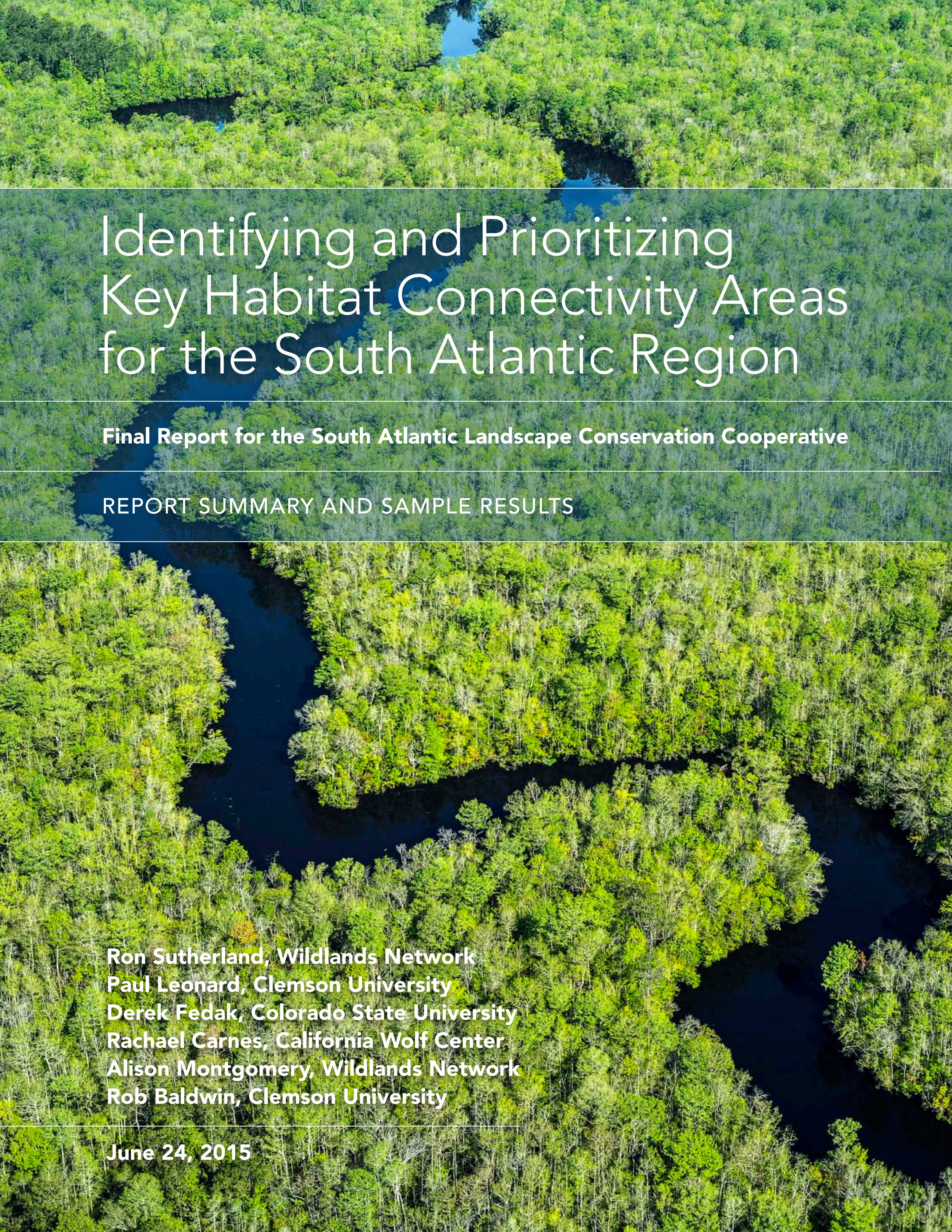

Identifying and Prioritizing Key Habitat Connectivity Areas for the South Atlantic Region

Final Report for the South Atlantic Landscape Conservation Cooperative

REPORT SUMMARY AND SAMPLE RESULTS

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Executive Summary

Using corridors to reconnect fragments of natural habitat is widely recognized as an essential tool for promoting the survival of many species. Likewise, the present threats to biodiversity such as climate change, urbanization, sea level rise and the demographic vulnerability of small, isolated populations are leading more and more conservationists to see the increasingly urgent need to protect and restore networks of connected habitats.

The Goal

This report summarizes the results of a three-year investigation of terrestrial habitat connectivity priorities for the South Atlantic Landscape Conservation Cooperative (South Atlantic LCC). Our primary objective was to generate results that could be used to drive fine-scale conservation planning for the enhancement of habitat connectivity across the region.

