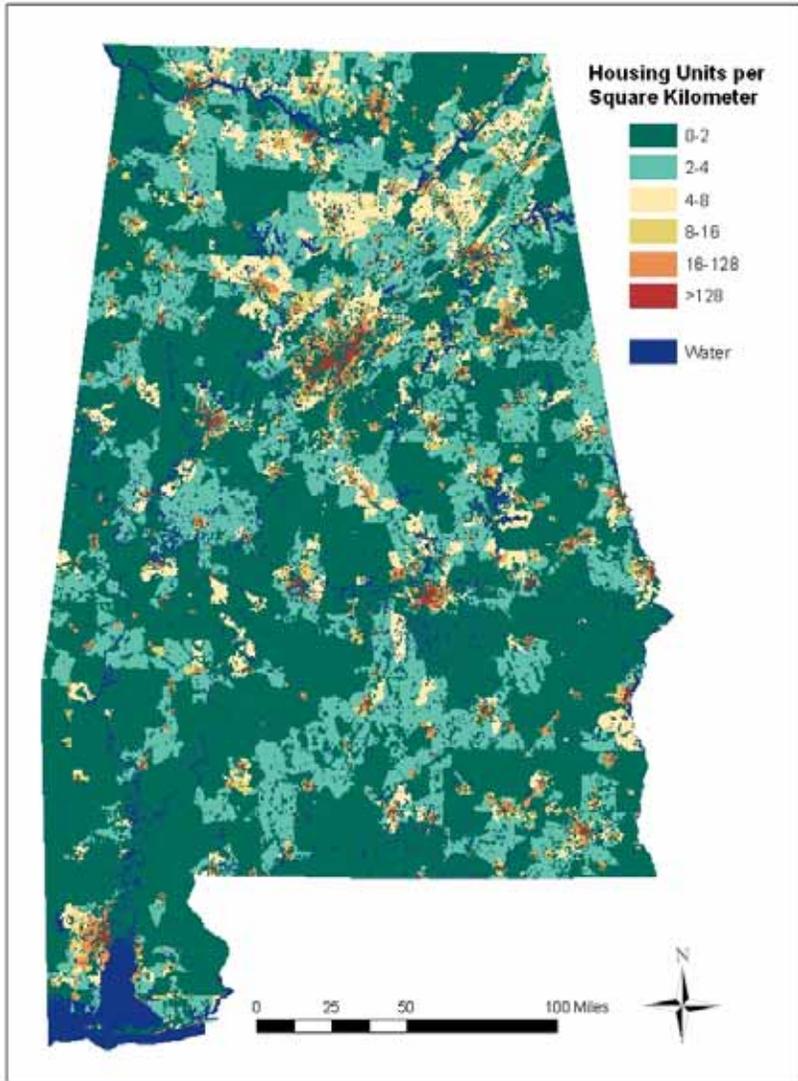
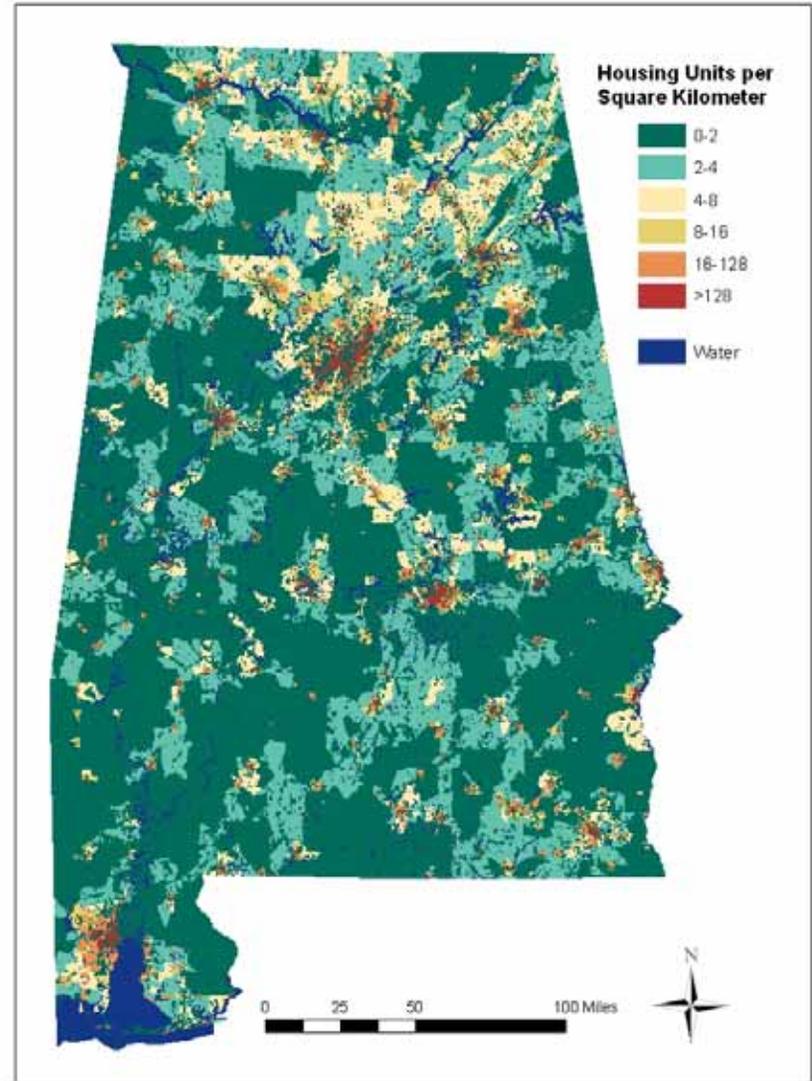


