Department of Natural Resources
SCI-MIC Supported Research Projects
2019 Progress Reports

TITLE: 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 (2019): Recall that 140 30-ac sites, ranging from Grayling to the base of the Keweenaw Peninsula, were harvested in the winter of 2017-2018, so vegetation on the treatment sites is entering the 3rd growing season. Post-treatment vegetation data were again collected on the sites during the summer and fall of 2019. On a subset (n=24; called camera sites) of the 140 sites (stratified randomly selected; 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 2019, we removed 96 cameras from the 2018 rotation sites, and deployed them in the 2019 site subset (n=12). On average in 2019, we had 261 (NLP), 231 (EUP), and 214 (WUP) camera days for each site through December 2019, with cameras currently deployed and still capturing data. We collected >1 million pictures that are being photo-tagged and archived on an ongoing basis for analysis. Due to the large number of photos collected, we trained a machine learning algorithm to assist with photo tagging analysis.

The algorithm uses ~250,000 images that we tagged by visual inspection for training, and then assigns a probability of a photo containing a deer based on that training set. This helps tremendously with reducing photo-tagging time, as moving vegetation often triggers the cameras (particularly during summer) and machine learning allows us to remove those photos automatically. We constantly monitor the performance of the machine learning algorithm by conducting occasional checks of individual photos. Every site is occupied by deer and, as expected, intensity of 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 2019, we also implemented a test of leave top (i.e., tops from harvested trees specifically left to deter deer movement) functionality for deterring browse by white-tailed deer. 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 Peninsula and northern Lower Peninsula (8 sites). Trees were planted in a grid (1 foot spacing) in October thru November 2019. We will monitor browse activity on grids, with the prediction that trees inside of treetops will show less herbivory than those outside of treetops.

As part of our camera maintenance schedule in 2019, we also maintained fenced exclosures in our leave top treatments. Each exclosure has a camera, so this maintenance included swapping SD cards and batteries on the cameras and confirming that the fencing was still intact. In some situations, we needed to cut downed trees off the fence and add additional posts to make the fencing more rigid in our heavier snowfall areas.

In spring and fall of 2019, we used the drone that SCI-MIC purchased to fly leaf-off imagery of leave top sites. We used this imagery to map leave tops and will compare these maps of leave tops 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.

We used the 2018 SCI-MIC 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 we use approximately $1,500.

The research team continues to meet quarterly with MDNR staff, and we conducted several field tours in 2019. We have been 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). Lastly, we published paper that was project related in the Wildlife Society Bulletin on effectiveness of an earthworm field survey technique (earthworms are thought to exacerbate the negative effects of deer, so at one time we contemplated trying to survey for worms and deer).

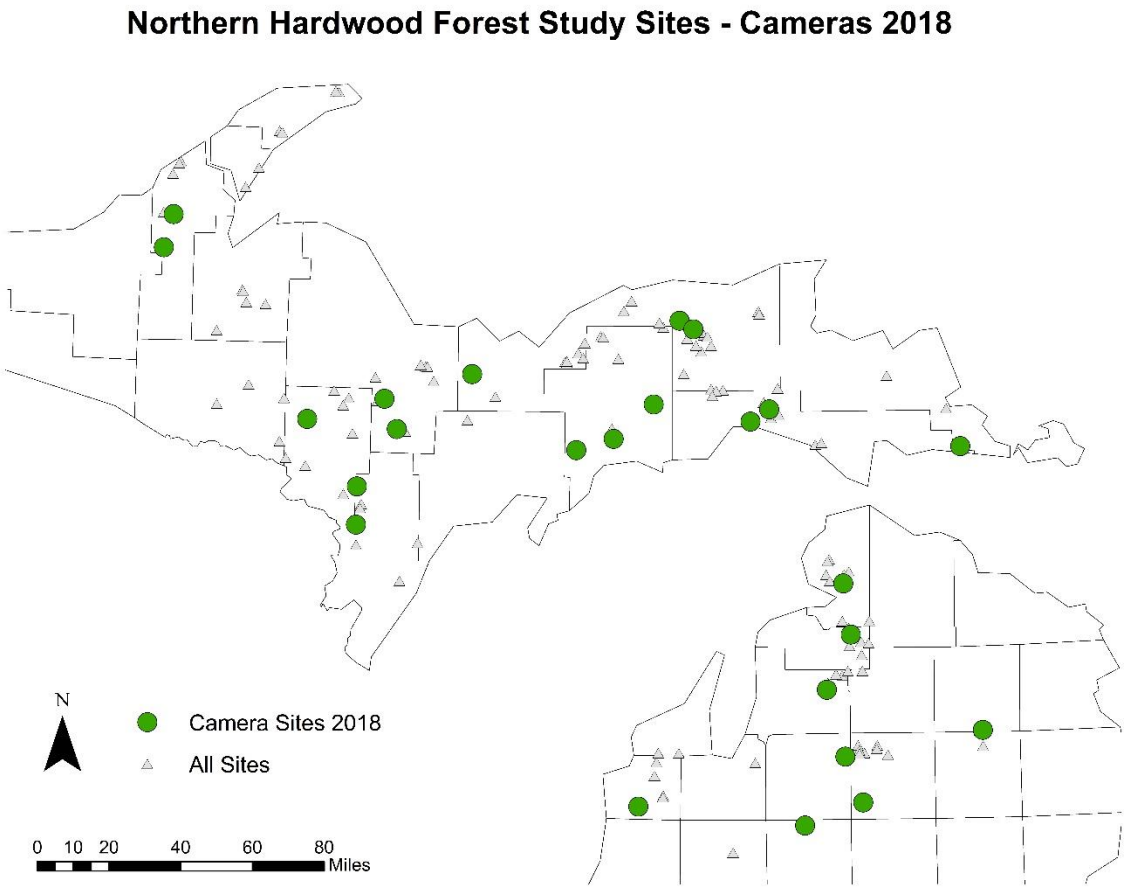

Figure 1. Locations of northern hardwood research sites that are being monitored for deer activity with remote cameras.

Partners: Safari Club International-MIC, MDNR-Forest Resources and Wildlife Divisions, Michigan State University, Hancock Timber Resources Group, and GMO Renewable Resources

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. Targeted funding request from SCI-MIC for FY2020: $4,000.