

Biodiversity and Population Growth Analysis in Buncombe County, North Carolina

Introduction

Population growth poses a significant threat to biodiversity across the world. Areas that support richly diverse ecosystems tend to be the most threatened by habitat loss due to development and land use. However, not many researchers have looked at specific biodiverse areas in the U.S. that may be threatened by population growth. As a result, the present analysis focused on a county in western North Carolina that has experienced a high rate of population growth and is located in a biodiverse area.

The goal of this report was to identify areas in Buncombe County, North Carolina in which the rate of population growth poses a threat to the other species in the census tract. The project was intended to cross-reference biodiversity conservation importance, as defined by the NC Wildlife Resources Commission, with population data from the US Census. Buncombe County was chosen because Asheville is a rapidly growing city and the county is surrounded by significant natural heritage areas that support a variety of species. In the present report, the change in population estimates from 2010 to 2014 in the county was mapped by census tract, and conservation value indicator data was averaged by census tract. The two measures were compared, and finally census tracts within the county with a moderate to high conservation value and positive population growth were highlighted.

Methods

Data was acquired from the US Census online database. The TIGER shapefile for census tracts within Buncombe county was downloaded, and the difference in population per tract from 2010 to 2014 was calculated and represented (Figure 3). The Biodiversity and Wildlife Habitat Assessment (BWAH) data sources were downloaded from the NC Wildlife Resources Commission website. The BWAH layer delineated conservation value from “>20% impervious surfaces” (i.e. urban areas) to “maximum conservation value.” Several indicators, including aquatic and terrestrial biodiversity, ecosystem integrity, and NC Division of Water Quality stream bioclassification ratings, were compiled to create the categorical ordinal scale. The BWAH layer was vectorized according to conservation value (Figure 4), and after Figure 4 was developed the census tract data was joined to the BWAH attribute table. The conservation values within each census tract were averaged, and a new column was made to show average conservation per tract (Figure 2). The scale was adjusted to 1-5, since no areas had an average higher than 5.

Another map was developed that showed population change and average conservation value for all counties (Figure 1). After trying many different combinations of overlays, a final layout was settled upon. Three people were asked if they could identify different values for the different census tracts, and all three were able to understand population change and average conservation values without difficulty.

Final maps included include the average conservation value and population change map (Figure 1), a separate map showing just average conservation value (Figure 2), a separate map showing population change (Figure 3), a map of the vectorized BWAH data with 12 classes to show the complexity and range of biodiversity in the area (Figure 4), and a location map to give the viewer a reference for the location of the county (Figure 5).

Results

The results show a county that is largely split in half in terms of population growth and decline. The east side of the county is mostly green, signifying population decline, while the west side ranges from yellow to red. The tracts with the highest conservation values are at the fringes of the county, which makes sense given the development of Asheville in the center of Buncombe county. Overall, the areas of substantial growth in Buncombe County coincide with lower average conservation values. Admittedly, this could be a factor of previous urbanization, resulting in more impervious surfaces and fewer species in already metropolitan areas. A large portion (61%) of census tracts in Buncombe County, particularly on the southwest side, experienced a growth in population from 2010 to 2014 and have an average conservation value ranging from moderate to high. The results also show that three tracts (29, 32.05, and 32.04) with high to very high conservation values experienced population decline.

The results of this report identify what census tracts may be posing a threat to the biodiversity in the immediate area. Moving forward, the local government could subsidize housing and business development areas that are growing in terms of population and focus conservation efforts towards the biodiverse areas where population is declining. Figure 1, especially if used with Figure 4, can provide more information on what is going on in specific census tracts.

