicides to control competing vegetation and then scarified with heavy equipment to provide suitable germination substrate for light-seeded tree species (like birch).

On a subset (n=24; called camera sites) of the 140 sites (Fig. 1), we continued to collect post-treatment data on wildlife use using trail cameras within and surrounding the sites, with an emphasis on deer. Half of the camera sites (n=12) are permanently monitored; the other half (n=12) are rotated annually in the spring. In 2020, we removed 96 cameras from the 2019 rotation sites, and deployed them in the 2020 site subset (n=12). In spring of 2021, we will have completed the first full camera rotation among our sites. To date, we have collected >3 million pictures that are being photo-tagged and archived on an ongoing basis for analysis. Due to the

large number of photos, we are working with Michigan Aerospace Corporation to train an artificial intelligence algorithm to assist with photo tagging analysis. The algorithm uses images that we tagged by visual inspection with data from other camera trapping research for training the algorithm and then assigns a probability of a photo containing a deer based on that training set. We constantly monitor the performance of the machine learning algorithm by conducting occasional checks of individual photos. Deer occupy every study site and as expected, intensity of deer use varies seasonally. Recall that we will use the photo data to quantify residence time (i.e., how long the deer stays in front of the camera) and frequency of deer use. The prediction is that residence time and deer use will decline in treatments that are tougher for deer to move through (e.g., seed tree leave top treatment).

In 2020, we collected tree survival data from our planting test in leave tops (i.e., tops from harvested trees specifically left to deter deer movement). Recall that we planted desirable browse species (i.e., red oak, yellow birch, paper birch, American chestnut; 4 of each) inside and outside of a treetop in shelterwood and seed tree treatments in the eastern Upper and northern Lower Peninsulas (8 sites). Trees were planted in a grid (1 foot spacing) in October thru November 2019. In September – October 2020 we monitored survival and browse activity on planted grids, with the prediction that trees inside of treetops will show less herbivory than those outside of treetops. Seedling survival was low (<50%) in treetops planted later in the year, with many showing signs of small mammal damage. Seedling survival was high for trees planted earlier, with lower survival and heavier browse observed outside of treetops on some sites. We will monitor these trees again in 2021.

As part of our camera maintenance schedule in 2020, we also maintained fenced exclosures in our leave top treatments. This maintenance included repairing fencing that collapsed under heavy snowfall at some sites, and repairing fencing damaged by falling trees and branches. Overall, the exclosures are functioning as intended, prohibiting deer and hare from browsing on the regenerating vegetation this offering a useful “no browse” control. In 2021, we will measure tree regeneration success inside and outside exclosures.

As part of our camera maintenance visits to sites, we deployed acoustic bat detectors on 12 sites from all three regions. This was a partnership with the U.S. Fish and Wildlife Service where they provided the detectors and data analyses if we deployed and collected the detectors. We found that 6 bat species used our timber harvest sites from early June (late start because of COVID-19) to October-November. We confirmed use by big browns, red, hoary, silver-haired, little brown, and tri-colored bats. Some of these sites are in the “heart of northern long-eared bat country” and although a single call was detected, the software could not reliably confirm that this species used any of our treatments. With our cooperation, the FWS wants us to deploy detectors again next spring for two years of data. We will use these data to quantify the nights that each species was likely present and intensity of use. We will see if there is a silviculture treatment effect on intensity of use (e.g., more use in bigger harvest gaps).

In spring and fall of 2020, we continued to use the drone that SCI-MIC purchased to fly leaf-off imagery of leave top sites and we started flying herbicide and scarification sites. We used this imagery to map leave tops and will compare these maps to deer movements collected during winter of 2020. The intent is to better describe the amount and distribution of leave tops needed to alter deer movements, thereby informing forestry prescriptions. The flights over the herbicide/scarification sites are being used to measure the amount of scarification done in the shelterwood and seed tree overstory treatments. These flights will continue again in the spring of 2021.

We used the 2020 SCI-MIC funding allocation to support camera data collection by purchasing additional cameras, SD cards, and batteries (which are swapped every 4-6 months to keep cameras running year around). We use lithium batteries for better performance during temperature extremes. Each time we swap batteries it costs approximately $1,500 so SCI-MIC support is greatly appreciated.

The research team continues to meet quarterly with MDNR staff. We are active with outreach, publishing two articles explaining the project through MSU Extension that were picked up by several local news outlets and presenting at numerous conferences and workshops. Furthermore, we built a project web site to assist with communication (https://nhardwoods.wixsite.com/nhwresearch).