Approach

The project focused on seven target species, including large mammals (black bear, red wolf, Florida panther/ eastern cougar) and a group of terrestrial reptiles (eastern diamondback rattlesnake, timber rattlesnake, pine snake, and box turtle). We used two modeling approaches: one to identify areas with high predicted flow of a given species (Circuitscape), the other to identify areas with greater importance to the overall habitat network for a given species (Connectivity Analysis Toolkit). We parameterized our models with a combination of expert opinion, land cover data, and traffic information. We also projected the same models into the future (year 2100) using predictions of urbanization and sea level rise.

Results

Our results highlight a number of high-priority connectivity areas across the South Atlantic LCC region. While intact coastal river floodplains figure prominently for many species, we also identify potential routes for overland corridors connecting longleaf pine ecosystems and other priority upland habitats. At present and for many species, the southern half of the South Atlantic LCC region seems to retain greater permeability for wildlife movement. However, future urbanization and sea level rise appear to threaten habitat connectivity across the region, especially around pinch-points such as coastal cities, in low-lying areas such as the Albemarle Peninsula in NC, and within the expanding Piedmont megalopolis from Atlanta, GA to Raleigh, NC.

Research Utility and Next Steps

Conservationists will be able to put our results to immediate use, helping to steer major investments in land acquisition, habitat restoration, private landowner outreach, and wildlife road crossing structures across the South Atlantic LCC.

Additional research is needed to empirically calibrate our predictions (which are made in relative and not absolute terms) so that they can be directly related to animal movement trends. There also is a strong need for connectivity research focused on longleaf pine ecosystems range-wide across the southeastern U.S. Such research would help direct the substantial investments being made in longleaf restoration toward facilitating a functioning, climate-robust habitat network for many terrestrial species associated with longleaf forests.

If substantial new sources of funding were found for protecting habitat corridors across the South Atlantic LCC, this task would be more feasible. The report concludes with a range of policy options for connectivity funding, many of which involve boosting existing conservation funding sources and then targeting the funds more specifically towards connectivity conservation.

DOWNLOAD LINK FOR THE FULL REPORT

http://www.wildlandsnetwork.org/sites/default/files/SALCC%20report%206_24_15.pdf

TO LEARN MORE

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South Atlantic LCC
http://www.southatlanticlcc.org

See following pages for more details about the significance of this project, along with three pages of sample results.

Project Significance: More Details

Our connectivity results are well suited for immediate use by conservationists across the South Atlantic LCC. Four primary roles are envisioned:

1. Using terrestrial habitat connectivity to guide new land and easement acquisition efforts and help place proposals for protection projects in a broader regional context.

2. Guiding ecosystem restoration priorities, so that even small-scale restoration projects can serve to enhance the broader habitat network on behalf of terrestrial wildlife.

3. Targeting the placement of new wildlife road crossing structures across the South Atlantic LCC.

4. Helping to steer inappropriate urban development and highway construction projects away from areas most critical to terrestrial habitat connectivity.

Novelty And Scientific Significance. In this report, there are seven innovative aspects of our work that deserve mention because of their novelty and scientific significance. These include:

1. We used a supercomputer to achieve fine-scale connectivity results across a very broad region (entire multi-state LCC plus 100km buffer). This important development will lead to additional projects in other areas and should prove beneficial to conservation efforts by providing plenty of detail for parcel-level planning by land trusts and government agencies. Previous connectivity projects have tended to be fine scale and local or coarse scale and regional. One previous usage of a supercomputing approach to connectivity (PATH, Hargrove and Westervelt 2012) focused on a much smaller area (gopher tortoises in Ft. Benning, GA), but it will be interesting to compare the utilities and outputs for PATH and Circuitscape in future work.

2. Our work represents the first attempt in the southeastern U.S. to combine connectivity models for a range of very different species, focusing simultaneously on large mammals and large terrestrial reptiles. Previous work in the region has been dominated by a focus on red-cockaded woodpeckers, when in fact, they may not even need corridors to successfully disperse across wide gaps in their preferred habitat. Our longleaf specialist models (pine snake and eastern diamondback rattlesnake) should provide a perfect complement to connectivity plans that have been formulated with woodpeckers in mind. Also, our results should greatly facilitate connectivity planning at multiple scales in the region.

3. We made several key improvements to the Circuitscape methodology. These include:

A. dividing up the pairwise calculations to make the models suitable for parallel processing;

B. weighting the pairwise results by node size, to prevent areas with numerous small nodes from dominating the cumulative current density maps; and

C. adding in a very useful distance threshold approach to eliminate the consideration of unrealistic pairs of nodes in the Circuitscape analysis, thereby allowing us to work with species that had otherwise intractable numbers of potential node pairs to evaluate.