### Housing Density, 1940-1950, Alabama

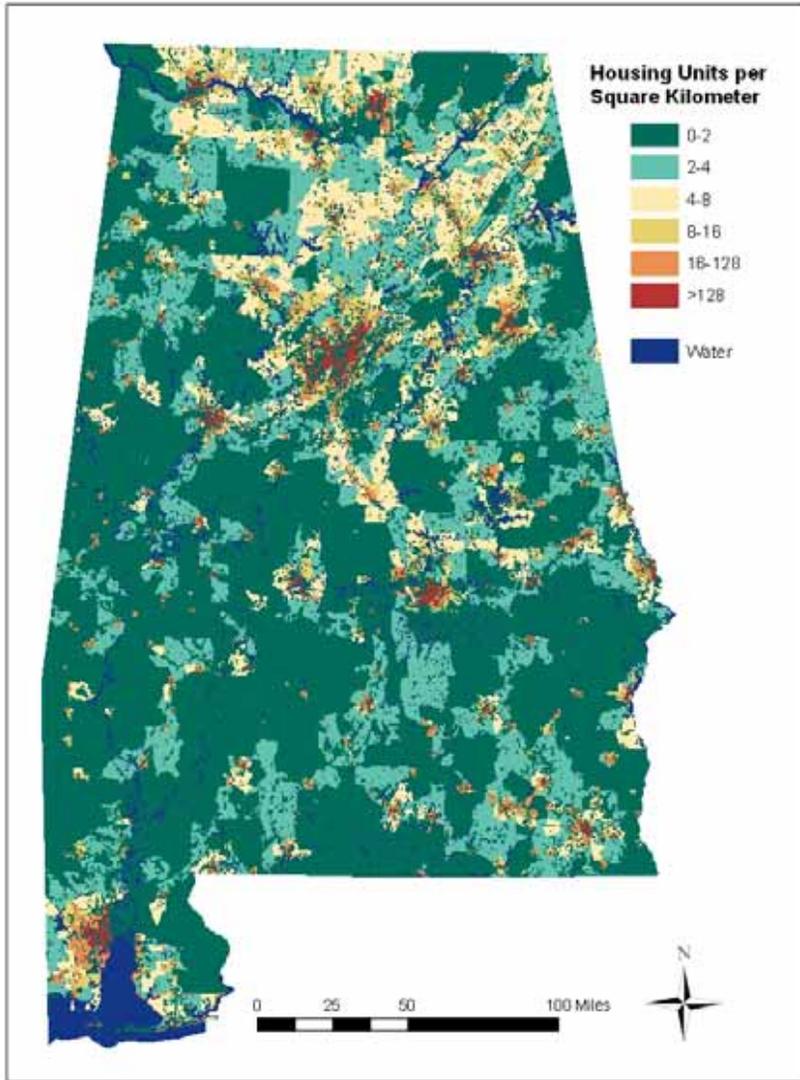


1940

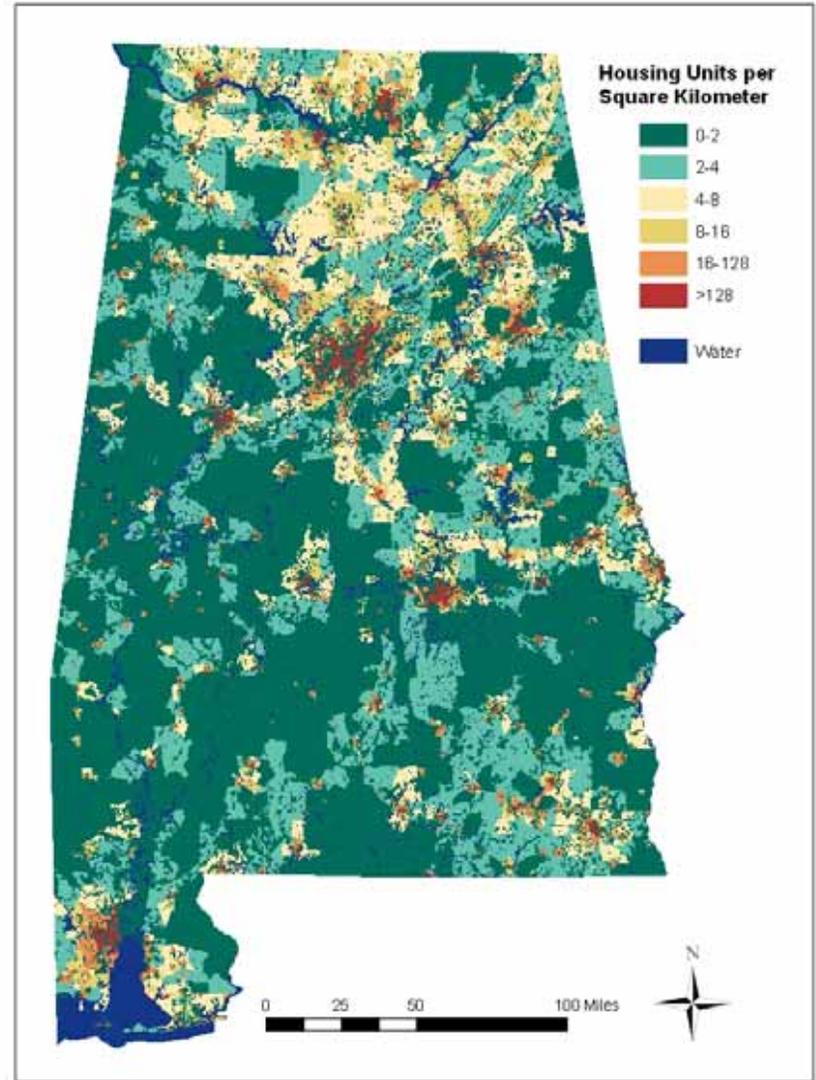


1950

### Housing Density, 1960-1970, Alabama

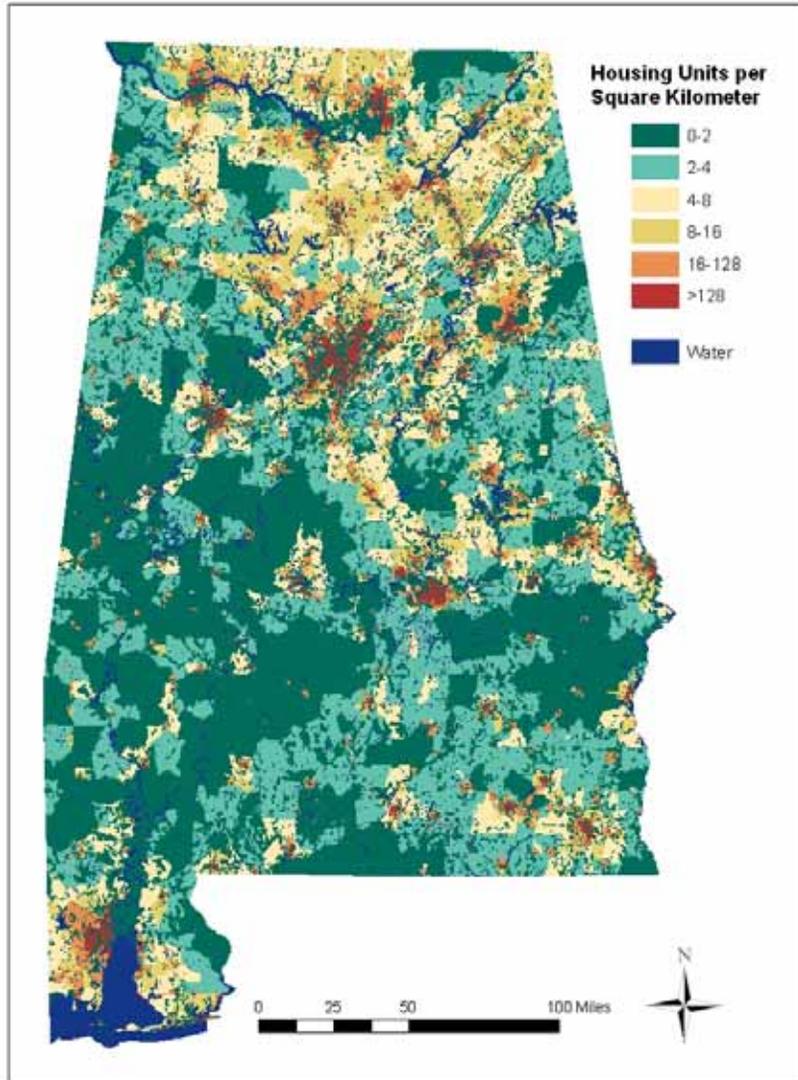


