

Stress Associated with Invasive Eastern Cottontails Is Mitigated by High Quality Habitats

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How do you cope with stress?

Introduction

- Ecosystems broadly face the localized (small-scale) and broad-scale influence of human activities
- Conservation practitioners and environmental managers struggle to identify and mitigate threats
- Traditional approaches to conservation science focus on observable measures of population health

What is wildlife physiology?

- Focuses on mechanisms underlying conservation problems
- Key benefit
 - Cause-and-effect relationships



Traditional approach

Environmental stressor (i.e. invasive competitor)



Declining population

Wildlife Physiology

Environmental stressor (i.e. invasive competitor)



Physiological biomarkers (i.e. elevated GC concentrations)



Reduced physiological condition



Lower survival likelihood for individuals

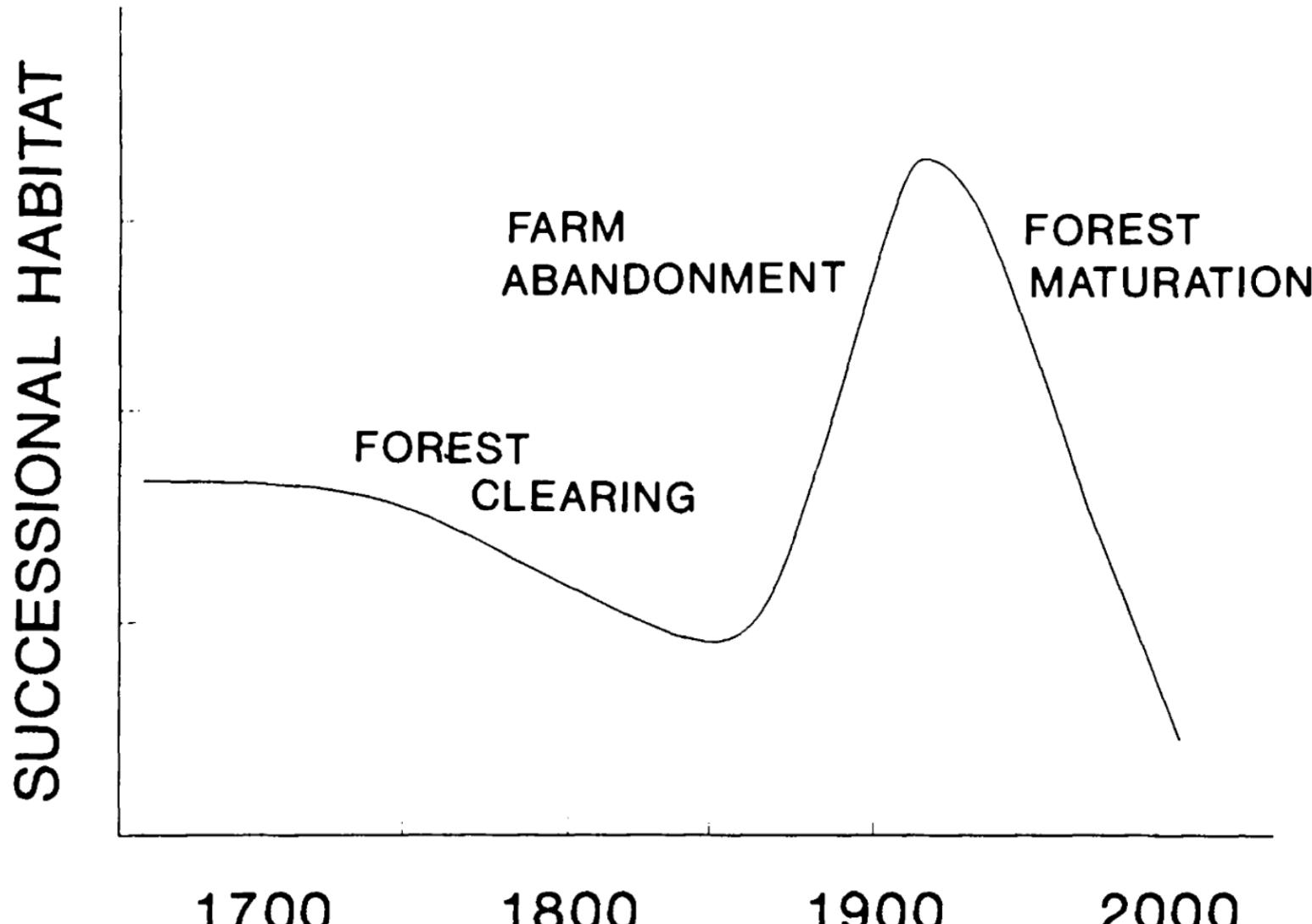


Declining populations

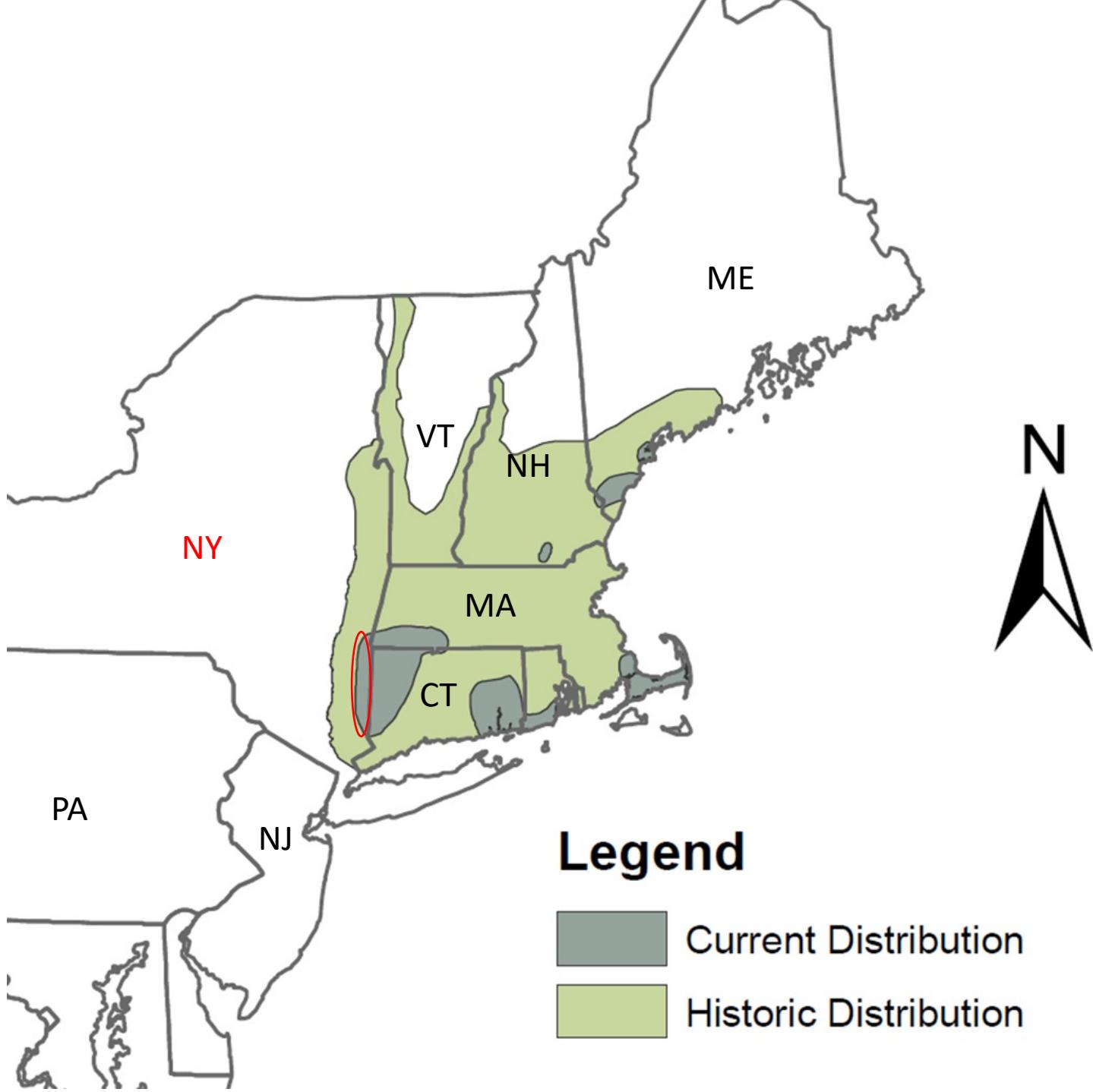
