

# An Analysis of National Weather Service Warning Tendencies

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## Background and Objectives

The National Weather Service (NWS) is the organization responsible for issuing severe weather warnings for the United States. There are 116 NWS forecast offices (WFO) in the lower 48 “contiguous” United States. Each office oversees a county warning area (CWA) for which it is responsible for issuing warnings. These CWAs consist of a set of counties geographically close to each WFO.

The objective of this study is to use Geographic Information System methods to conduct an analysis of the tendencies of each office for issuing warnings as well as to determine which areas of the country are more frequently warned for severe weather. The particular warning types studied in this analysis include tornado and severe thunderstorm warnings.

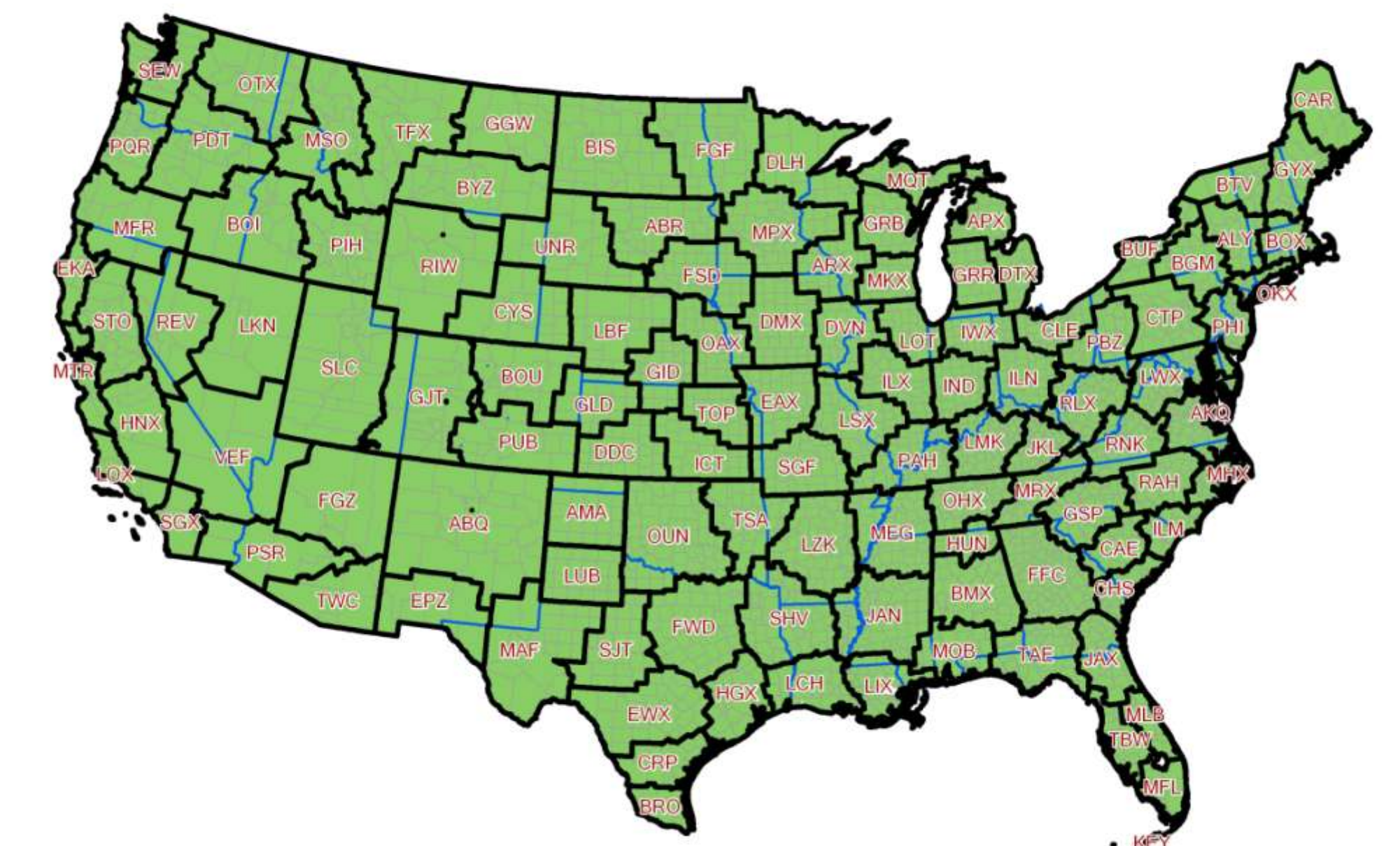
## The Research Process

Data used in this study was obtained from the Iowa Environmental Mesonet (<http://mesonet.agron.iastate.edu/>). These data consist of polygon shapefiles comprised of NWS issued severe weather warning polygons for one year at a time.