4. We also made a crucial improvement to the Connectivity Analysis Toolkit centrality modeling techniques. By using a null model to derive relativized centrality values, we were able to discern those areas that are more important to the overall habitat network than would be expected by geographic position alone.

5. We used a comprehensive approach to create our resistance layers for each species, involving expert opinion, land cover maps, traffic data, landscape effects, bridges, open water correction factors and protected area adjustments. This approach, while time-consuming, yielded what we think is a more realistic surface for each species.

6. When faced with a shortage of empirical data on population centers for our target species, we created an innovative approach to determining node locations for Circuitscape that relied on the base resistance layers we had derived from expert opinion. This approach makes logical sense, as areas with very low resistance should be expected to provide the largest numbers of dispersing animals. An alternative approach would have been to rely on occurrence-based habitat suitability models, but such models can be heavily influenced by the available location data for a given species.

7. We took the creative approach of examining potential connectivity across the entire available landscape for each species, rather than only focusing on existing population locations. This was an appropriate method given our interest in promoting the recovery of wildlife populations. Black bears, for example, are still expanding in some areas of the Southeast, and our models will be useful for designing corridors to promote their recovery. Red wolves and Florida panther are even more restricted to a small fraction of their historic range. Our models also can be used to predict future natural expansion trajectories by our target species.