Figure 1: Conservation and Population

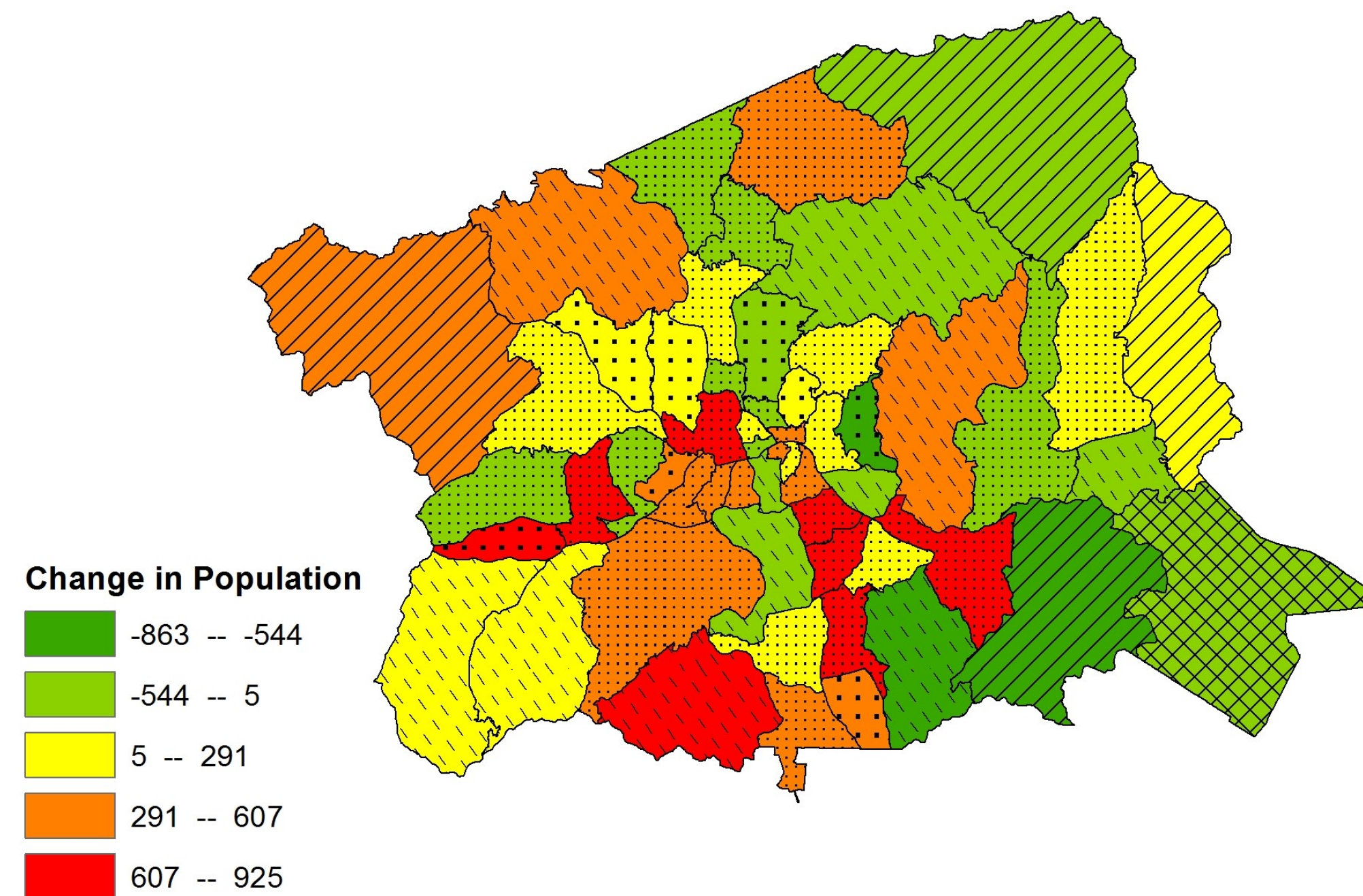