1960

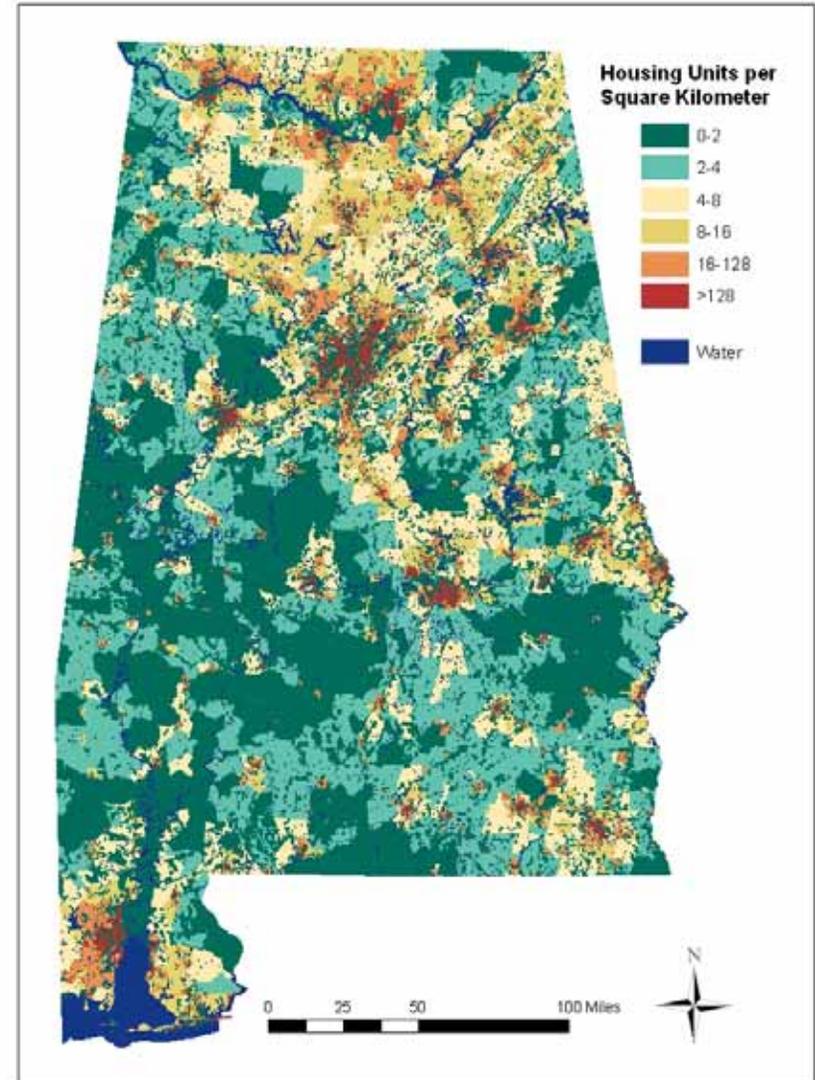


1970

## Housing Density, 1980-1990, Alabama

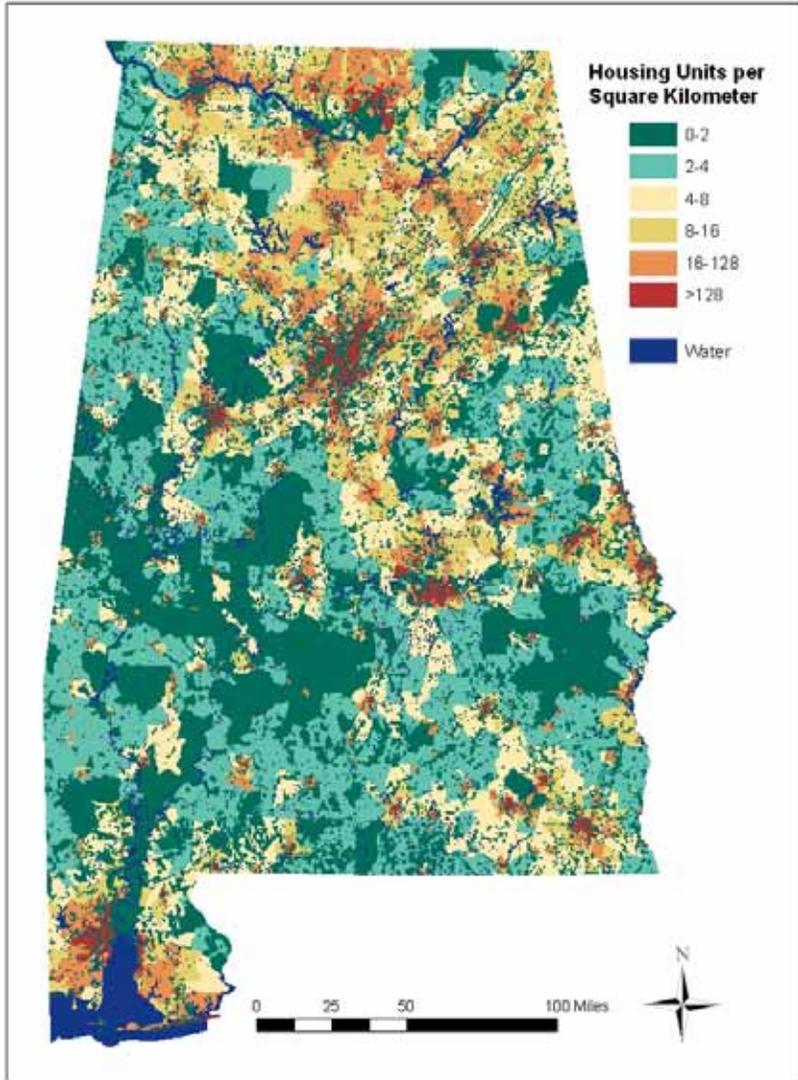


1980

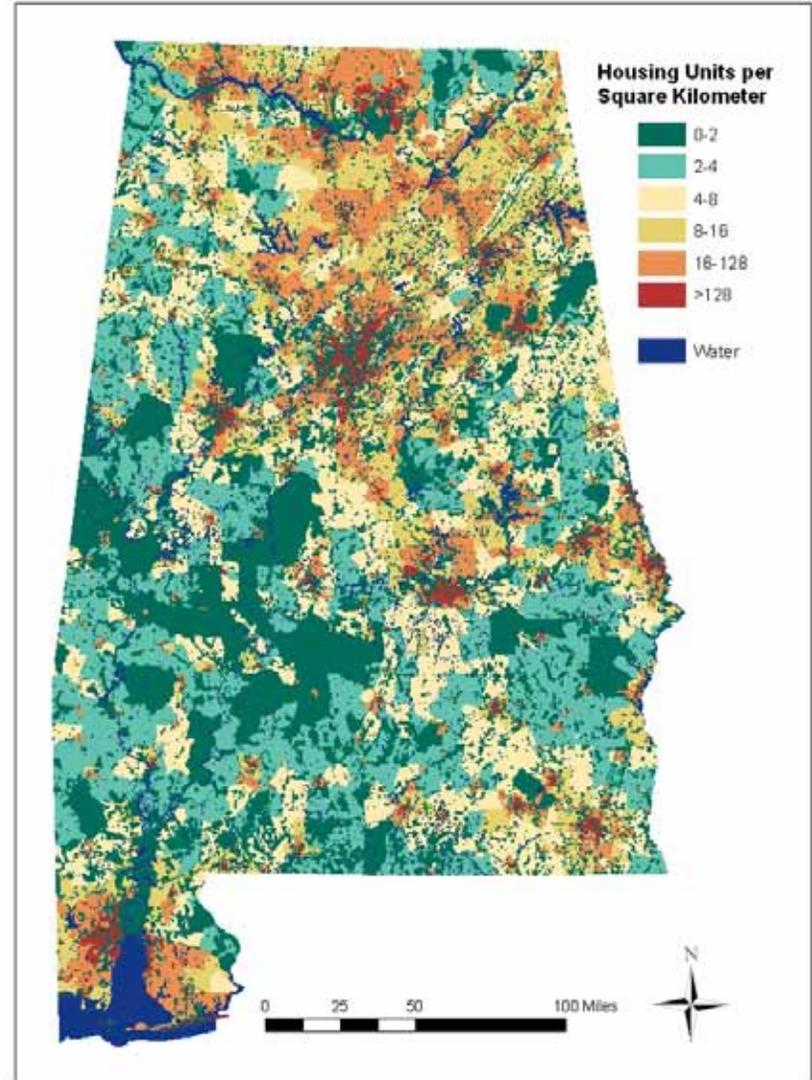


