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Article

An empirical evaluation of landscape energetic models: Mallard and American black duck space use during the non-breeding period

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ABSTRACT

Bird conservation Joint Ventures are collaborative partnerships between public agencies and private organizations that facilitate habitat management to support waterfowl and other bird populations. A subset of Joint Ventures has developed energetic carrying capacity models (ECCs) to translate regional waterfowl population goals into habitat objectives during the non-breeding period. Energetic carrying capacity models consider food biomass, metabolism, and available habitat to estimate waterfowl carrying capacity within an area. To evaluate Joint Venture ECCs in the context of waterfowl space use, we monitored 33 female mallards (Anas platyrhynchos) and 55 female American black ducks (A. rubripes) using global positioning system satellite telemetry in the central and eastern United States. To quantify space use, we measured first-passage time (FPT: time required for an individual to transit across a circle of a given radius) at biologically relevant spatial scales for mallards (3.46 km) and American black ducks (2.30 km) during the non-breeding period, which included autumn migration, winter, and spring migration. We developed a series of models to predict FPT using Joint Venture ECCs and compared them to a biological null model that quantified habitat composition and a statistical null model, which included intercept and random terms. Energetic carrying capacity models predicted mallard space use more efficiently during autumn and spring migrations, but the statistical null was the top model for winter. For American black ducks, ECCs did not improve predictions of space use; the biological null was top ranked for winter and the statistical null was top ranked for spring migration. Thus, ECCs provided limited insight into predicting waterfowl space use during the non-breeding season. Refined estimates of spatial and temporal variation in food abundance, habitat conditions, and anthropogenic disturbance will likely improve ECCs and benefit conservation planners in linking non-breeding waterfowl habitat objectives with distribution and population parameters. Published 2015. This article is a U.S. Government work and is in the public domain in the USA.

Figures in this publication