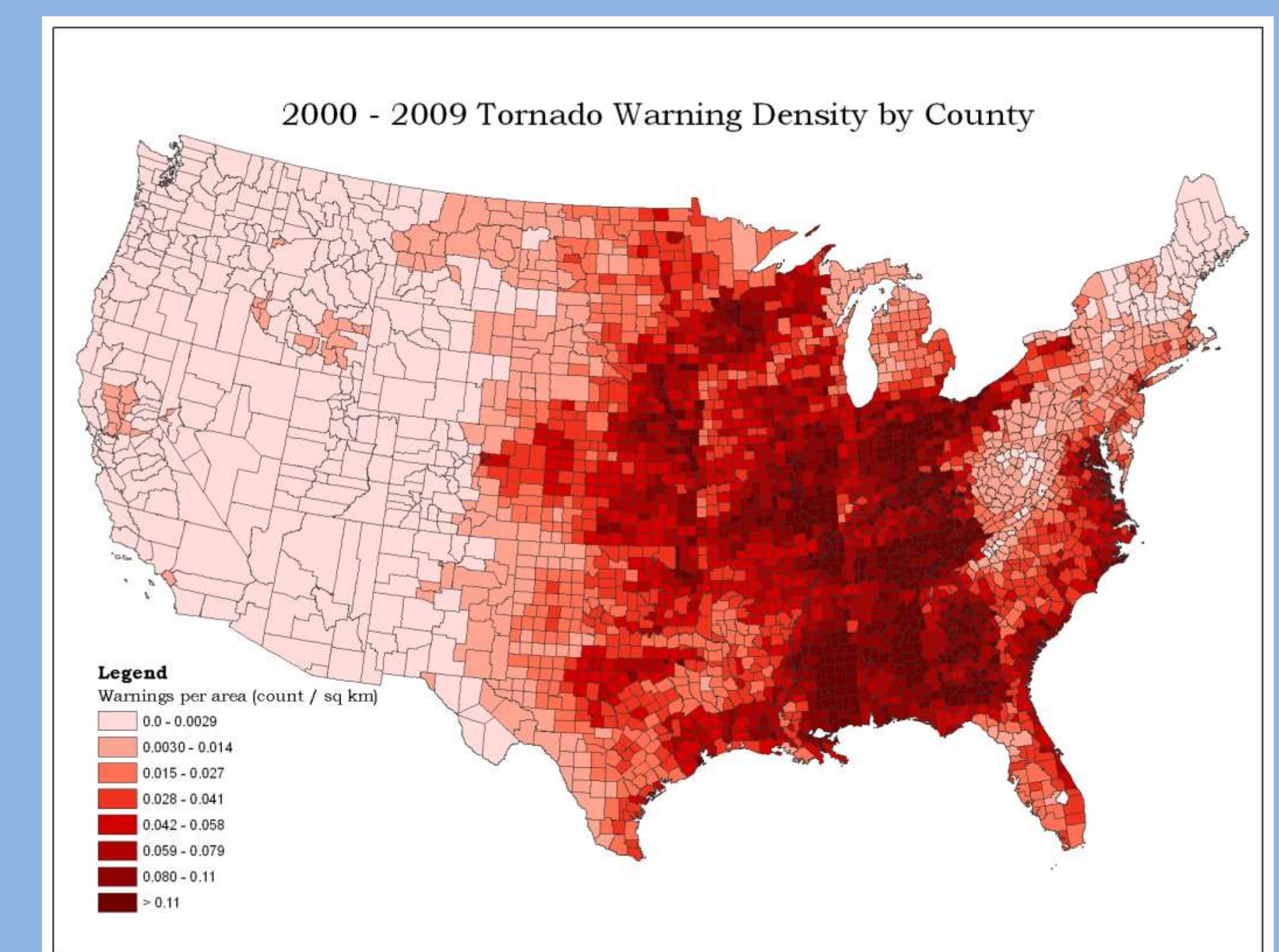
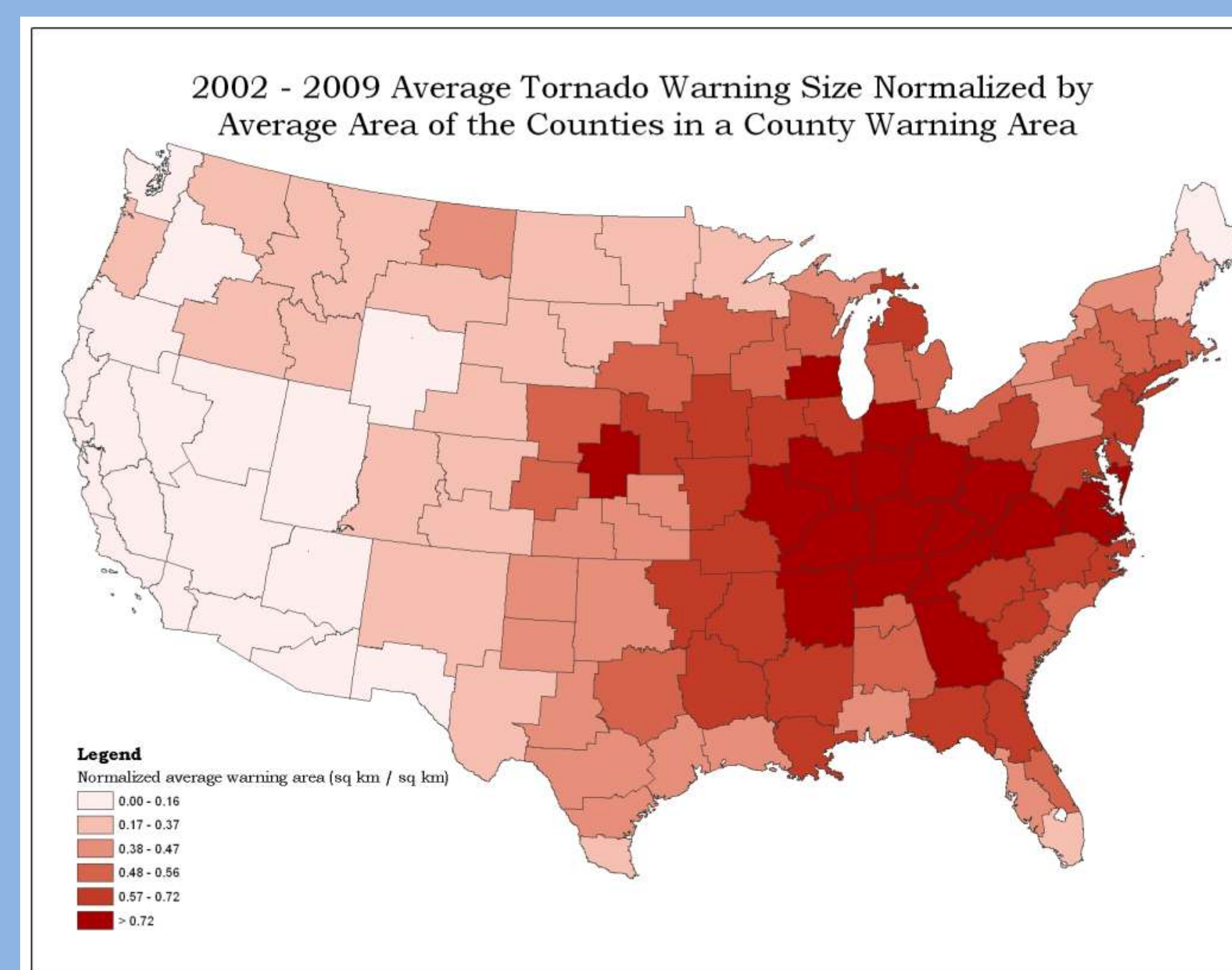
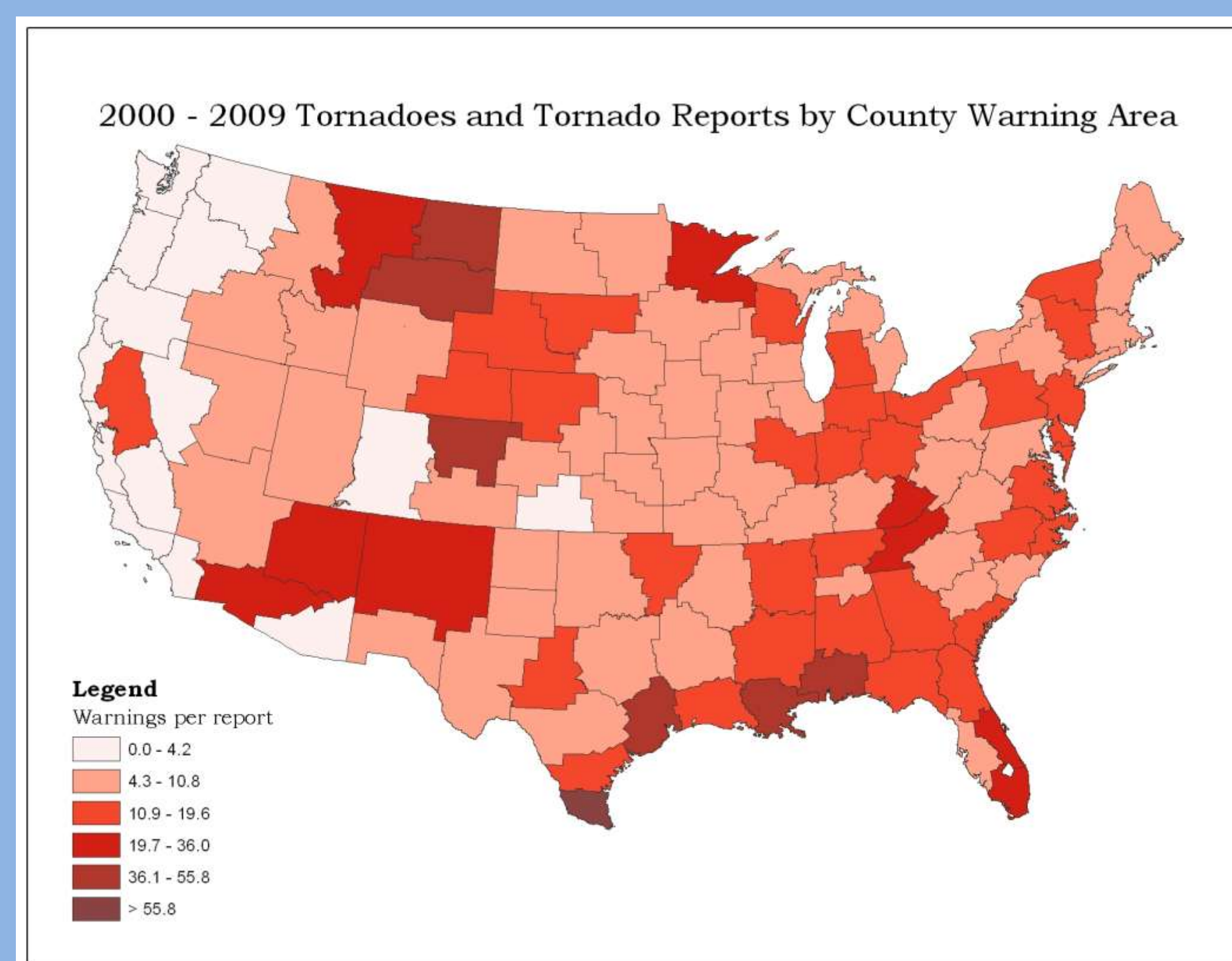
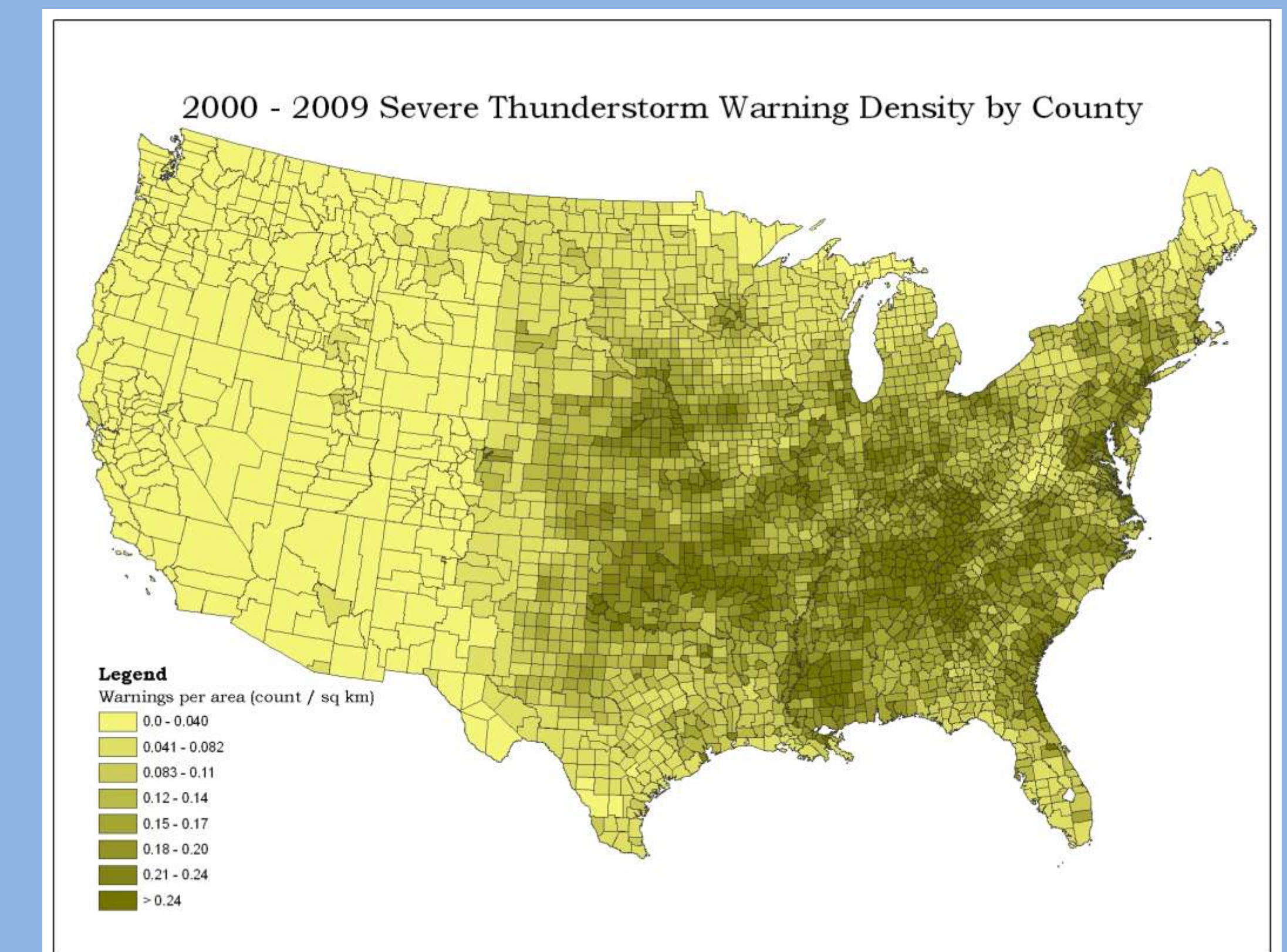
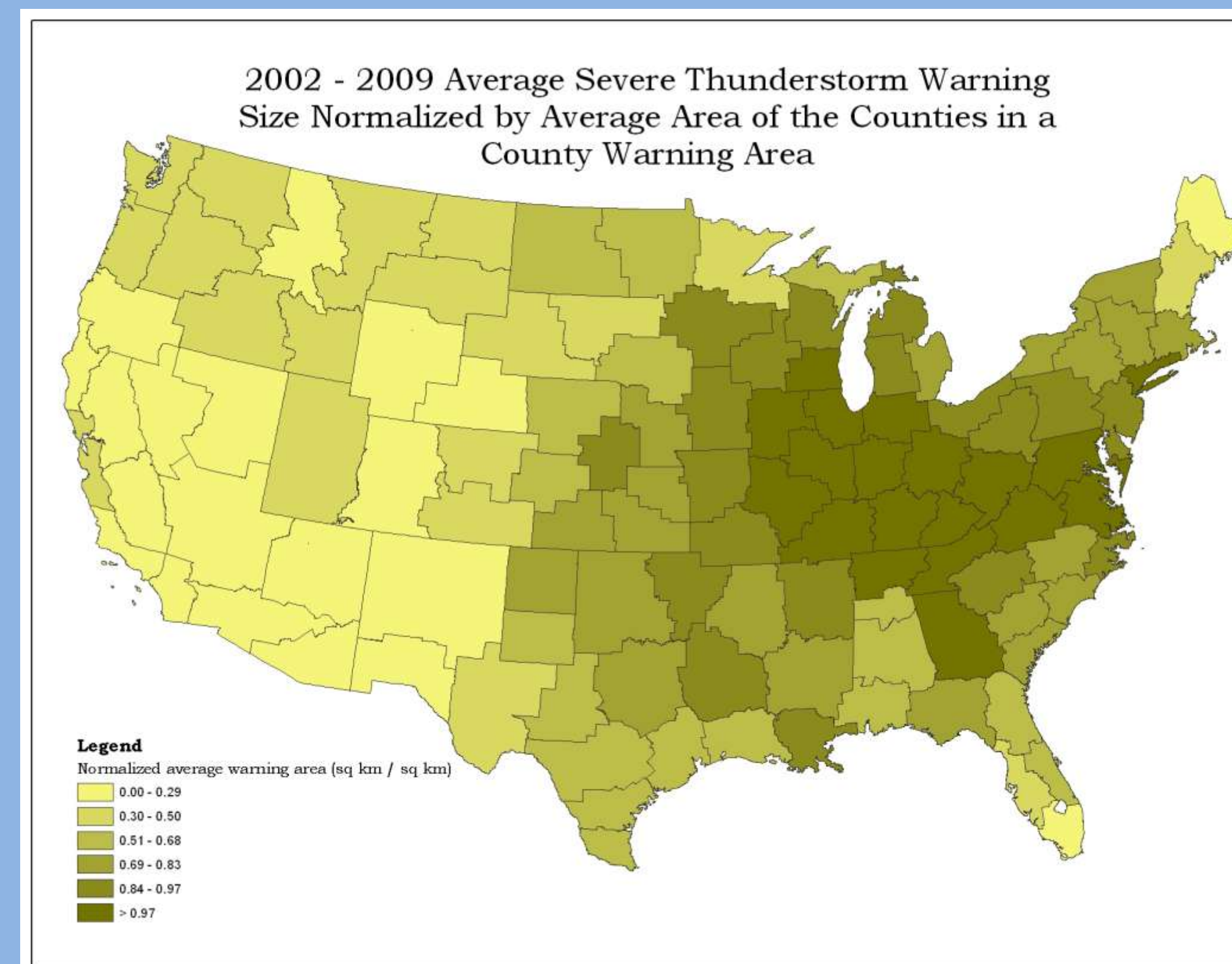
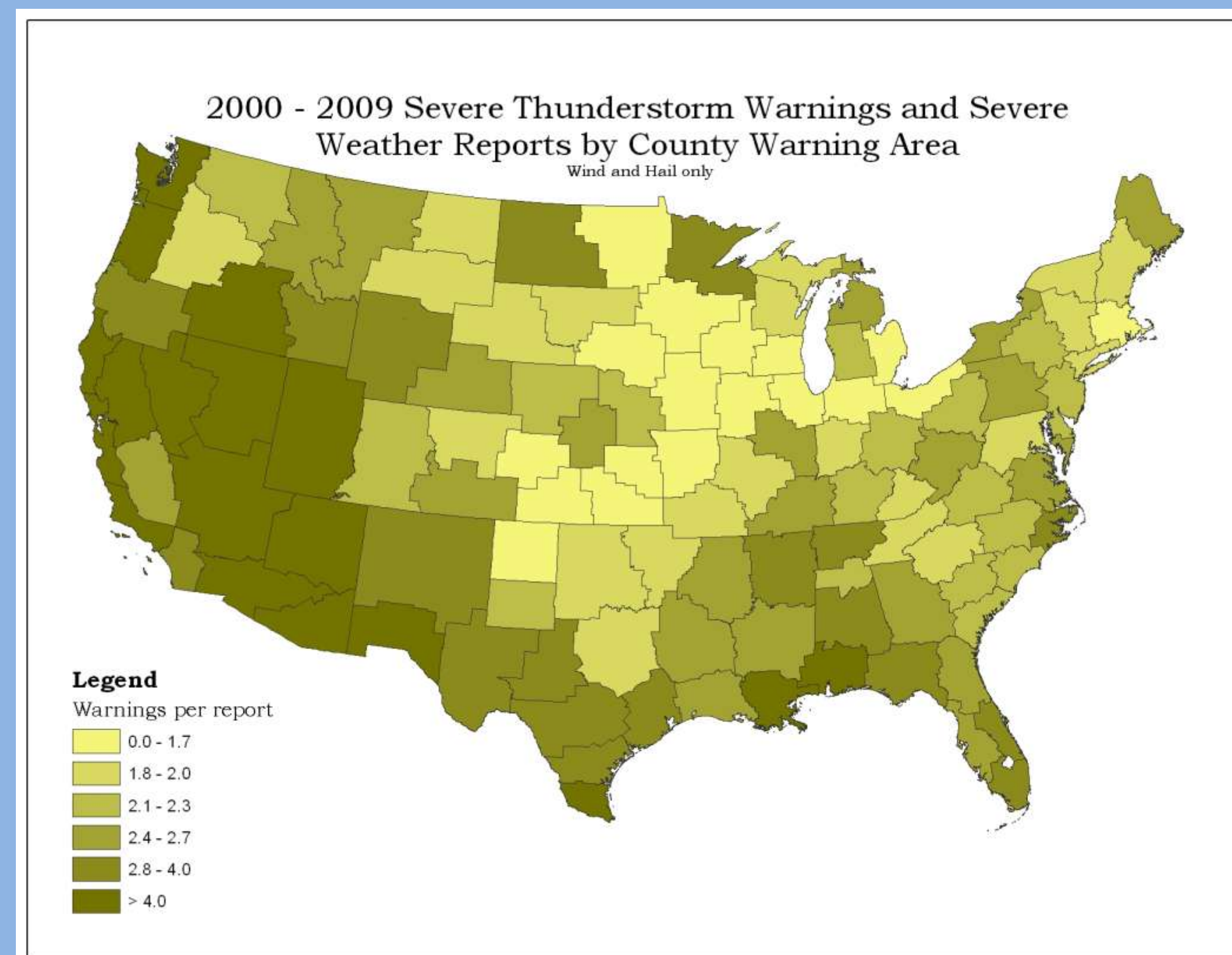
A number of ArcGIS v.9.3.1 geoprocessing techniques were used in this study, including:

- 1) Select by attributes — export data as shapefile