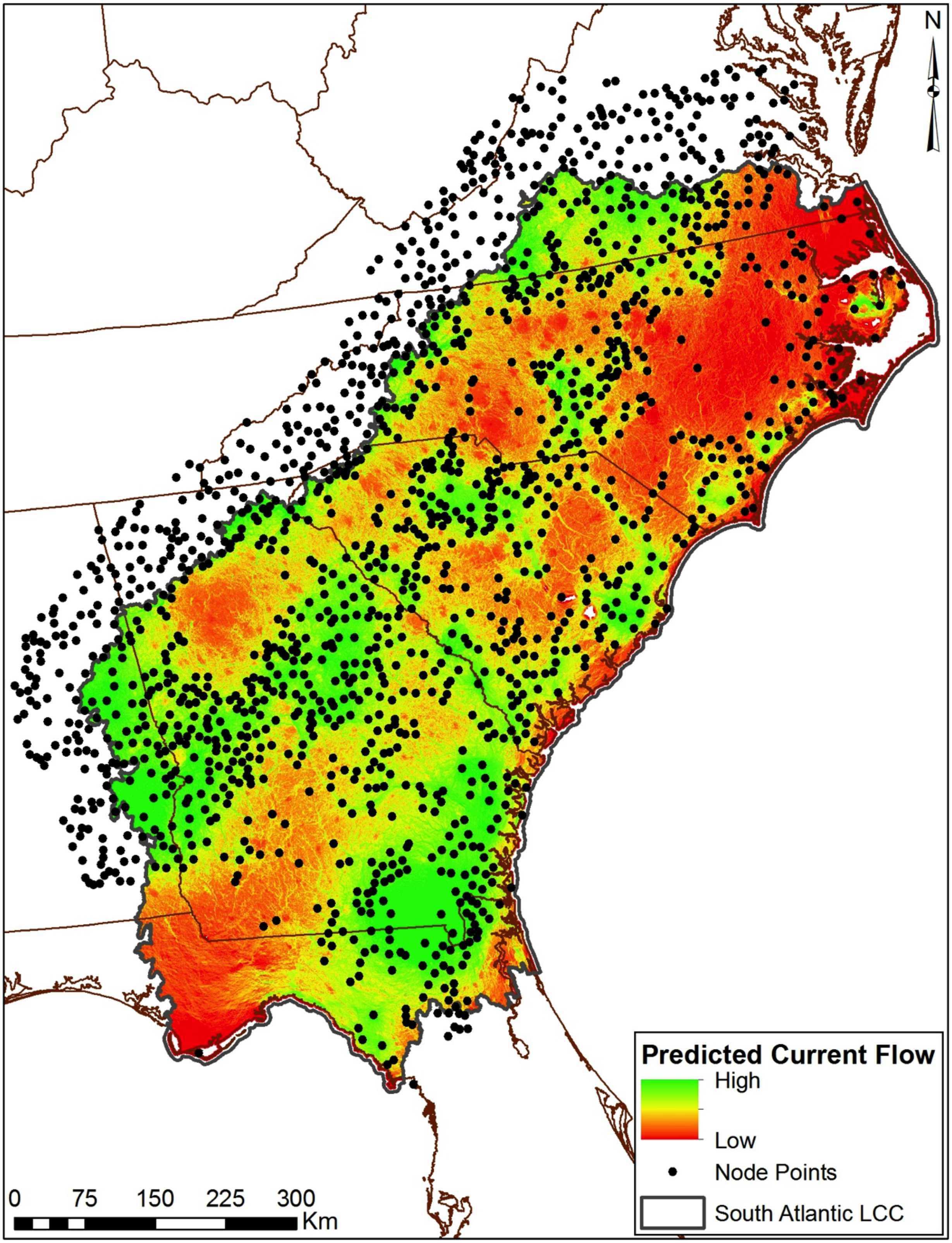

Figure 19. Cumulative current density model for timber rattlesnake (circa 2006). This map shows the output from Circuitscape connectivity software for the rattlesnake, with each of the black dots representing the nodes that were used in the analysis. Green areas have the highest current density, indicating they have a higher potential flow of the target species across that portion of the landscape.

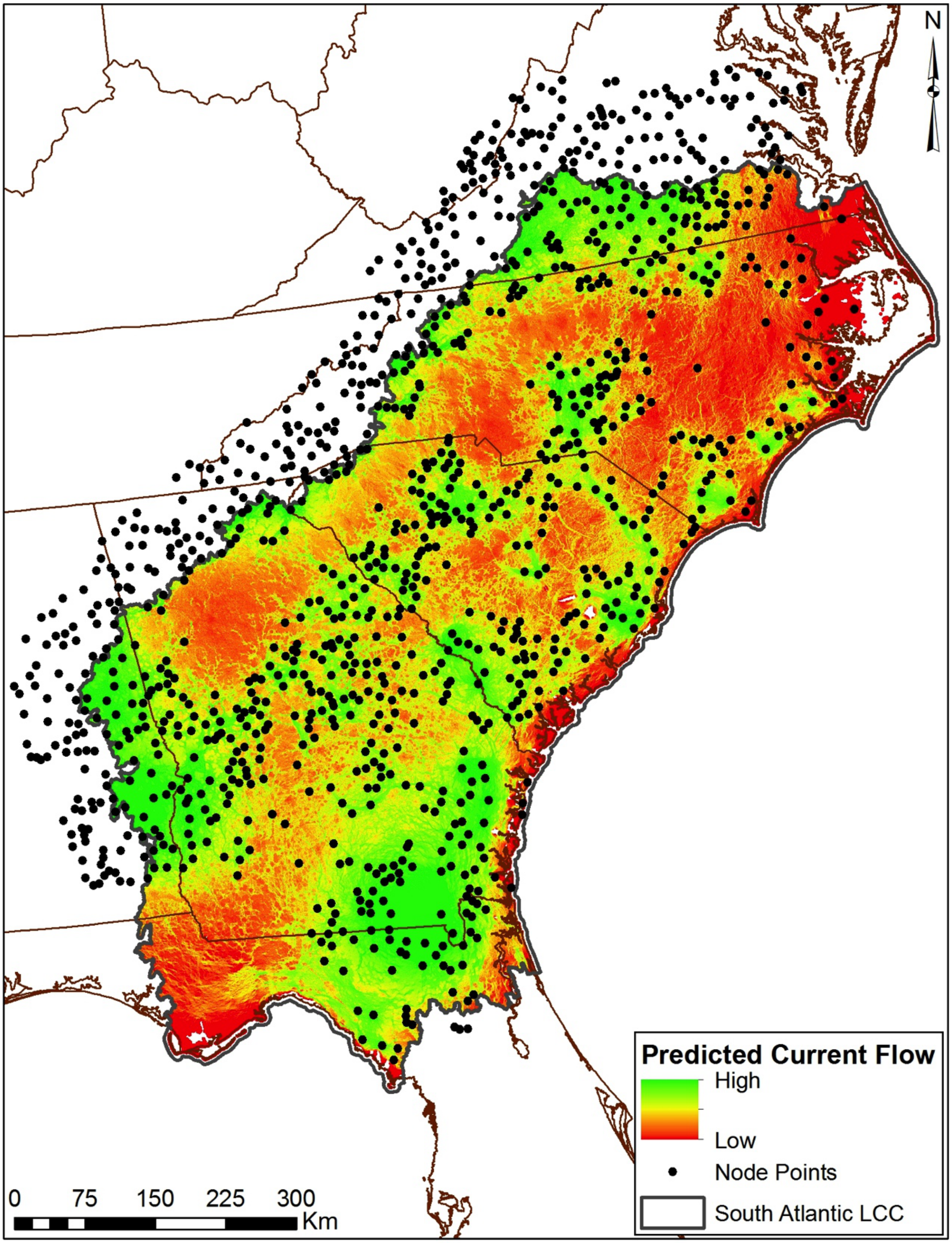

Figure 20. Cumulative current density model for timber rattlesnake (circa 2100). This map shows the output from Circuitscape connectivity software for the rattlesnake, with each of the black dots representing the nodes that were used in the analysis. Green areas have the highest current density, indicating they have a higher potential flow of the target species across that portion of the landscape.