Application of wildlife physiology

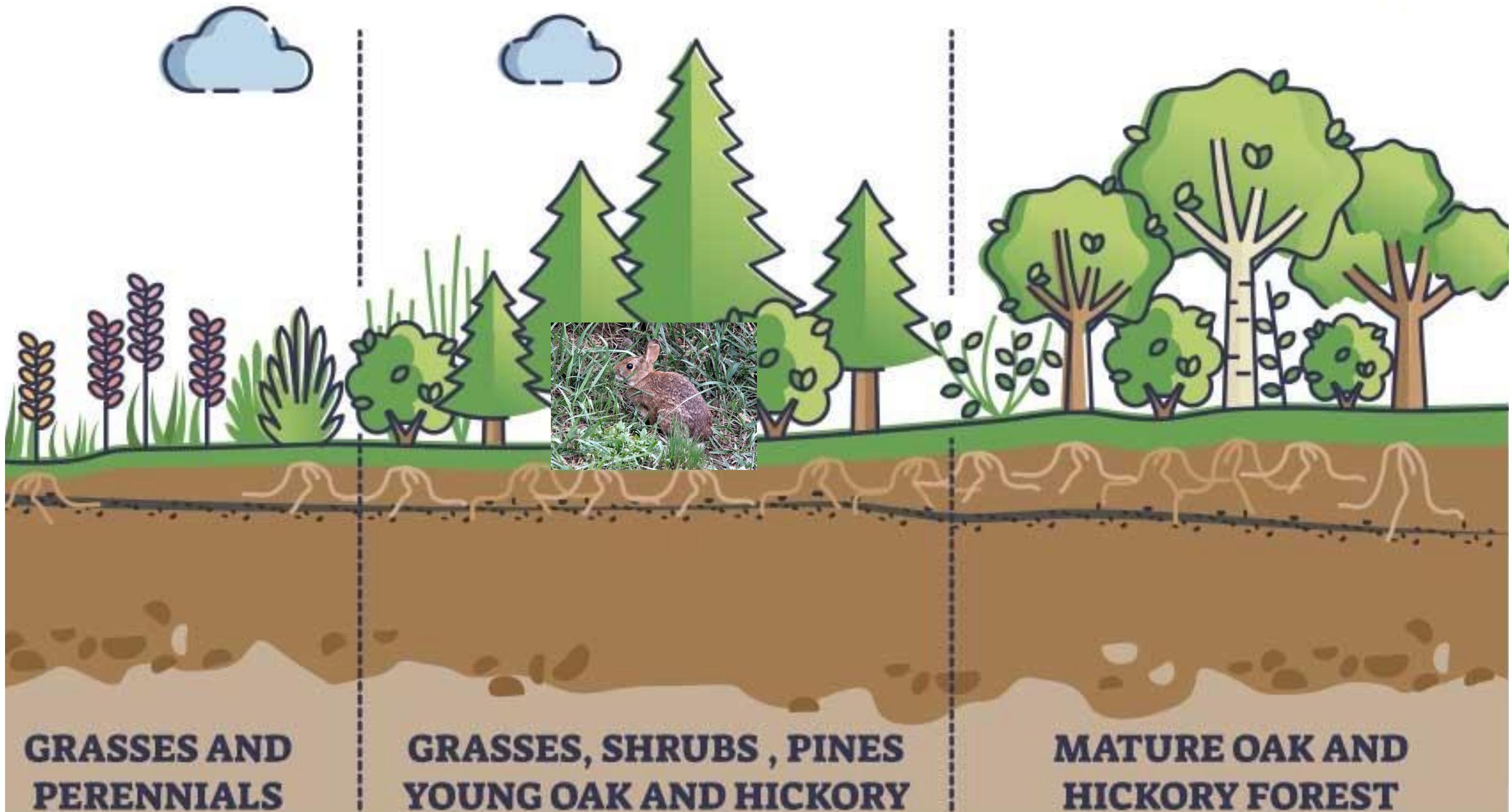
- Detecting changes in population before observable decline
 - Preventative vs reactive approach to conservation
 - Potential for adaptive management
- Policy standpoint

Land use change in New England (1650-present)



From Litvaitis 1993, *Conservation Biology*





Potential Environmental Stressors

- Resource competition
 - Eastern cottontails
(*Sylvilagus floridanus*)

- Invasive plants
 - Japanese barberry
(*Barberis thunbergii*)