Figure 2: Conservation

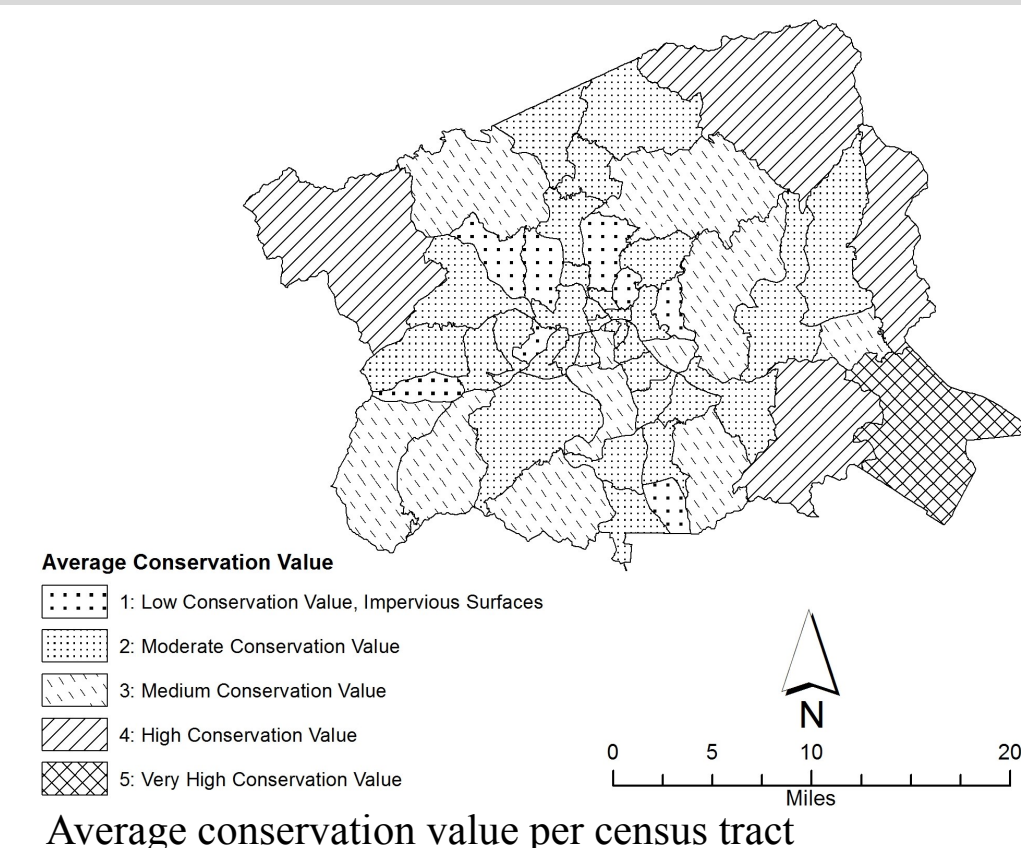


Figure 3: Population

