Department of Natural Resources
SCI-MIC Supported Research Projects
2022 Progress Reports

Project Title - Deer Behavior and CWD

Project Background - Effective CWD management strategies depend on understanding how disease spreads and grows on a landscape. While DNR and its partners have developed advanced models to estimate the spread and growth of CWD in Michigan, there is a critical need to inform the fundamental process that leads to disease transmission among deer. Transmission pathways for CWD are through direct (deer to deer) and indirect (environment to deer) contacts. This research is designed to quantify how the landscape, deer density, and artificial attractants, such as bait, influence where and to what extent deer congregate. It will also provide estimates of actual physical contacts among individuals, and the accumulation and persistence of deer feces. These are all factors that influence transmission of CWD, but we have very little sound data on any one factor.

Recent studies of CWD transmission pathways in white-tailed deer (Odocoileus virginianus) have focused on common patterns of within and between group interactions of radio-collared deer. These studies imply direct contacts by assuming that animals in close proximity in time and space have an opportunity to directly contact each other; however, direct contact is not observed and likely varies from predictions. In theory, this information is useful, but practical use is limited because direct interactions among a few individuals may fail to represent potential interactions among all deer in a population. For example, interactions among unrelated deer can increase with increasing group size and at concentrated food sources. Indirect contacts are particularly important because unrelated deer are less likely to temporarily occupy the same areas and congregation behavior of unrelated deer varies seasonally. A better understanding of how deer ecology and social interactions facilitate direct and indirect contacts among deer is critical for understanding CWD transmission within populations.

Existing estimates of indirect contacts among deer are based on overlapping space-use by collared deer and do not account for important processes such as the differential shedding of infectious agents. Infectious CWD prions from cervids are shed in feces, saliva, urine, and blood and remain infectious in feces for up to 7 freeze-thaw cycles. Quantifying the accumulation and persistence of feces in different habitats would be informative for understanding the potential for disease transmission through indirect contact, particularly in the Midwest where deer frequently congregate in agricultural areas in late winter and early spring. Seasonal congregation of deer influences localized deer density and may lead to increased bioaccumulation of feces and potential for increased fecal prion seeding. While deer in northern forested regions congregate seasonally in “yards” for thermal cover and food resources, these factors are not limiting for deer from agricultural regions. Thus, we want to know if there are predictable factors influencing deer congregations, social behavior, and associations in agricultural regions of the Midwest.

Direct and indirect contact behavior among deer may be facilitated or disrupted by the presence of bait, which has been shown to alter the movement behavior of deer. In the presence of bait, deer significantly shift space use, potentially increasing opportunities for direct and indirect contact. While changes in deer movement patterns have been documented, little is known about how direct contact behaviors, or the shedding of infectious agents differ in the presence of bait.

Given the controversial nature of baiting deer in Michigan, a better understanding of potential deer behavioral changes related to bait is warranted.

A critical need for CWD management is to identify what factors influence aggregations of deer in agricultural regions and to quantify how those aggregations influence direct contacts (i.e., physical contact behavior) and bioaccumulation of feces at scales relevant for newly developed agent-based CWD models. Understanding factors that influence congregations in agricultural regions and how deer interact under these circumstances would assist in epidemiological modeling for population management and disease control actions. This research would represent a critical advancement in CWD knowledge, directly inform holes in existing disease modeling efforts, and have clear applications for CWD management.

Progress 2022 - The second field season of data collection was conducted from January 1 to April 30, 2022. We secured permission from 19 private landowners to conduct camera trapping at 10 bait sites and 9 food plots. Cameras recorded videos of deer behavior from January through the beginning of April. We recorded approximately 4,500 hours of video footage and observed 1,982 deer for behavior. We also conducted 352 roadside surveys observing deer behavior on 34 different, 3-mile long transects. We observed a total of 416 groups of deer and counted 3,390 individual deer. These data have been plotted in GIS to determine landscape-level patterns of congregation. Statistical analyses of video footage and survey data are ongoing. Additionally, we will use data collected from roadside surveys in a distance sampling framework to estimate deer abundance on the study area.

We performed fecal sampling at all food plots and bait sites beginning in March through April. Following collection, we weighed the samples, dried them in an oven, and then reweighed them. Currently, we are performing statistical analysis to compare the dry weights between food plots and bait sites.

Over forest fragments in southern Michigan, we conducted 7 infrared drone test flights in January and February 2022 to determine optimal conditions to allow for a high level of confidence for identification of deer from images. We used a Matrice 300 drone with high resolution RGB imagery to conduct the surveys. We evaluated using a Zenmuse P1 camera to generate orthomosaics of these forest fragments for large mammal detection and white-tailed deer enumeration. Twelve drone flights were conducted over 8 locations between January and February. We collected high resolution imagery of 7 forest fragments ranging in size from 18 to 52 acres.

Graduate student, Samantha Courtney, gave an oral presentation at The Wildlife Society Conference titled: “Impacts of Supplemental Feeding on Deer Behavior and Risk for Disease Transmission”. She also gave a poster presentation at The Wildlife Disease Association Conference titled: “Risky Business: Deer Behavior and Chronic Wasting Disease”. Apart from these two professional conferences, she presented the research in several other professional arenas. In September, she spoke with a local National Deer Association Co-op to talk about the research and impacts on deer management. Samantha spoke at the Midwest & Southeast Deer and Wild Turkey Meeting with an oral talk titled: “Does Supplementally Feeding Deer Increase Risk of CWD Transmission in Deer”. The United States Department of Agriculture-Wildlife Services agency expressed an interest in the project. Samantha gave a presentation titled: “Impacts of Supplemental Feed and Landscape Variables on CWD Transmission”. Graduate student, Jack Magee, presented at the Drone Symposium held at The Wildlife Society Conference with an oral presentation titled “Benefits and Limitations of Using an Uncrewed Aircraft Vehicle to Survey Large Mammals in Forest Fragments”.

Partners - DNR, MSU-Boone and Crockett Quantitative Wildlife Center and Applied Forest and Wildlife Ecology Laboratory, SCI-MIC

Timeframe and budget - This project was initiated in winter 2021 and is now extended through 2024. Total cost of this project exceeds $400,000 plus in-kind services from MSU and DNR.