New England Cottontail



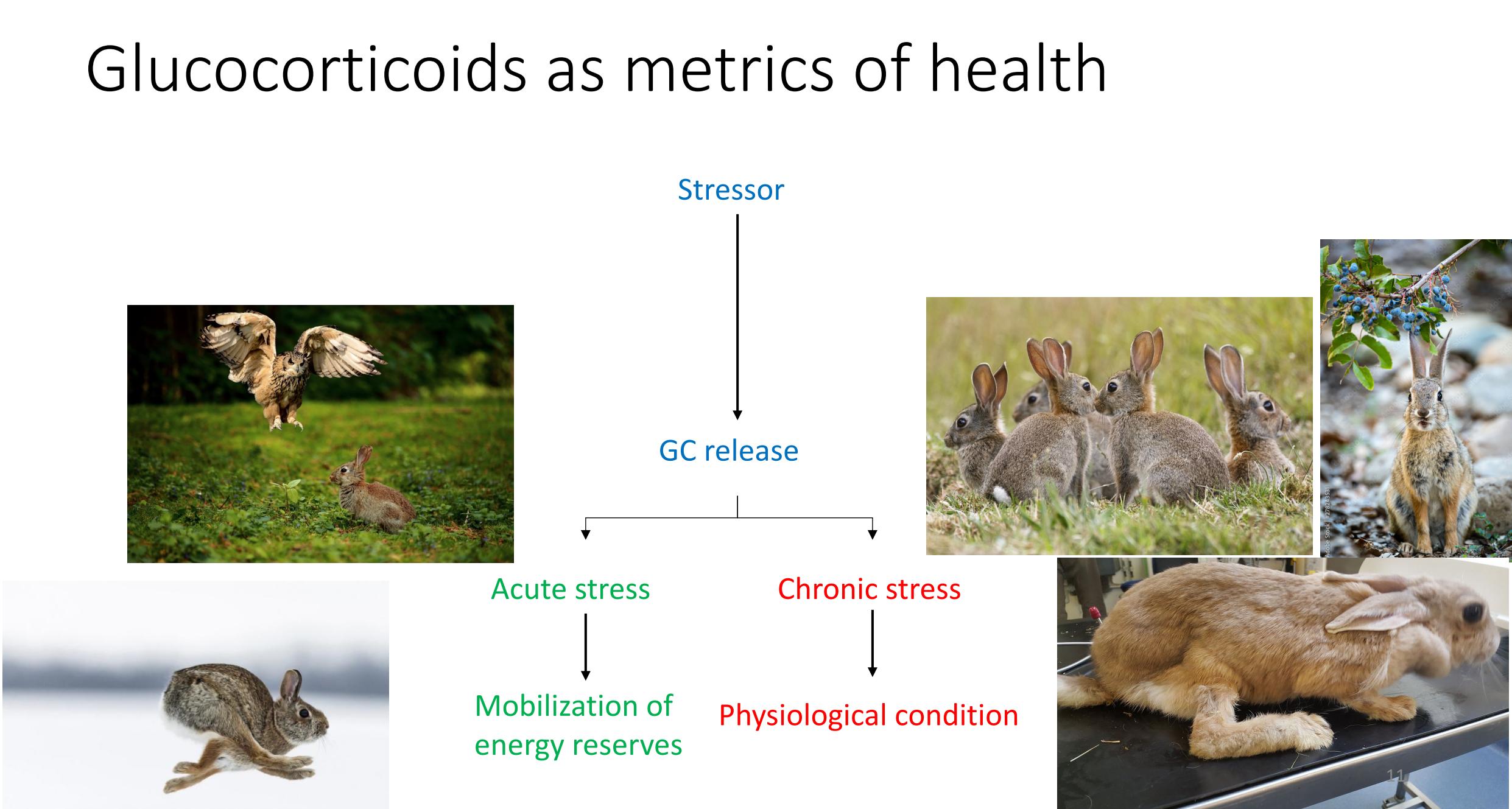
Eastern Cottontail

Population Monitoring

- Current methods assessing individual health and population trajectory have drawbacks
- Physiological and fitness-related metrics
 - Fecal glucocorticoid metabolites (FGMs)