1990

### Housing Density, 2000-2010, Alabama

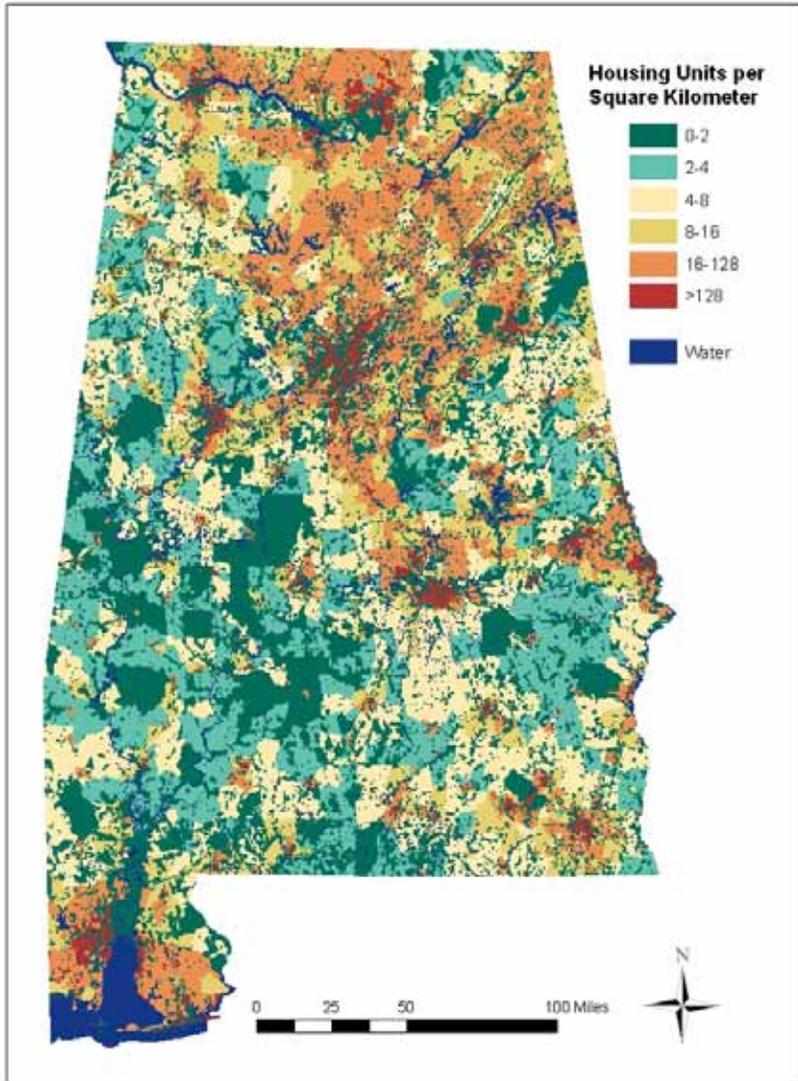


2000

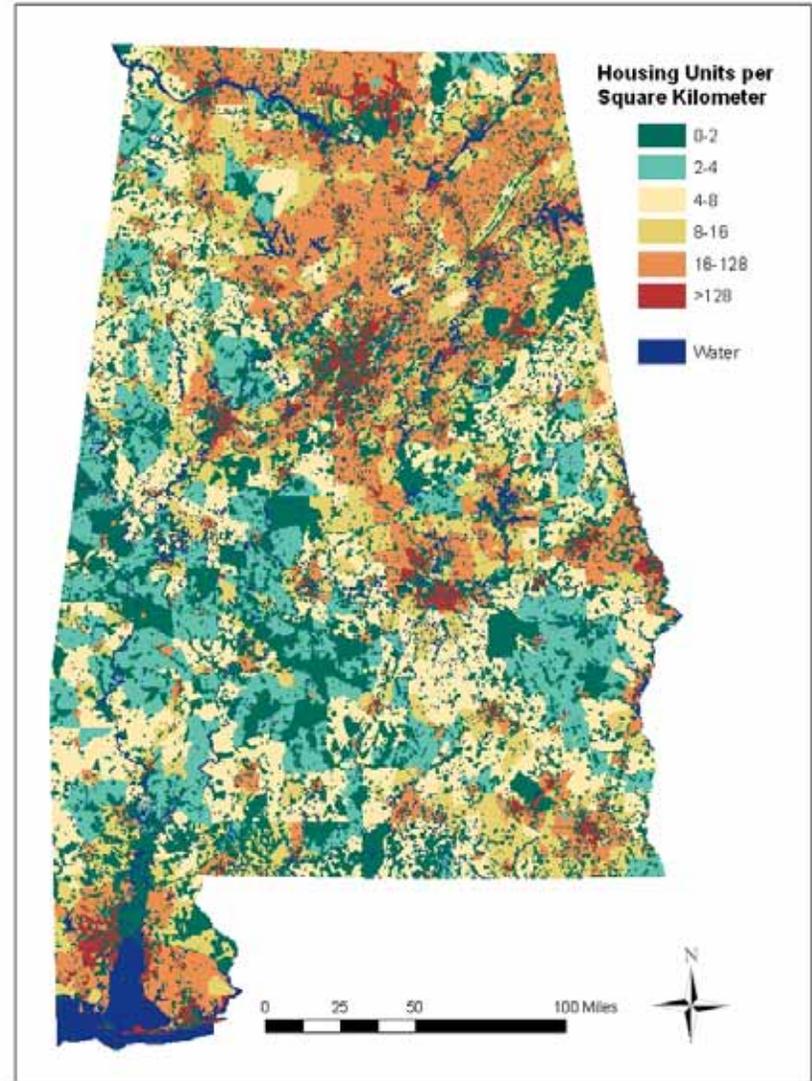


2010

### Housing Density, 2020-2030, Alabama



2020



2030

## Methods and Data:

The data depicted in these maps of housing density by decade, 1940-2030, were developed by R.B. Hammer and V.C. Radeloff at the University of Wisconsin – Madison, with funding from the USDA Forest Service North Central Research Station. The paragraphs below summarize the techniques used. For more details on methodology, see these papers available at <http://silvis.forest.wisc.edu/pubs.asp>.

Radeloff, V. C., R. B. Hammer, and S. I. Stewart. 2005. Sprawl and forest fragmentation in the U.S. Midwest from 1940 to 2000. *Conservation Biology* 19: 793-805.

