

# Shifting Boundaries

Assessing the Impacts of Urbanization on the Reedy River and Lake Conestee

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## I. Introduction / Lit Review

The Reedy River, which flows through Greenville, SC, was originally dammed in 1830 and re-constructed in the 1880s, impounding a lake of around 145 acres for the purpose of creating a mill pond to mechanically power the mill on site. This impoundment was downstream from a growing number of industrial businesses and residents in the city in the late 1800s and into the twentieth century. The increasing development included increasing amounts of impervious surfaces, from which toxins and debris would run off and into the river, and variations in flow of the river over time changed the channel of the river near the lake. The industrial history of Lake Conestee made it a unique "watershed-derived Brownfields" site, which was purchased in 2000 by a non-profit organization and made into an educational and recreational park known as Lake Conestee Nature Park (Wylie & Hargett, 2002). The river upstream and downstream from the lake contained many bedrock shoals used to build plank-and-frame dams for mills and mill towns, aiding the industrial growth of Greenville and the war efforts of the time. A study conducted by Hargett and Wylie (2002) investigating contamination conditions in Lake Conestee sediments using the Targeted Brownfields Assessment determined that degradation of Lake Conestee was hastened by dam construction and use, wastewater treatment operations, and development of the watershed before the implementation of the Clean Water Act of 1972. Hargett and Wylie (2002) make observations from aerial photographs dated from 1943 to 1999 on the changing characteristics of the river channel, noting the filling in of the lake with sediment followed by the delta formation at the northeastern area of the lake which was then also filled in, causing meandering and channel formation in the southeast region. In his article "Landscapes and Riverscapes" (2004), Dr. Allen from the University of Michigan School of Natural Resources and Environment explains how land uses, such as agricultural, urban, forestry, mining, and recreation affect the conditions of neighboring streams in order to justify the need for further research in quantifying such responses. The changing river channel in conjunction with the changing population and land use over time makes Lake Conestee Nature Park (LCNP) an ideal site for geomorphological investigation. By virtue of its filtering and "stilling" functions, the lake has served to protect the lower reaches of the Reedy River from water and sediment toxins, pollution, and flooding. Analyzing the anthropomorphic effects of urbanization in Greenville on the Reedy River can provide information vital to the remediation and management of the river, the Conestee dam, and Lake Conestee Nature Park. This study investigates the geomorphology of the Reedy River in the vicinity of Lake Conestee Nature Park, specifically, addressing historical changes in the river channel since 1938. If increasing urbanization, population, and industrialization intensify river morphology, as previous studies have suggested, then a pattern should be seen between these activities and geomorphologic changes in this reach of the Reedy River.

## III. Results and Discussion

The largest visible change in the lake, showing the greatest amount of sedimentation, is seen between 1957 and 1983, however this time frame of 26 years is too large to be used for significant analysis. As stated in the Greenville County Comprehensive plan, Greenville County has a long history of consistent and steady growth, and the number of new residents added each decade has been increasing considerably since 1900. However, while there are slight anomalies in the graph of increase in population between decades, there are no significant patterns or jumps that could be used for geomorphologic analysis.

