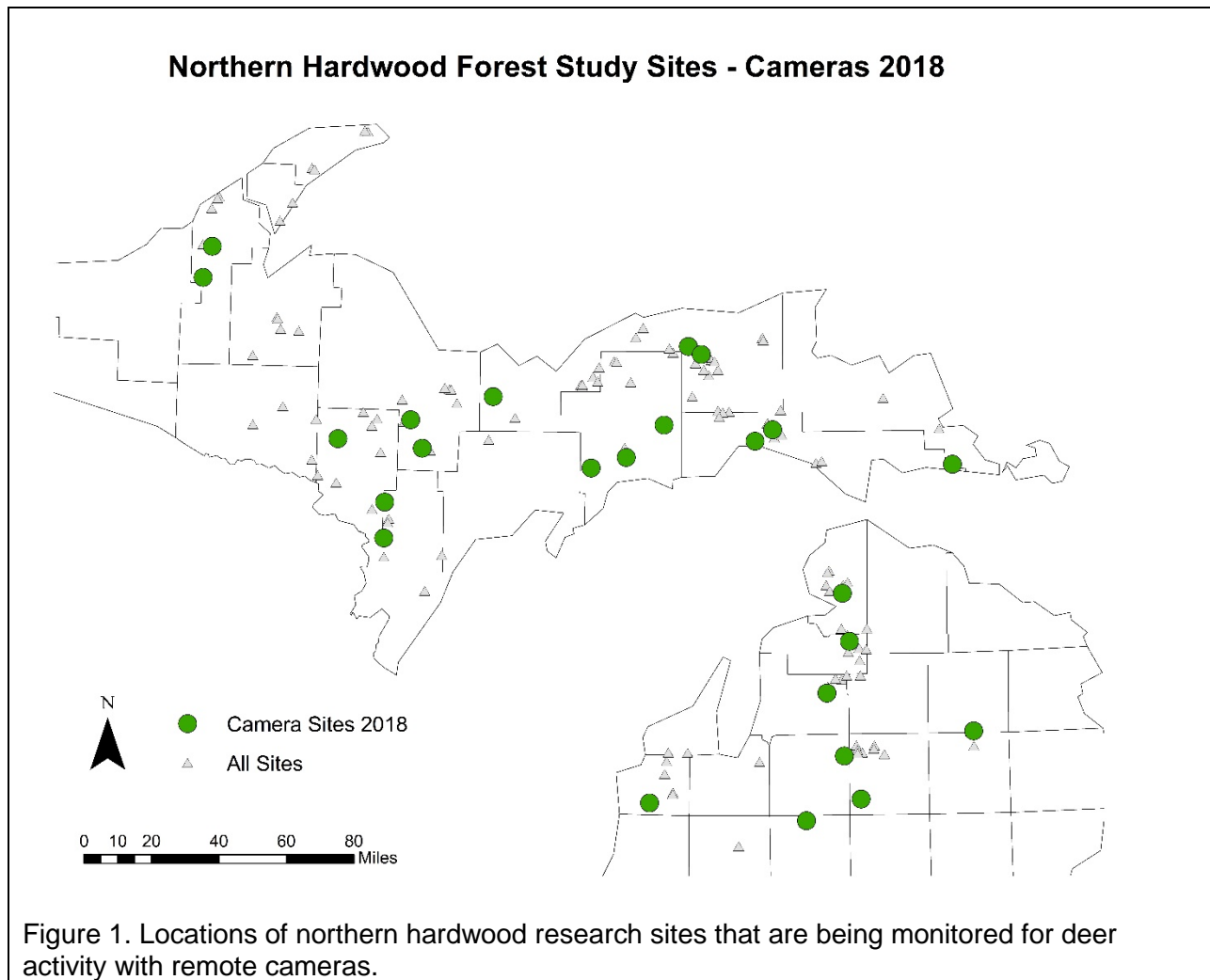## TITLE: Deer and Northern Hardwoods in Michigan

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. 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. The proposed project will evaluate innovative silvicultural approaches to forest management that alter deer behavior in northern hardwood management areas to reduce browsing affects 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 ultimate 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 (2018): All timber treatments on 141 30-acre sites distributed throughout Michigan are complete. These sites represent different combinations of site quality (i.e., tree growing potential) and deer densities (coarsely estimated). Post-treatment vegetation data were collected on all leave top treatment sites during the summer and fall of 2018. On a subset (n=24) of the 141 sites (stratified randomly selected; Fig. 1), we collected post-treatment data on wildlife use using trail cameras within and surrounding the sites, with an emphasis on deer. On average, we had 318 (NLP), 308 (EUP), and 280 (WUP) camera days for each site. We collected 100's of thousands of pictures that are currently being photo-tagged and archived for analysis.

We completed snow track surveys on all camera sites (n=48) January thru March 2018. Logging on some sites extended through June 2018, and we re-deployed cameras as logging ended with our first sites getting cameras back in January 2018. Cameras will remain on these sites for 1 year, and then rotate to new sites.

Northern Hardwood Forest Study Sites - Cameras 2018

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

We used the 2017 SCI-MIC allocation to purchase a high-end recreational drone for measuring cover of downed wood and amount of scarified soil in our timber harvest areas. Recall that our two understory treatments included leaving treetops to deter deer herbivory and scarification

and herbicides to create optimal growing conditions for tree seedlings. For the leave treetops treatment, the only efficient way to measure the amount and distribution of material is through aerial survey. The drone will allow us to economically photo (during leaf off) our sites, giving us high-resolution imagery to quantify cover of woody debris. We will start our leaf off surveys this winter into spring.

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.