United States Department of Agriculture

Research highlight from APHIS Wildlife Services, National Wildlife Research Center

Introduction of captive-bred white-tailed deer is infeasible for chronic wasting disease management in free-ranging populations.

Chronic wasting disease (CWD) is a contagious, fatal prion disease affecting cervids, including white-tailed deer (WTD). The high transmissibility and long environmental persistence of CWD have challenged its management in both farmed and wild WTD populations, leading to a need for new approaches. Research has demonstrated that susceptibility to CWD and other prion diseases is governed by the prion protein gene.[1, 2, 3] Although a clear mechanism has yet to be demonstrated for other genes, recent work[4, 5] has sparked interest in leveraging numerous genes to reduce susceptibility through selective breeding of farmed cervids. This has led to an interest in introducing captive-bred deer into wild populations.

Study Objectives

To evaluate the potential effectiveness of releasing captive-bred WTD as an approach to CWD control.

Methods

NWRC researchers and collaborators developed an individual-based, genetically explicit model of two WTD populations: one free-ranging and one captive. The model simulates selective breeding for lower susceptibility in the captive population, mimicking current guidelines[6]. Introductions are simulated, moving 100 individuals (~1% of wild population size) or 1000 individuals (~10% of wild population size) from the captive population into the wild population annually for 1, 5, or 10 years. The model records the mean and standard deviation of susceptibility to evaluate genetic responses to introductions over a 30-year period.

Key Findings

- Changes in susceptibility in the wild population were generally small (minimum: -0.01 (± 0.002 SD), maximum: -0.6 (± 0.0271 SD)).
- No introduction scenario was able to align average susceptibility in wild and captive populations.
- Changes in variation in susceptibility (the standard deviation) were short-lived, decaying over the 30-year surveillance period regardless of conditions.
- For a single population, the most effective scenario would require introducing 10,000 captive-bred deer over the course of a decade, which translates to introductions of 10,000s or 100,000s of deer each year for up to a decade at the state level.

What This Means

- Introductions of captive-bred WTD to wild populations will yield limited benefits, even for the most extreme scenarios modelled, which are logistically infeasible at the state level.
- This approach will likely have low to negative return on investment while posing a risk to ecological systems and public recreation.

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