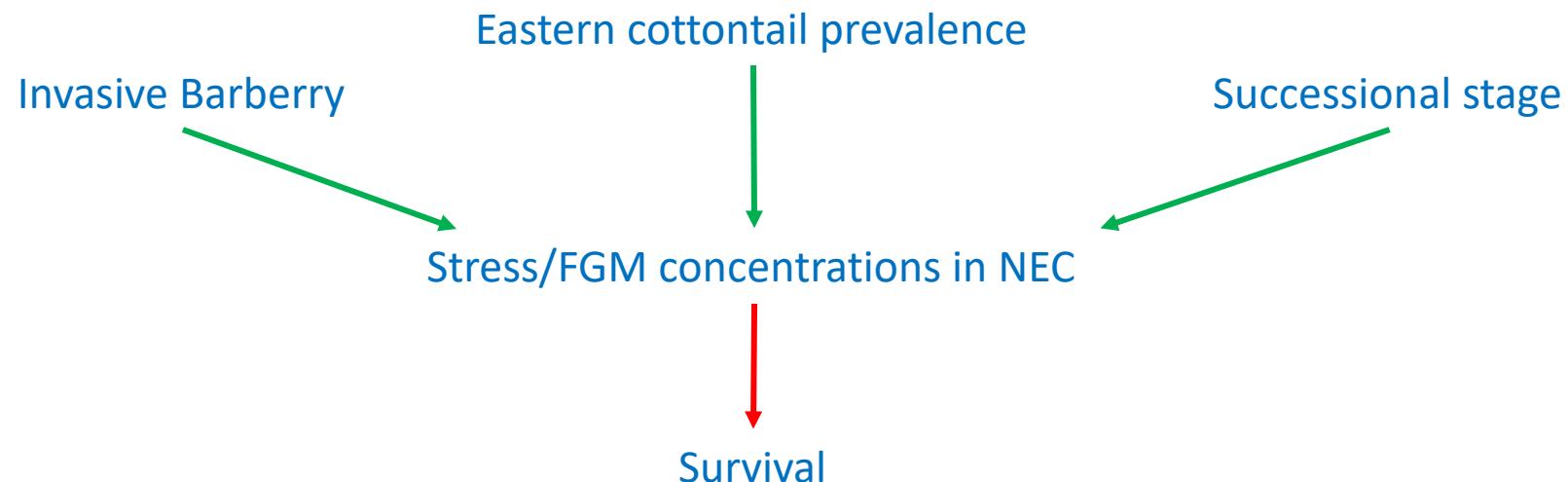


Glucocorticoids as metrics of health



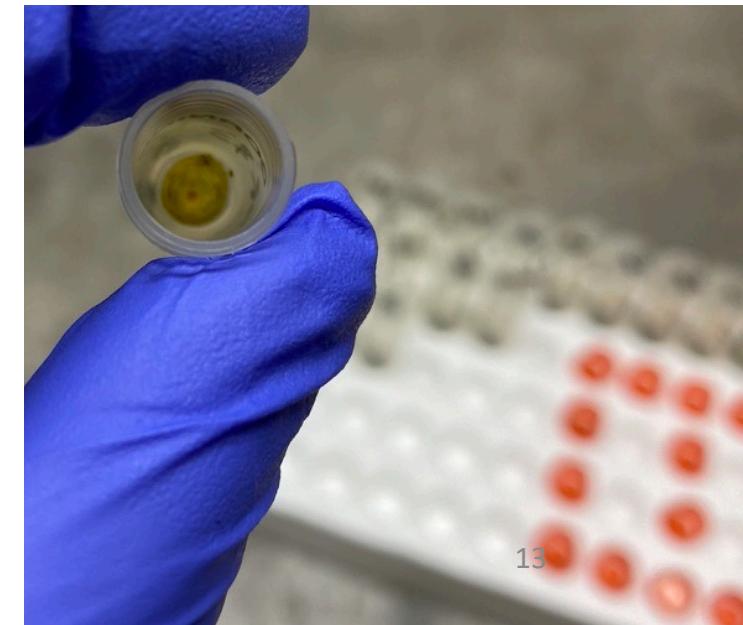
Research Question and Prediction

- **Research Question:** How do habitat and environmental stressors affect health in New England cottontails?



Methods: Sample Processing

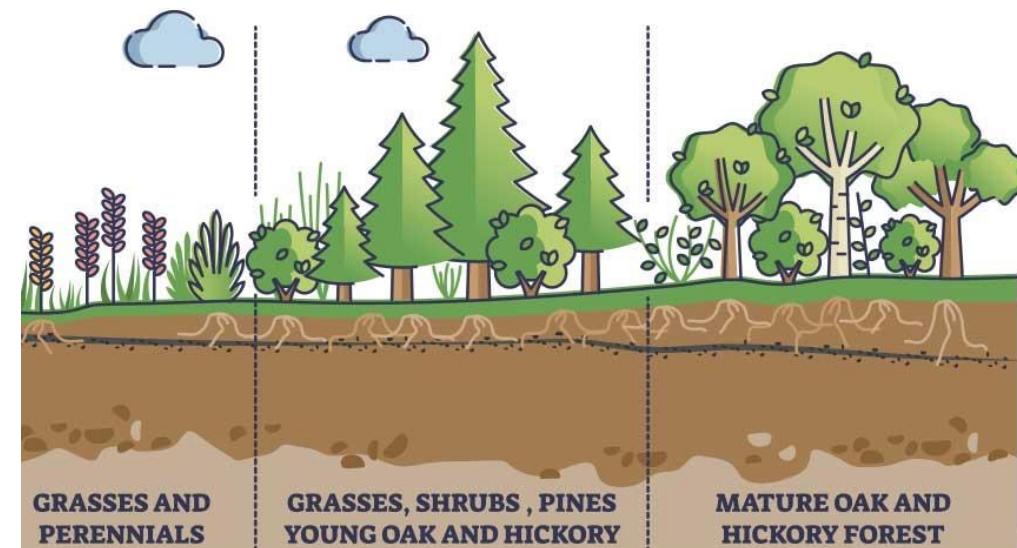
- 165 fecal samples stratified across sites with varying barberry density and either low or high eastern cottontail prevalence
- To prepare samples, we extracted FGMs and dried extractions.
- We then used Corticosterone EIA kits (Arbor Assays) to quantify FGM concentrations