Hammer, R. B. S. I. Stewart, R. Winkler, V. C. Radeloff, and P. R. Voss. 2004. Characterizing spatial and temporal residential density patterns across the U.S. Midwest, 1940-1990. *Landscape and Urban Planning*, 69(2-3):183-199.

Radeloff, V. C., R. B. Hammer, P. R. Voss, A. E. Hagen, D. R. Field, and D. J. Mladenoff. 2001. Human demographic trends and landscape level forest management in the northwest Wisconsin Pine Barrens. *Forest Science* 47, no. 2:229-241.

Housing units and geographies: Housing density in these maps is measured as housing units per square kilometer. A housing unit, as defined in the U.S. Census of Population and Housing (source of the data) might be a free-standing single-family home, one-half of a duplex, an apartment, a house trailer, or even a boat or camper if that serves as a permanent residence. Housing units include both year-round primary residences and “vacant” homes (a category which includes seasonal homes that are not the primary residence, even if they are occupied for much of the year). Since the growth of second-homes may cause significant forest fragmentation, it is appropriate to include the “vacant” units in the density measure.

Mapping units are “partial block groups”, intermediate in scale between Census blocks and block groups. Census blocks are delineated by physical features and may be as small as a city block or may contain many acres in sparsely populated areas. Because of their small size, confidentiality concerns and sampling errors dictate that the Census not report details like the year a house was built at the Census block level. For this reason, the study could not use Census blocks as the basic geographic unit. Block groups are aggregates of Census blocks that generally contain approximately 600 to 3,000 people and vary widely in size. The partial block group provides better spatial resolution than the block group, while also making key housing data available.

Special note about protected lands within partial block groups: The map shows each partial block group as a single color based on average housing density across that entire geographic unit; it does not display individual house locations because we do not know where those are. If a portion of a partial block group is protected from development by public or non-profit ownership or by easements, and the rest is privately owned, the maps will show an intermediate housing density color across the entire geographic unit – in spite of the fact that true housing density is zero on the protected portion. A partial block group will show as dark green on the map only if the entire partial block group area is in public ownership or is otherwise protected from development (or nobody has chosen to build there – yet).

Estimation methods: Two estimation methods were used to construct these maps, one for “backcasting” houses that existed before 2000, and the other for forecasting houses likely to exist in 2010, 2020 and 2030.

Historic housing units: Since Census block and block group boundaries change from one Census to the next, the study could not simply use housing units reported by the Census for each decade. Instead, they used the Census 2000 boundaries and the age of housing present during that year to estimate number of units in previous years. Respondents to the Census long-form survey (about 1 in 7 households) report the year their house was built. The researchers adjusted for the fact that some older houses were destroyed before 2000 and hence no longer appear in the Census. The adjustment was based on the number of houses actually present in a historic Census year county-wide (because county boundaries are usually consistent from one Census to the next), compared with the houses of that vintage still present at the 2000 Census. For instance, if a county reported 6,000 houses in the 1940 Census, but the 2000 Census reported only 5,000 houses that were built before 1940, then the adjustment factor would be  $6,000 / 5,000 = 1.2$ . For a block group in that county reporting 100 houses built before 1940 in the 2000 Census, the estimate for houses present in 1940 would be  $100 \times 1.2 = 120$ . The assumption is that 20 of the houses present in 1940 were destroyed before 2000.

Future housing units: Projections of housing units for 2010, 2020 and 2030 for each partial block group assume that past growth rates will continue for the next thirty years. The study derived rates of growth of housing units from 1990 to 2000, then applied those growth rates in each of the following three decades. This is a fairly simplistic forecast, and researchers are currently working on a more sophisticated model to predict future housing growth.

For questions about map displays, contact: Ann Ingerson, Research Associate, The Wilderness Society, [ann\\_ingerson@twc.org](mailto:ann_ingerson@twc.org) or (802) 586-9625.

For questions about data methods, contact: Volker Radeloff, U. Wisconsin-Madison, Forest Ecology and Management, 1630 Linden Drive, Madison, WI 53706, [radeloff@wisc.edu](mailto:radeloff@wisc.edu), 608-263-4349.