NATIONAL *fish, wildlife & plants* CLIMATE ADAPTATION STRATEGY

Project Title: Identifying Climate Resilient Sites for Conservation of Terrestrial Species and Habitats in the Northeast and Mid-Atlantic

Headline Title: Resilient Sites in the Northeast

Brief Summary (Abstract): Conservationists need a method through which to conserve biological diversity while allowing species and communities to rearrange in response to a changing climate. We developed and tested such a method for northeastern North America that we based on physical features associated with ecological diversity and site resilience to climate change. We comprehensively mapped 29 distinct geophysical settings based on geology and elevation. Within each geophysical setting, we identified sites that were both connected by natural cover and that had relatively more microclimates indicated by diverse topography and elevation gradients. We did this by scoring every 405 ha hexagon in the region for these two characteristics and selecting those that scored >SD 0.5 above the mean combined score for each setting. We hypothesized that these high-scoring sites had the greatest resilience to climate change, and we compared them with sites selected by The Nature Conservancy for their high-quality rare species populations and natural community occurrences. High-scoring sites captured significantly more of the biodiversity sites than expected by chance ($p<0.0001$): 75% of the 414 target species, 49% of the 4592 target species locations, and 53% of the 2170 target community locations. Calcareous bedrock, coarse sand, and fine silt settings scored markedly lower for estimated resilience and had low levels of permanent land protection (average 7%). Because our method identifies – for every geophysical setting - sites that are the most likely to retain species and functions longer under a changing climate, it reveals natural strongholds for future conservation that would also capture substantial existing biodiversity and correct the bias in current secured lands.

Project Location: Northeast and Mid-Atlantic US and Maritime Canada (ME, NH, VT, NY, MA, RI, CT, DE, PA, NJ, MD, WV, VA, NB, NS, PEI and parts of QB)

Partners: This project was designed and led by The Nature Conservancy's Eastern Conservation Science office with a steering committee representative of 14 states and including members of the US Fish and Wildlife's North Atlantic Landscape Conservation Cooperative, the Northeast Association of Fish and Wildlife Agencies, and the Open Space Institute. Species data was contributed by the Northeast and Mid-Atlantic Natural Heritage Programs and NatureServe.

Background: Biodiversity is threatened by climate change, and conservationists urgently require a way to prioritize strategic land conservation that will conserve biological diversity in spite of a changing climate. In 2010 we explored an approach which asserted that in addition to trying to protect biodiversity one-species at a time, it is important to protect the ultimate drivers of biodiversity. We tested how well geology predicted the species diversity of 14 US states and three Canadian provinces, using a comprehensive new spatial dataset and found that four factors; the number of geological classes, latitude, elevation range and the amount of calcareous bedrock, predicted species diversity with certainty (adj. $R2 = 0.94$). Our results suggested that protecting geophysical settings will conserve the stage for current and future biodiversity and may be a robust alternative to species-level predictions.

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This follow up study develops a method to identify sites for each geophysical setting that are the most likely to retain their native diversity, and identifies where those places are.

Project Goals: Identify sites for each of 29 geophysical settings in the Northeast that are most likely to sustain native species diversity and ecological function in spite of a changing climate.

Strategy Goals Implemented: Goal 2, Strategy 2.2, Action 2.2.1 Use vulnerability assessments to design and implement management actions at species to ecosystem scales, And Strategy 2.1, Action 2.1.3 Identify species and habitats particularly vulnerable to transition under climate change. The Nature Conservancy has integrated the results of this study into their land protection criteria as a filter to identify place likely to be resilience or vulnerable to climate change. The work was followed up by a 5.5 M land conservation fund from the Doris Duke Foundation.

Climate Impacts Addressed: Impacts on species and habitats. Specifically, we address the need for species to move and communities to continually rearrange in response to a changing climate.

Status of Project Implementation: Complete

Project Outcomes: A wall to wall map of the Northeast where every 90m cell and 1000 acre hexagon is identified as to its geophysical setting and scored for its resilience to climate change

Funding Sources: The Nature Conservancy, The Northeast Association of Fish and Wildlife, The Doris Duke Charitable Foundation.

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Photos/Attachments: Report and data: Anderson, M.G., M. Clark, and A. Olivero Sheldon. 2012. Resilient Sites for Terrestrial Conservation in the Northeast and Mid-Atlantic Region. The NatureConservancy, Eastern Conservation Science. 168pp. http://nature.ly/resilienceNE

Photo/Figure Credits (do we have permission to print): Yes

Suggested Photo Caption: Estimated of Climate Resilience for Sites in the Northeast. This map shows the places with the highest landscape diversity and local connectedness for each of 29 geophysical settings. Areas in brown are vulnerable to climate change.