Methods: Statistical Analysis

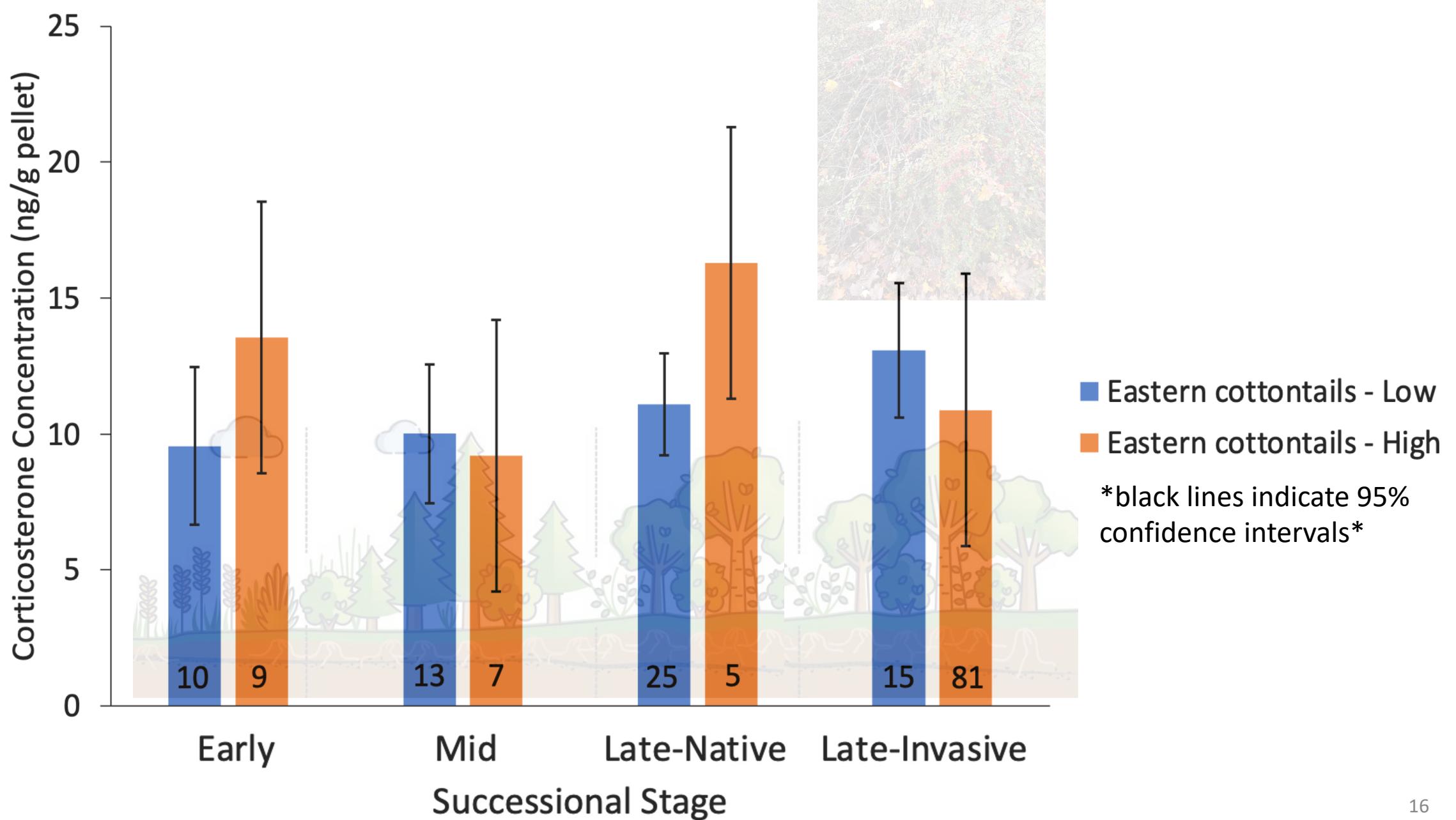
- We constructed mixed effects models in R (*lme4 package*), with the following variables and used AIC values for model selection:

- **Response variable:**
 - FGM concentration in NEC
- **Predictor variables:**
 - Eastern cottontail prevalence
 - Japanese barberry stem density
 - Successional stage
 - Site (random effect)

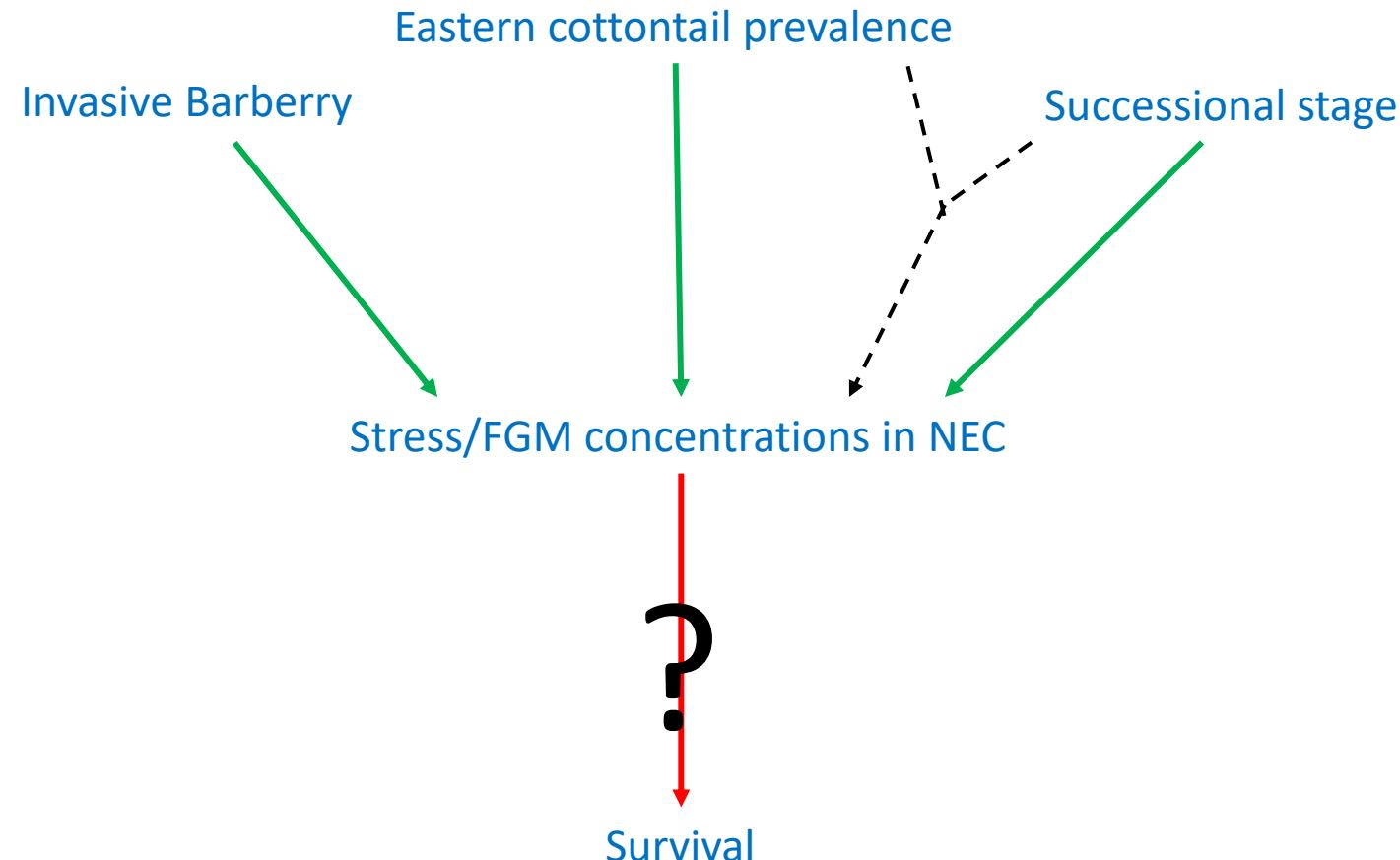


Results: Model Evaluation

<i>Model Description</i>	<i>K</i>	<i>AIC</i>	<i>dAIC</i>	<i>AIC weights</i>
<i>Eastern cottontail + successional stage + eastern cottontail * successional stage</i>	10	962.33	0.00	0.98
<i>Barberry density + eastern cottontail + successional stage + eastern cottontail * successional stage</i>	11	970.59	8.26	0.02
...
<i>Null Model</i>	3	979.81	17.48	0.00
...