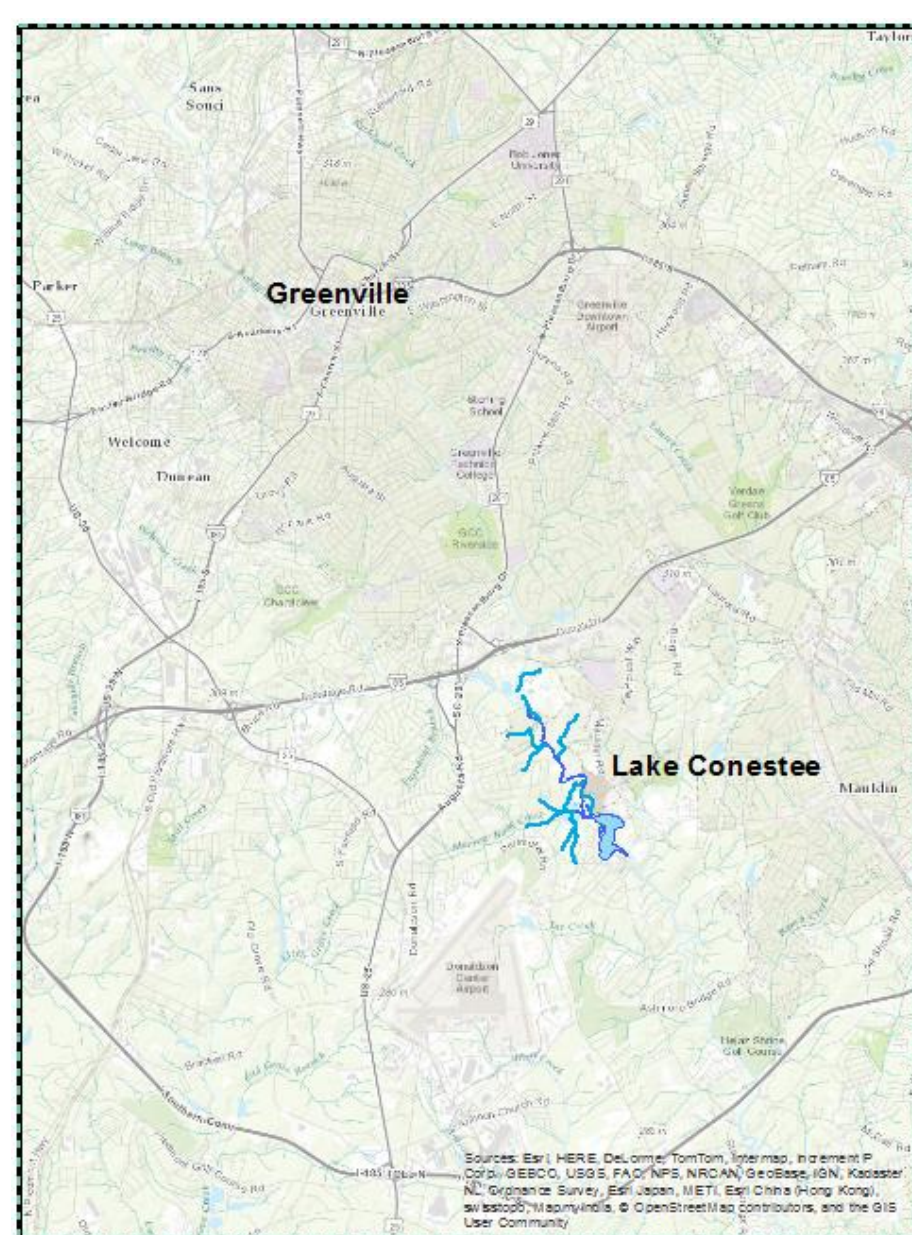
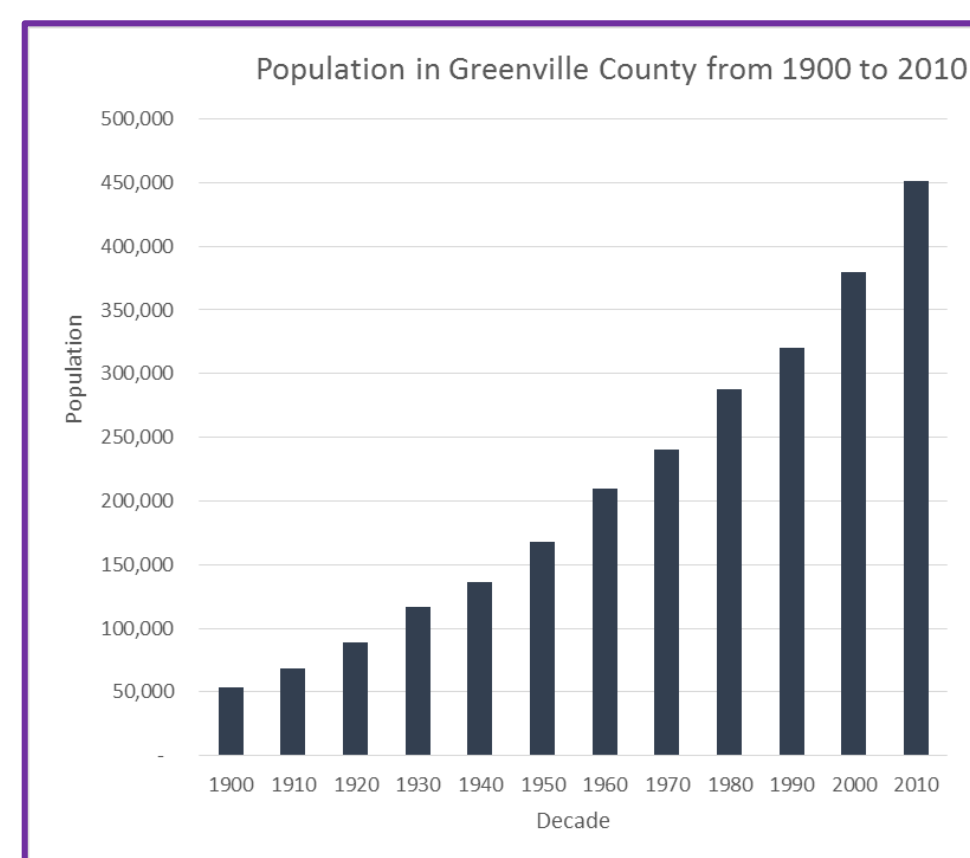