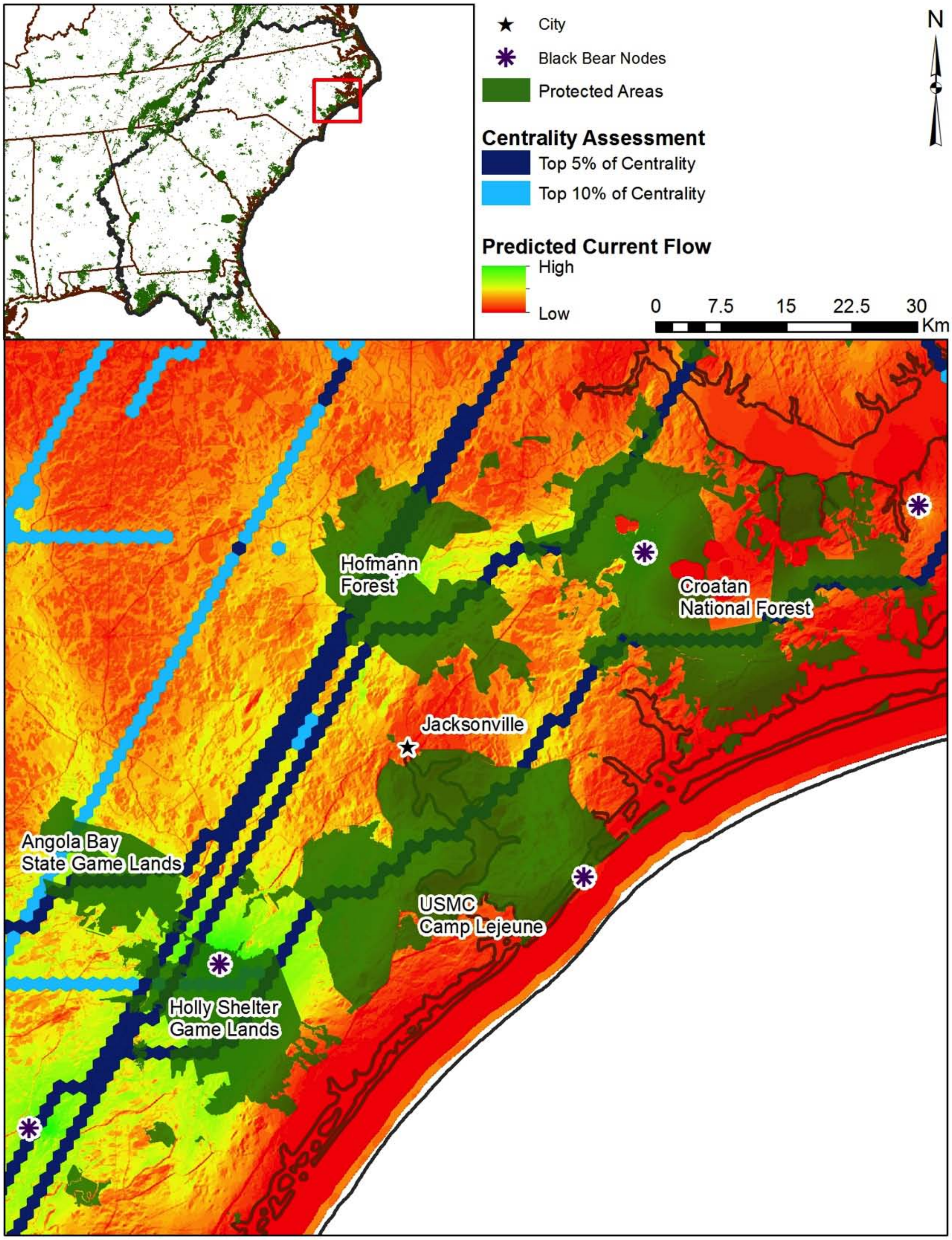

Figure 43. Focal Area Connectivity Map for the Onslow Bight region, showing model results for black bear (circa 2006). High predicted values of cumulative current density are shown in the background as shades of green, and the areas with highest shortest path betweenness centrality are shown in the foreground in shades of blue. Protected areas are labeled in dark green, and the nodes used in Circuitscape are shown as black stars.