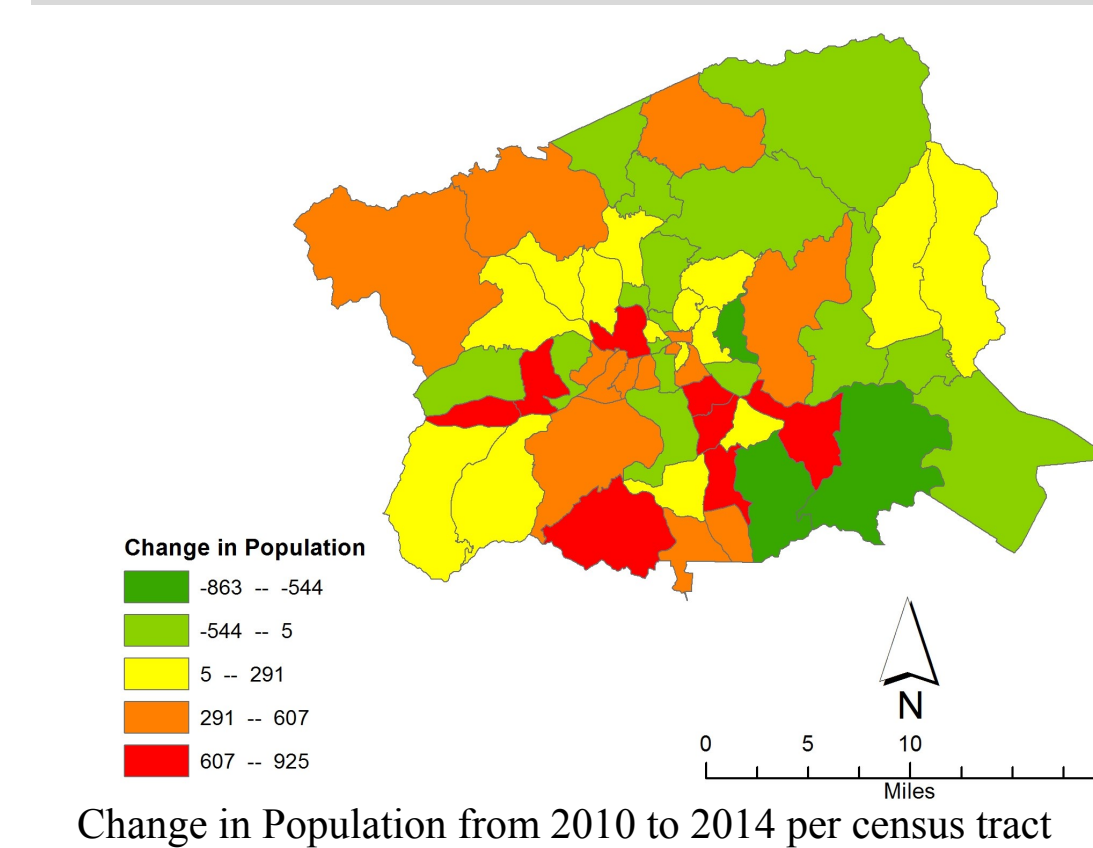
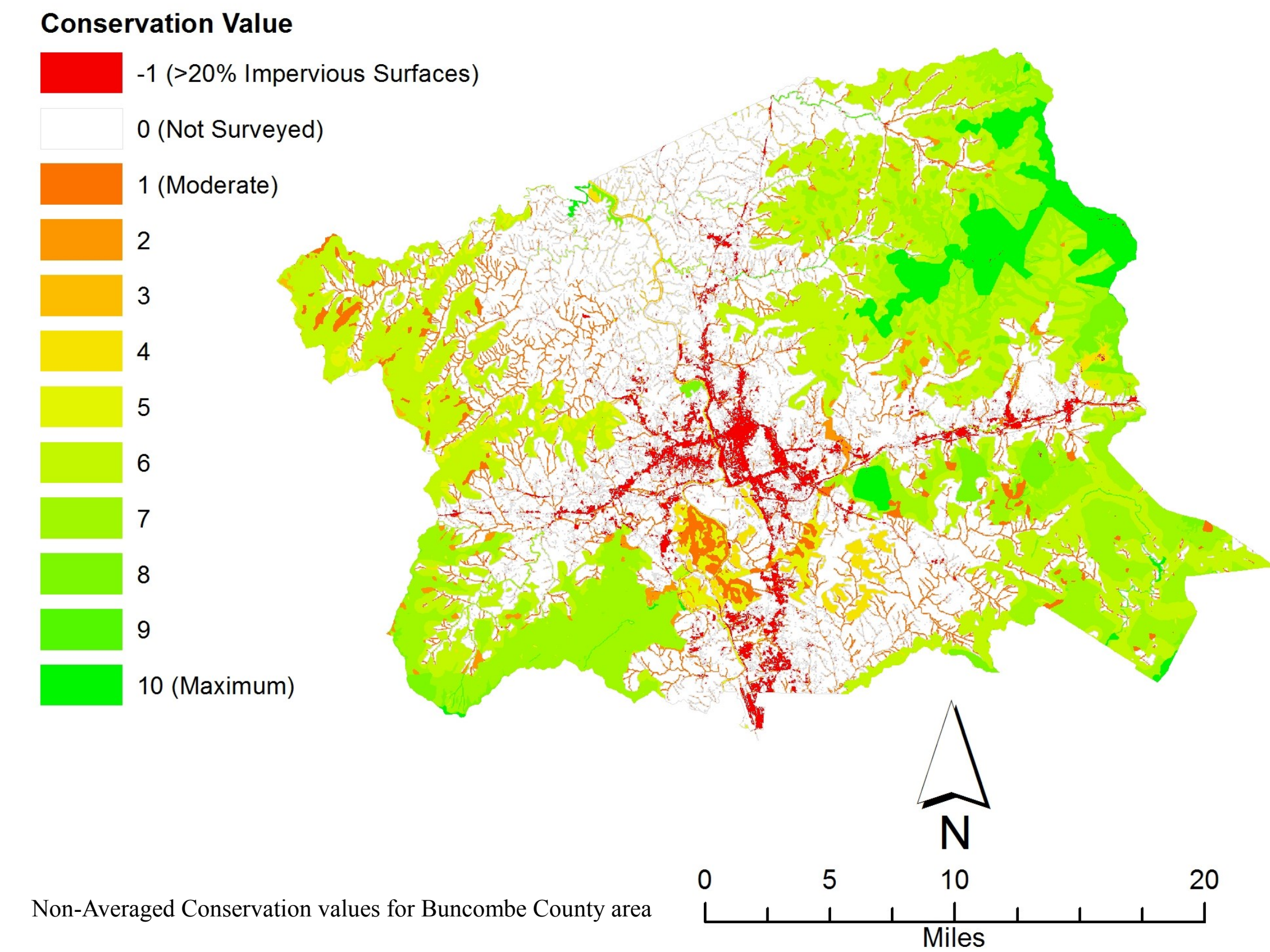