- 2) Spatial joining of points, lines, and polygons to polygons
- 3) Merging of polygon shapefiles
- 4) Buffering of polygon shapefiles
- 5) Editing of polygon shapefiles
- 6) Computation of area of shapefiles

National Weather Service County Warning areas and Weather Forecast Offices



The above tasks, as well as others, were used to create three sets of maps to analyze NWS warning tendencies. One set shows the number of warnings issued by each WFO relative to the actual number of reports of severe weather in its CWA. Another set shows the average size of the warnings issued relative to the average size of the counties in each CWA. The final set shows the density of warnings by county.



## Results and Conclusions

The left set of images show that, while nearly every WFO “over” warns (i.e., issues more warnings than receives reports), those in the western and southern portions of the lower 48 tend to issue the most severe thunderstorm warnings relative to the number of actual reports of severe weather (large hail and high wind) received than do those in the central portion of the lower 48. This may imply that these offices issue more false alarms than other offices. No clear pattern exists for tornado warnings other than Pacific coast WFOs issuing a smaller number of warnings relative to the number of tornado reports received. The middle set of images shows that WFOs in the Midwest to Ohio valley region tend to issue large warnings relative to the sizes of the counties in their CWAs. This is likely due to the small county sizes in this area of the country. The right set clearly shows that areas along and west of the front range of the Rocky Mountains are rarely warned for severe thunderstorms or tornadoes compared to other areas of the country. There are assorted local maxima in warning density throughout the Great Plains, the Midwest, the Great Lakes region, the mid-South, the Southeast, and the Atlantic coast. This is likely related to the occurrence of severe weather in a given county or the tendency of a WFO to issue warnings for that county.