White-tailed deer (*Odocoileus virginianus*) winter resource selection in northern Wisconsin, *Executive Summary*

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Introduction

Resource use patterns are shaped through adaptive tradeoffs (Southwood 1977), and wildlife select resources with respect to time and space to increase survival (Boyce and McDonald 1999; Kunkel and Pletscher 2000), and ultimately fitness (DeCesare et al. 2014). Our study species was the white-tailed deer (*Odocoileus virginianus*) which has large social and economic importance throughout North America. Understanding factors shaping resource use patterns for white-tailed deer is critical for their conservation.

Objective

Model white-tailed deer resource selection through spatially explicit habitat variables.

Required data

This project required spatial locations of deer using radio-collared individuals as part of the 2011-2014 deer survival study in Northern Wisconsin. Data for physical landscape factors included land cover (Wiscland 2.0) and water (WDNR HYDRO 24k Waterbodies).

Methods

We modeled 3rd order (site) habitat selection using a resource selection function (Manly et al. 2002). Resource Selection Functions (RSF's) offer the ability to infer resource use patterns among factors influencing selection at different scales including forage availability, climate, and terrain features (Boyce 2006). The RSF model is a logistic regression that compares the probability of selecting certain resources compared to other available resources. Because locations of individual deer were not independent, we incorporated a mixed-effects model where the fixed variables are spatially varying physical landscape factors of interest and the random variable is the individual deer (Gillies et al. 2006). We created *a-priori* models and used AIC for model selection. We used model averaging to estimate β values for each habitat feature and to create a heat map to identify core areas for deer conservation.

Results

White-tailed deer preferentially selected for forage and water. This result was congruent with our expectation that resource selection would be mostly influenced by food availability. Water was the most important component of deer selection behavior. We suggest that selection for open water, which is frozen during the winter season, may reflect predatory avoidance behavior where open areas could provide escape routes. Results of our heat map (Figure1) stress core areas of deer resource selection and can be used by wildlife managers in conservation planning and land management practices.