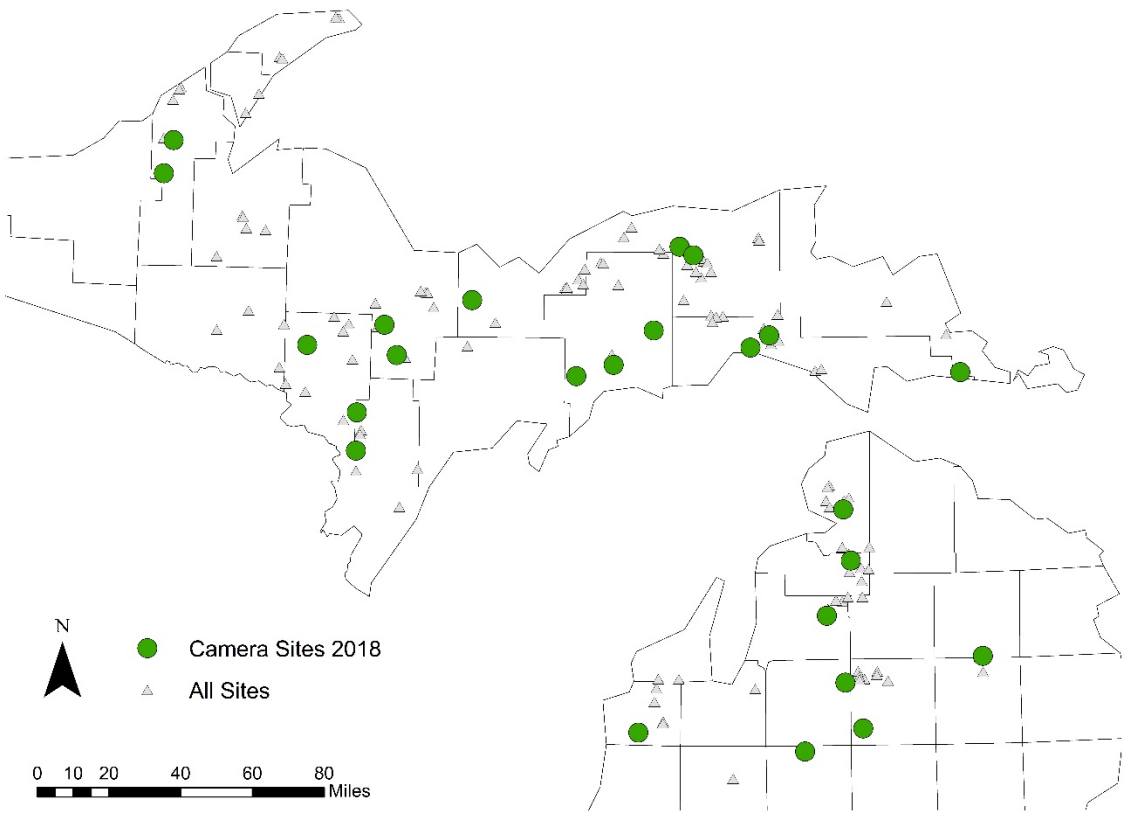

Figure 1. Locations of northern hardwood research sites that are being monitored for deer activity with remote cameras.

Partners: Safari Club International-Michigan Involvement Committee, MDNR-Forest Resources and Wildlife Divisions, Michigan State University, Hancock Timber Resources Group, and the Rohatyn Group (formerly GMO Renewable Resources), National Council for Air and Stream Improvement (NCASI), and U.S. Fish and Wildlife Service.

Timeframe and budget: Project started in the summer of 2016, with the first phase of the deer portion scheduled to end in the spring of 2021 (4+ years). The initial budget for deer work

approved by MDNR-Wildlife Division was $283,777, with equipment costs projected to exceed that budget. The forest monitoring component of the project started in summer of 2016 and is projected to run for 10 years (the time frame required to ensure that tree regeneration is free to grow). The budget for forest monitoring from MDNR-Forest Resources Division is >$600,000. In 2020, we successfully engaged the National Council for Air and Stream Improvement (NCASI) as a research partner, and they committed to $57,599 to the project from 2020 – 2022. Additionally, the MDNR – Wildlife Division approved a project extension and allocated an additional $181,676 between 2021 and 2024. These additional contributions solidified project budgets for personnel and travel associated with field data collection. A 2021allocation by SCI-MIC would be used to purchase an additional drone, allowing us to more efficiently cover our large study area.