Figure 1. Location of Lake Conestee and surrounding river channels within the study area in relation to the City of Greenville.



Graph 1. U.S. Census data on total population in Greenville County every decade from 1900 to 2010 is represented by a bar graph. The trend is a steady increase.

## II. Methodology

Topographic maps were selected as the best way to generate representations of the boundary of Lake Conestee at different years. The historical topographic maps were downloaded at every year available that was detailed enough in the study area. They few appropriate maps were converted from a geoPDF to a geoTIFF using Global Mapper, allowing their spatial information to be read and understood by ArcMap. Aerial photographs collected from the government documents department at USC's library in Columbia, SC were of low resolution and sporadic in dates available, so they were omitted. I downloaded Census data available online for Greenville County, and there existed population data for each decade from 1790 to now, however the only data available to me on industry was from 1840 and was therefore also omitted from this study. From the information I could access, I used ArcMap and excel to create maps and tables looking for trends between population and channel and lake changes. By hand tracing the features on the topographic maps, I was able to digitize them and create new layers of the shapes of the lake and river at the different years.

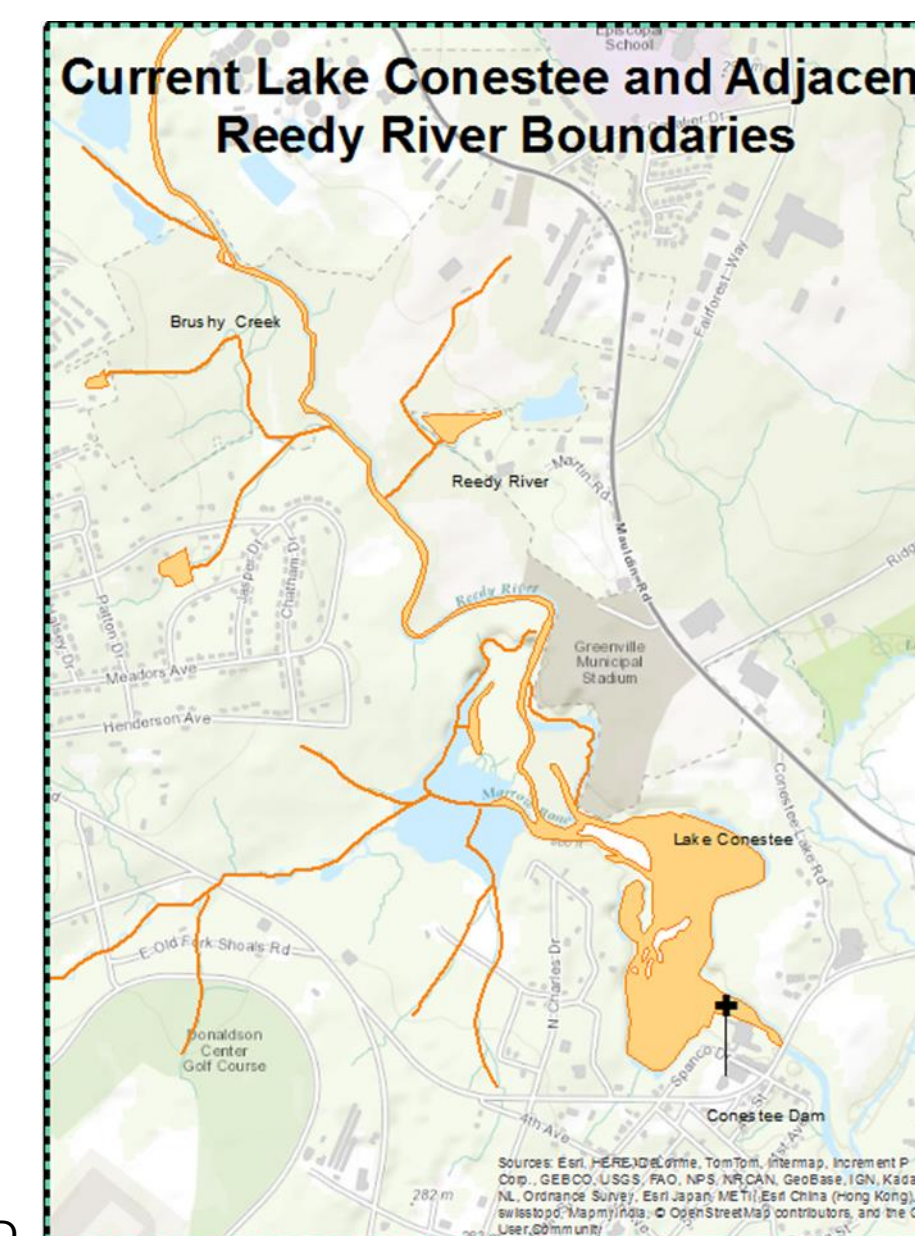
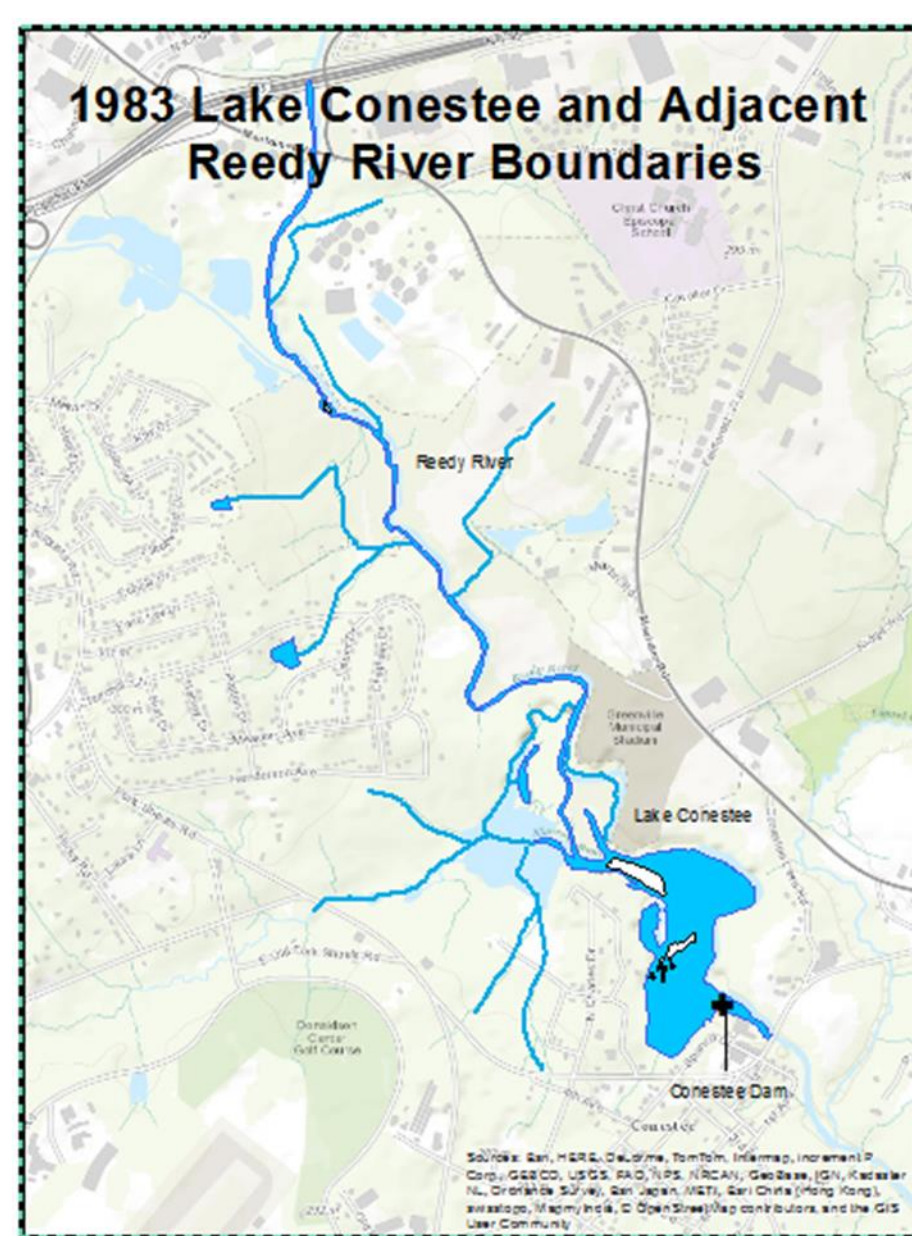
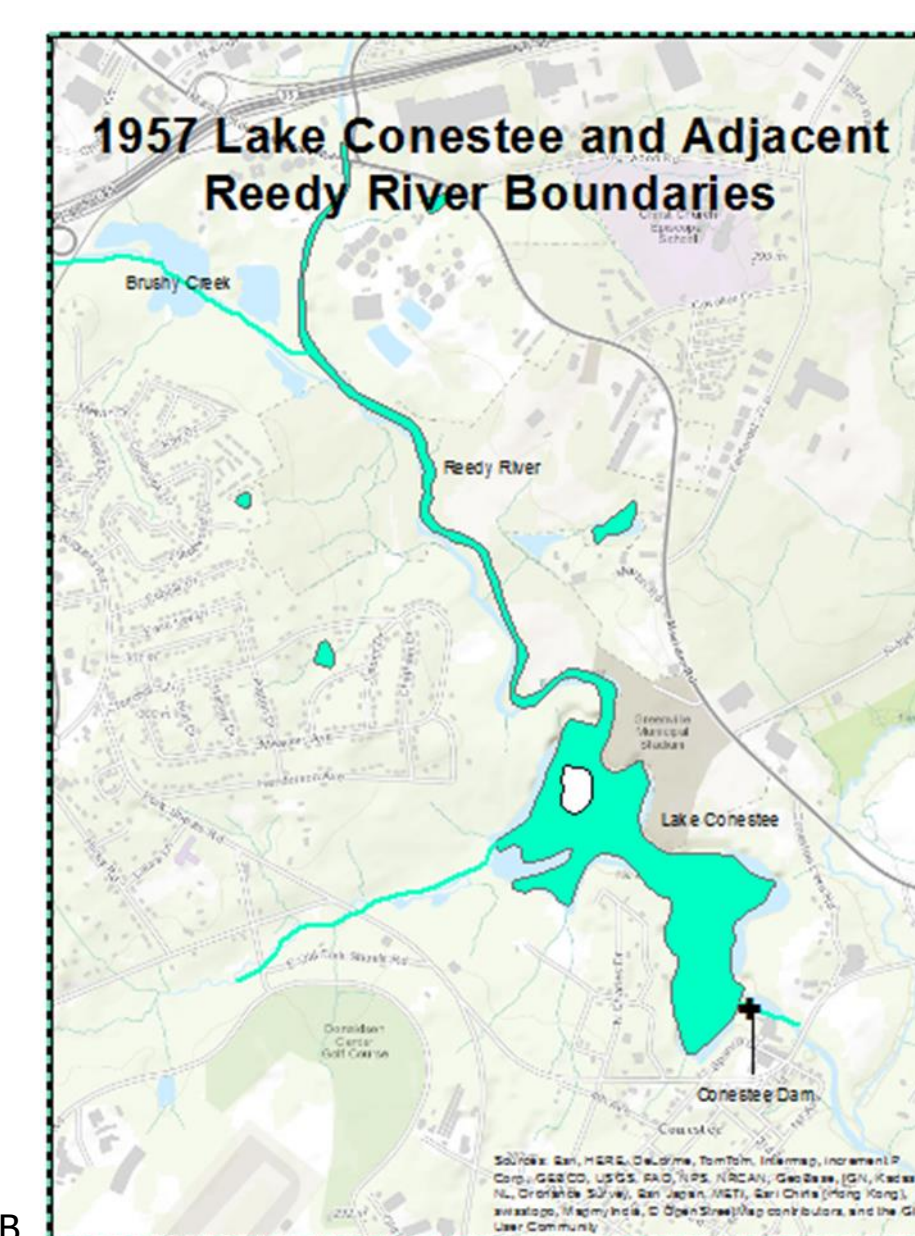
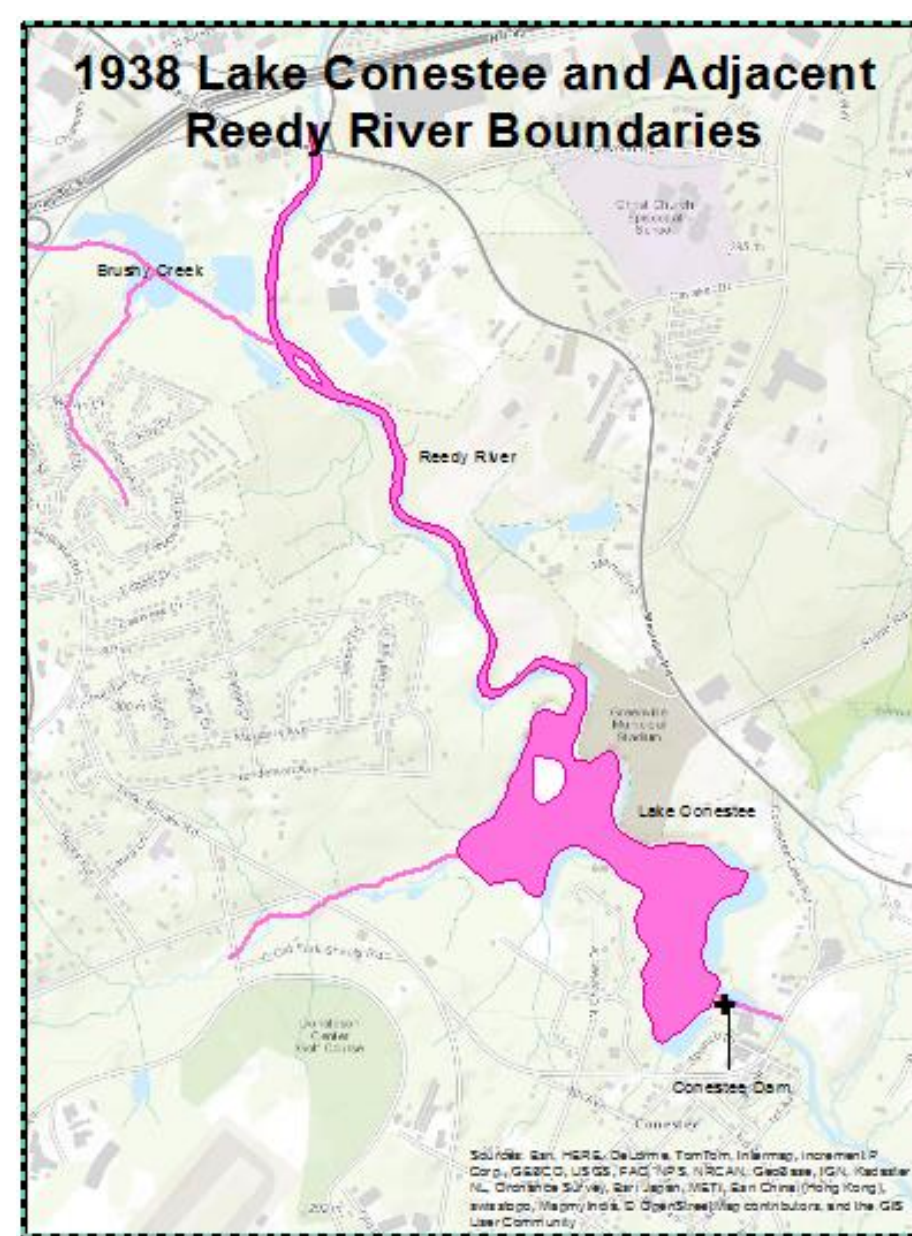


