NSRC Progress Report 2022

Integrating Genetic and Ecological Data Using a New Circuit Theory Approach to Measure and Map Wildlife Connectivity across the Northeast

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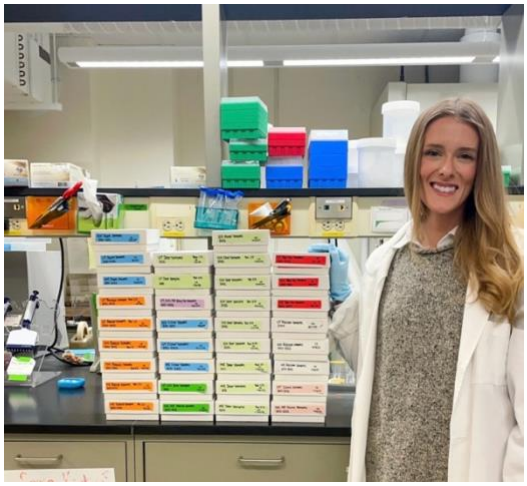
Project Abstract

NSRC researchers will integrate ecological and genetic data using a new circuit theory approach to map connectivity for 9 managed species with high ecological, economic, and cultural importance: moose, deer, bear, bobcat, coyote, red fox, fisher, marten, and turkey. The goal is to provide a precise and comprehensive depiction of wildlife connectivity across the region that can be used to support management decision-making at multiple spatial scales. Researchers will apply the approach to the Green Mountain National Forest with partners at the USDA Forest Service to evaluate effects of routine forest management activities on connectivity and improve decision-making that maximizes benefits for species while considering other objectives. They will develop a decision-making tool for the Green Mountain National Forest that can be applied to other forest management issues in the region.

Progress in 2022

We continued an extensive effort to collect genetic samples for eleven terrestrial wildlife species across the three-state study area (Vermont, New Hampshire, and Maine). Our sample collection effort involved regular coordination and meetings with collaborators at the Vermont Fish and Wildlife Department, New Hampshire Fish and Game Department, Maine Department of Inland Fisheries and Wildlife, and USDA Wildlife Services. In cooperation with our partners, we collected samples from big game reporting stations, furbearer necropsy sessions, individual trappers and hunters, and road killed animals. We completed sample collection in January 2023, with a total of 1,149 samples across all species (see table below). These samples will be used to develop species-specific, genetic-based landscape resistance surfaces and will be combined with species distribution data to visualize wildlife connectivity and gene flow across the Northeast.



Graduate student Caitlin Drasher with samples collected as part of this project.

The full-time graduate student working on the project (Caitlin Drasher, Ph.D. program) coordinated sample collection efforts and completed a dissertation proposal defense and comprehensive exams in 2022. She also presented connectivity modeling work and NSRC research updates at The Wildlife Society's Annual Conference in Spokane, Washington.

Species	Vermont	New Hampshire	Maine	Total
Bear	15	47	0	62
Bobcat	85	38	89	212
Coyote	41	28	21	90
Deer	65	157	89	311
Fisher	76	18	33	127
Gray Fox	12	17	12	41
Marten	0	8	9	17
Moose	0	21	0	21
Raccoon	37	38	38	113
Red Fox	20	19	38	77
Skunk	36	23	19	78
TOTAL	**387**	**414**	**348**	**1,149**

Number of genetic samples (tissue/hair) collected from eleven species across Vermont, New Hampshire, and Maine during 2021-2022.

Problems or Changes

We were able to meet our original sample collection target of 100 samples for bobcat, deer, fisher, and raccoon. We also collected sufficient sample numbers for other target species including bear, coyote, red fox, and skunk. Additional samples were collected for moose and marten; however, we will be using samples collected from previous studies to develop connectivity models for these two species. We decided to exclude gray fox from the analysis due to an insufficient number of samples (n=41) with less ideal geographic distribution.

Plans for 2023

Genetic analyses (DNA extraction and amplification of microsatellite and SNP markers) will be completed through the Mammalian Ecology and Conservation Unit at University of California, Davis, directed by Dr. Benjamin Sacks. We anticipate genetic analyses to begin in spring of 2023 and be completed by early summer. During this time, we intend to develop our final modeling approach using genetic data for moose. We will then apply the approach to the genetic results to create models of landscape resistance for the other species. Once completed, models will be used to map resistance for each species. Maps will then be used as an input to generate the circuit-based connectivity models and maps across the region. Final models and maps will inform development of a decision-making framework for Green Mountain National Forest partners in management scenario planning.

Collaboration

As mentioned above, our project coordinates with several state agencies. Our project also collaborates with partners at the US Forest Service Green Mountain and Finger Lakes National Forests. We intend to use our connectivity analyses to inform decisions related to forest management scenarios in Green Mountain National Forest. We have met with our main collaborator and communicate updates on our progress. In 2023, we intend to work closely with partners to develop management scenarios and decision-analysis tools.