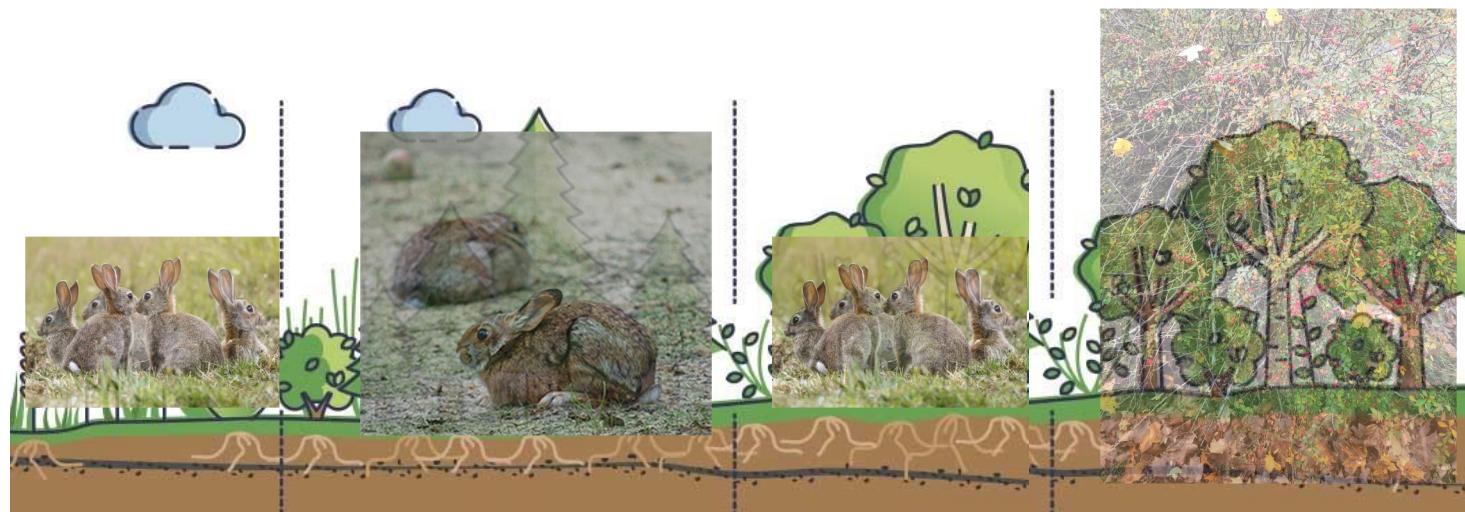


Recap of Findings



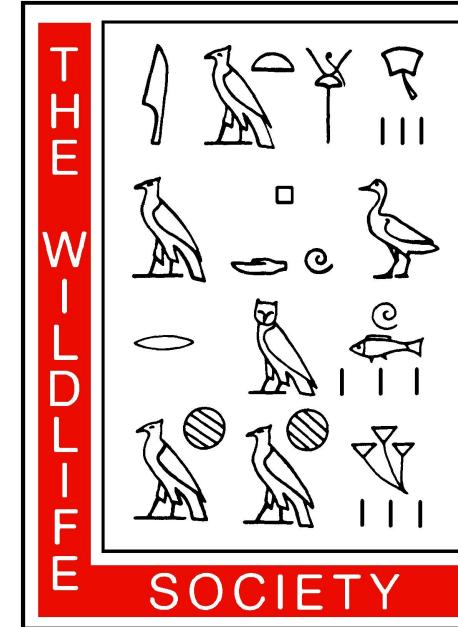
Broader Implications

- Establishes link between habitat, FGMs, stress, and physiological condition
- These findings can inform management decisions to focus conservation efforts on:
 - Preserving habitats where the competitive effects of Eastern cottontails are ameliorated (mid-successional and late-invasive*)
 - Mitigating effects of Eastern cottontail competition in early and late-native stages



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OK

Questions/Comments?

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WE NEED TO TALK

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