Figure 2. The four maps above form a time-scale showing the boundaries of the study site in 1938 (A), 1957 (B), 1983 (C), and currently (D). Boundaries were created using topographic maps from the cited year, and can be compared to show how the river upstream of Conestee Dam, as well as Lake Conestee, have changed over time. The stretch of the Reedy River shifts slightly, but maintains relatively the same channel pattern and direction over the four maps. The most obvious changes occur in the presence and paths of streams and in the shape of the lake. The lake decreases significantly in size over the time scale, and the presence of Brushy Creek is inconsistent. The Basemap is World Topographic Map from ESRI Online.

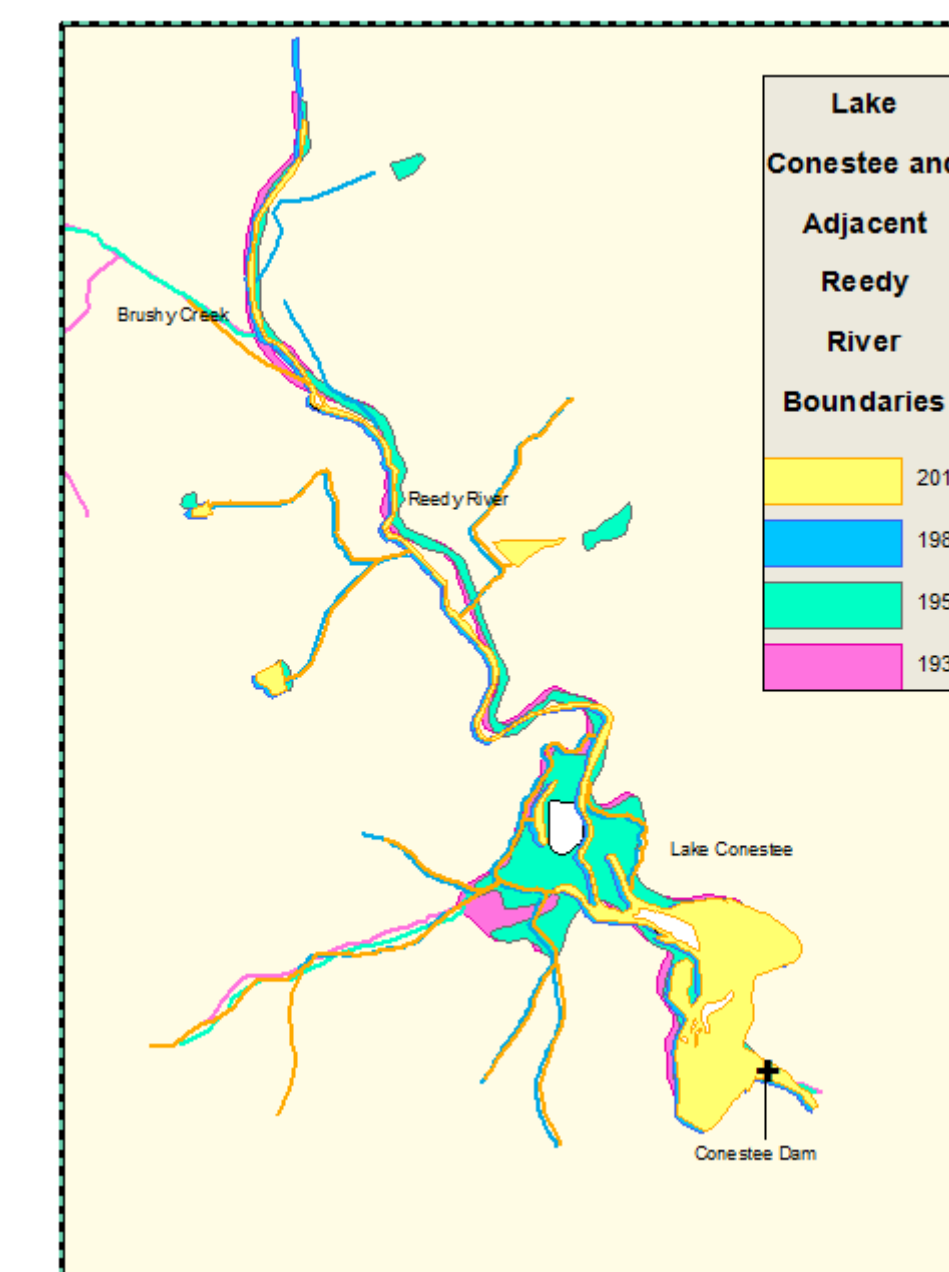
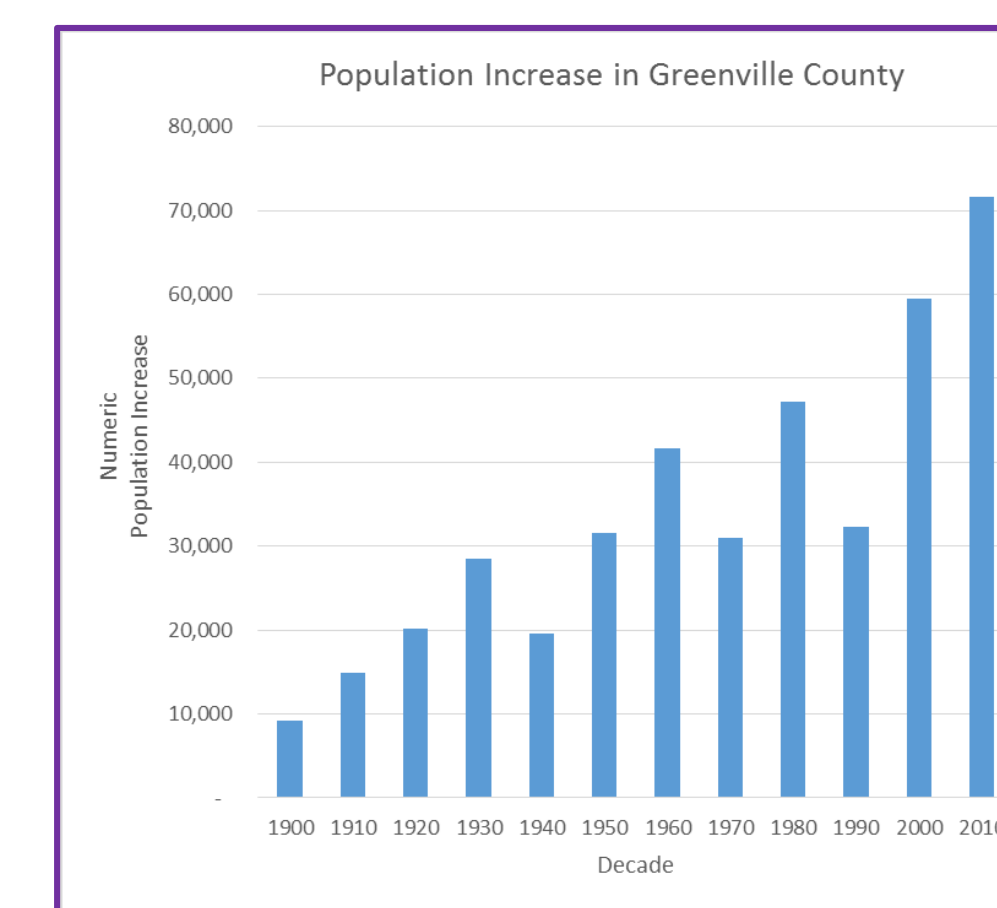


