Department of Natural Resources
SCI-MIC Supported Research Projects
2023 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 2023 – We completed the final field season of data collection from January 1 to April 30, 2023. We conducted a total of 986 roadside surveys and recorded observations of deer behavior on 35 transects. We observed 969 groups of deer and tallied 7,375 deer as part of these groups. These data have been plotted in GIS to determine landscape-level patterns of congregation. We secured permission from 18 private landowners to conduct camera trapping at 10 bait sites and 8 food plots. We completed processing video footage 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.

Using a combination of *R* and ArcMap, we plotted groups of deer observed during roadside surveys to model factors associated with group size and location. Courtney (2023: Chapter 1) concluded that larger group sizes were observed in fields consisting of larger areas of corn and forage crop. Group sizes increased as distance from buildings increased and smaller group sizes were associated with residential and forest cover types.

We performed a third year of fecal sampling at food plots, bait sites and areas where deer naturally congregate starting January 9 and ending April 28. Following collection, we dried and weighed the fecal samples from all sites. Currently, we are performing statistical analysis to compare the rate of fecal deposition between food plots, bait sites, and areas where deer were observed congregating in the absence of artificial attractants.

We conducted 48 drone surveys across 8 deciduous forest fragments in southcentral Michigan with thermal and high resolution RGB sensors from January through March. We will be using this set of spatiotemporally replicated surveys and a double-observer protocol to investigate how environmental factors including snow coverage, solar altitude, and cloud cover, influence the detectability of white-tailed deer in thermal and high-resolution aerial imagery. This analysis will identify optimal conditions for drone surveys and improve our level of confidence for identifying areas where deer naturally congregate in forested habitats.

Graduate student, Jack Magee gave an oral presentation at the Conservation Drone Summit Texas 2023; Investigating Environmental Impacts on White-tailed Deer Detectability: Insights from Thermal and High-Resolution Imagery Analysis.

In May 2023, graduate student Samantha Courtney was hired as the Assistant Deer Biologist for West Virgina DNR and she successfully defended her MS thesis in September 2023.

Partners - DNR, MSU 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.