Figure 4: Priority Regions for Conservation

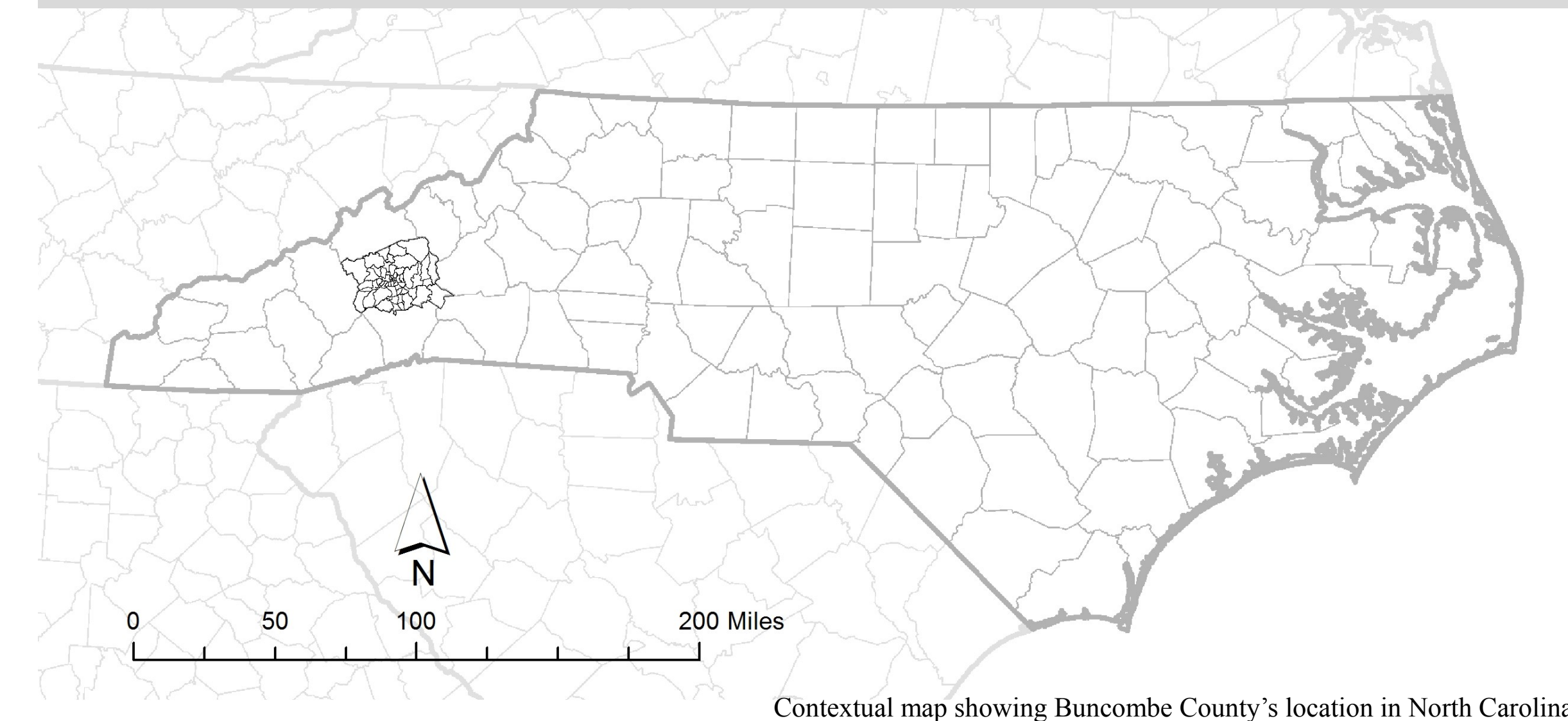


Limitations and Conclusions

This analysis used census data based on 5-year estimates for population growth, not actual growth. Because the census count from 2000 was conducted before many census tracts were created in the area, it was not used. To get a more representative idea of recent growth, the 5-year estimates from 2010 to 2014 were used. The BWAH conservation value dataset was only collected once so far, in 2013, and thus could not be mapped in terms of change like population. Because of this, it is difficult to correlate population growth and biodiversity loss. The data does not lend itself to causation, as there are many other factors at play including weather, climate change, and invasive species that can affect biodiversity. Additionally, the averaging process dilutes extremely biodiverse areas in the county because of the prevalence of impervious surfaces in the city of Asheville.

Future studies could collect biodiversity indicators over the same span of time as population data, to obtain the rate of change and areas most in need of conservation efforts. Also, it might be worthwhile to look at these factors at the state level, since areas like the Outer Banks and the Piedmont have unique ecosystems. It is important to look at population and biodiversity information on a smaller scale as well as a global scale, as it is likely that local communities will be able to enact change sooner than country or even statewide governments.

Figure 5: Location Map



Contextual map showing Buncombe County's location in North Carolina