Figure 3. This map offers a comparison of the boundaries shown in Figure 2. Maps A-D from Figure 2 are overlaid, with ascending dates from bottom to top. The basemap is the same as in figures 1 and 2 for consistency in spatial referencing, however a solid background covers it for easier visual interpretation.



Graph 2. This bar graph utilizes the same U.S. Census data on population in Greenville County seen in Graph 1. The graph represents numeric population increase, which is the increase in population from one decade to the next. Trends and anomalies are easier seen here.

## IV. Conclusions and Future Research

The slight changes in population increase per decade since 1900 and the geomorphologic changes in the river channel and lake boundary over such large and inconsistent time intervals are not consistent with each other or significant enough to make conclusions about the effects of population and urbanization on sedimentation of Lake Conestee and channel shifting of the Reedy River in what is now Lake Conestee Nature Park. The tremendous lake boundary change between 1957 and 1983 however, does make it clear that the natural morphology was enhanced or accelerated, and more data should be collected to make an analysis as to the primary factors contributing to such drastic changes. Information on industry and engineering along the river, as well as more frequent sequential data on population and maps of the area should be gathered in order to look for trends and significant patterns between urbanization and geomorphology of the study area.

## V. References/ Data Sources

Allen, J. D., 2004, Landscapes and riverscapes: The influence of land use on stream ecosystems: Annual Review of Ecology, Evolution, and Systematics, v. 35. p. 257 – 284.

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USGS Topographic Maps, U.S. Census data obtained from <http://historicalmaps.arcgis.com/usgs/>

## VI. Acknowledgements

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