**Monitoring Alabama White-tailed Deer Populations to Inform Future Decision-Making**

Annual Performance Report

1 October 2023 – 30 September 2024

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**INTRODUCTION**

The white-tailed deer (*Odocoileus virginianus*; WTD) is the most widespread and abundant large herbivore in North America and is the most frequently hunted big-game species across the eastern United States. In Alabama, the WTD is the highest priority wildlife species from a state management focus. Hunting for WTD in Alabama produces economic impacts of ~$1 billion in Alabama (Responsive Management 2022), and the corresponding WTD license sales drives much of the wildlife management budget of the Wildlife and Freshwater Fisheries Division (DWFF). The species is similarly important from animal damage (e.g., vehicle-deer collisions) and recreational viewing perspectives (Cook and Gray 2003, Hussain et al. 2007). With an estimated 1-2 million wild deer in Alabama, the species shapes Alabama’s terrestrial ecosystems through its roles as an herbivore, prey species, and resource for scavengers (Rooney 2001, Cook and Gray 2003, Coté 2011). Given the importance of the species, a scientifically defensible, data-driven basis for Alabama WTD management decision-making by the DWFF is a fundamental expectation of stakeholders.

The ability of DWFF to make data-informed decisions would be greatly enhanced if currently collected data (e.g., hunter surveys, game check stations, Deer Management Assistance Program) and potentially additional data can be integrated into formal population-estimation and projection models to better monitor WTD herd size and population structure. A WTD population model is a fundamental part of decision analyses, ideally coupled with model modules linking deer population attributes to hunter satisfaction, economic impacts, etc. (Converse et al. 2013, Robinson et al. 2016). A broad variety of deer population model platforms are available or can readily be developed, from deterministic spreadsheet models (Starfield 1997) to stochastic matrix models (Robinson et al. 2016) to individual-based models (agent-based models; e.g. Belsare and Stewart 2020). Similarly, there are many options for collecting WTD population data at a range of scales, from research-grade camera trapping and thermal surveys to short-term telemetry studies to state-wide pregnancy studies to citizen-science camera and observation data (e.g., Wiggers and Beckerman 1993, Keever et al. 2017, MacMahon et al. 2021, Forsyth et al. 2022). By integrating data from diverse sources, we may be able to improve precision of deer population parameters which will scale up to improve efficiency and defensibility of harvest decisions.

For this project, our team has partnered with DWFF with the goal of leveraging multiple types of data to estimate WTD demographic parameters at multiple spatial scales. The total period of performance for this project is 1 July 2024 through 30 September 2029. This report provides an update on progress we have made towards our four project objectives during the first fiscal year, 1 July 2024 through 30 September 2024. Below we describe each objective, the progress we have made, preliminary results, and note any significant deviations from our initial plans.

**OBJECTIVE 1**. Develop modeling, monitoring, and decision-analysis frameworks in preparation for subsequent project objectives.

*Methods and actions towards accomplishing objective*

* All AU personnel met on Tuesday, 1 October 2024 for 2 hours to discuss plans for initiating a framework. During that meeting, we agreed on the basic outline described in Figure 1 for project evolution.
* AU personnel will be meeting again on 11 October 2024 to prioritize resources needed from ADCNR.

*Results of project actions*

* We have decided that team meetings will occur monthly going forward to help with developing decision analysis scenarios.
* We also plan to start establishing quarterly meetings with ADCNR personnel to help steer relevant management scenarios for evaluating our modeling approaches. We will also use these meetings to inform ADCNR personnel about our modeling progress, allow them to ask questions and provide feedback.

*Significant deviations* – None to report

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**Figure 1**. A flowchart describing the sequence of major actions and responsibilities on this project. Time moves from left to right.

**OBJECTIVE 2**. Summarize and evaluate value of existing Alabama WTD harvest information.

*Methods and actions towards accomplishing objective*

We posted an advertisement for a MS position, sorted through over 100 applications, and interviewed approximately 3 candidates. We then selected Conner Mills to coordinate this objective as part of his MS thesis. In his first 6 weeks, Conner took the following steps on this objective:

* He has been reading daily to better understand the current state-of-the-art tools for modeling deer populations from harvest data.
* He enrolled in Advanced Analysis for Ecological Sciences, Research Methods, and GIS Applications in Natural Resources and has completed his first 6 weeks of class.
* He has begun spatially mapping deer harvest data available from the ADCNR website.

*Results of project actions*

* Conner has greatly improved his statistical modeling, R coding, and geospatial modeling capabilities.
* He is also now familiar with the data structures required for reconstructing deer populations and has begun developing a list of resources required from ADCNR.

*Significant deviations* – None to report

**OBJECTIVE 3**. Identify, evaluate, and compare integrated WTD monitoring alternatives.

*Methods and actions towards accomplishing objective*

We posted an advertisement for a PhD position and sorted through nearly 50 applications. We interviewed 3 candidates and selected Rylee Tomey to coordinate this objective as part of her PhD dissertation. Rylee is currently finishing her thesis and will formally start working on the project in January 2025. In the meantime, she took a course called “Species Distribution and Ecological Niche Modelling in R” through Physalia Courses.

*Results of project actions*

* Rylee has developed advanced distribution modeling skills that will be extremely useful when mapping WTD habitat. This will be critical for developing habitat suitability models that she will use in her population modeling.

*Significant deviations* – None to report.

**OBJECTIVE 4**. Evaluate trade-offs of alternative decision-modeling approaches.

This specific objective cannot be accomplished until we have made substantial progress on the previous three objectives. That is, we must first develop the models based on current and integrated datasets before we can compare them in terms of their value for decision-making. Thus, all progress described for the objectives above should be considered progress towards this objective.

**DISCUSSION**

As noted above, we made substantial progress in the first 6 weeks of this project. We hired 2 graduate students, outlined a framework for completing the project over the next 5 years, and took substantial steps towards building our first WTD population models. In the second fiscal year, we look forward to: finalizing our modeling, monitoring, and decision-analysis frameworks; gathering data from ADCNR and other available sources; summarizing these data; and developing and reporting on prototype models.

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