



**TOWERS
PERRIN**

TILLINGHAST

Territorial Analysis: Putting Your Company on the Map

CAS Predictive Modeling Seminar

Klayton N. Southwood, FCAS, MAAA

October 11, 2007

Basis to Group Areas

County

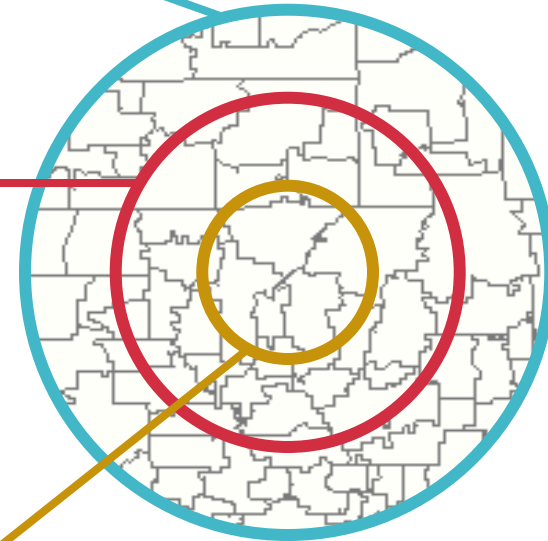
- Largely stable over time
- Broad area

ZIP Code

- Narrowly defined — may be beneficial to define territories
- Useful for online rating
- Main disadvantage is need to deal with change over time

Geo-Coding

- Finest detail
- Static over time
- No predefined grouping



Loss Index Normalized Pure Premium

Normalized Zip Code Pure Premium

=

Actual Zip Code Pure Premium

X

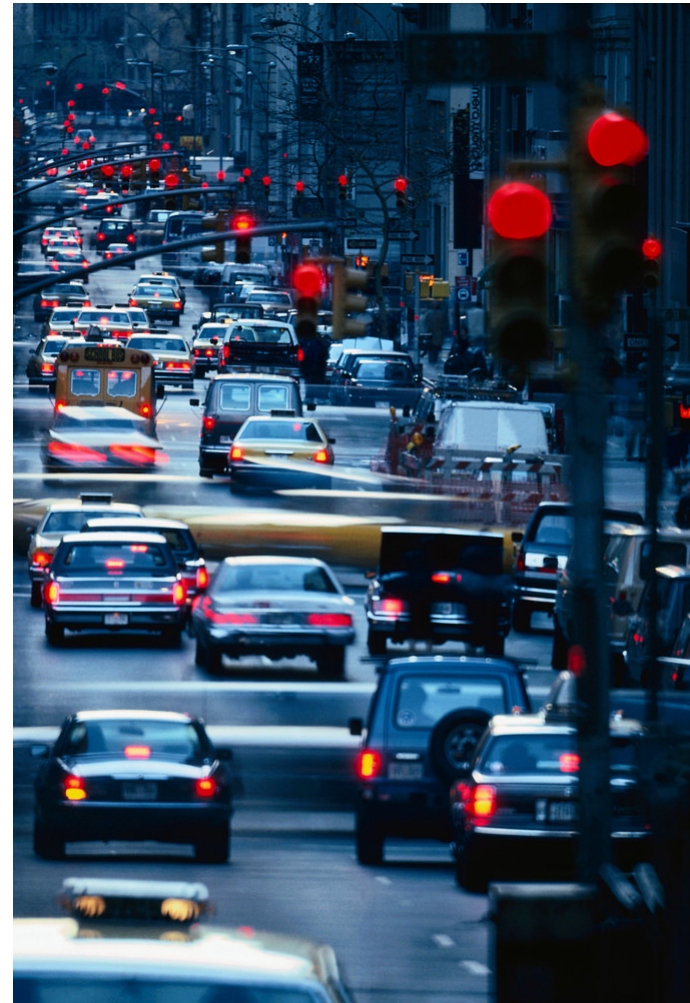
State Avg. Prem.
State Avg. Base

÷

Zip Avg. Prem.
Zip Base

Loss Index Econometric Model — Private Passenger Auto

- Population Density →
- Vehicle Density →
- Accidents per Vehicle →
- Injuries per Accident →
- Thefts per Vehicle →



Loss Index Econometric Model — Business Owners Liability

- Departure from Normal Temperature →
- Number of Days Maximum Temperature is Below Freezing →
- Total Precipitation →
- Population Density →
- Population Growth →
- Percent of Population Using Public Transportation →

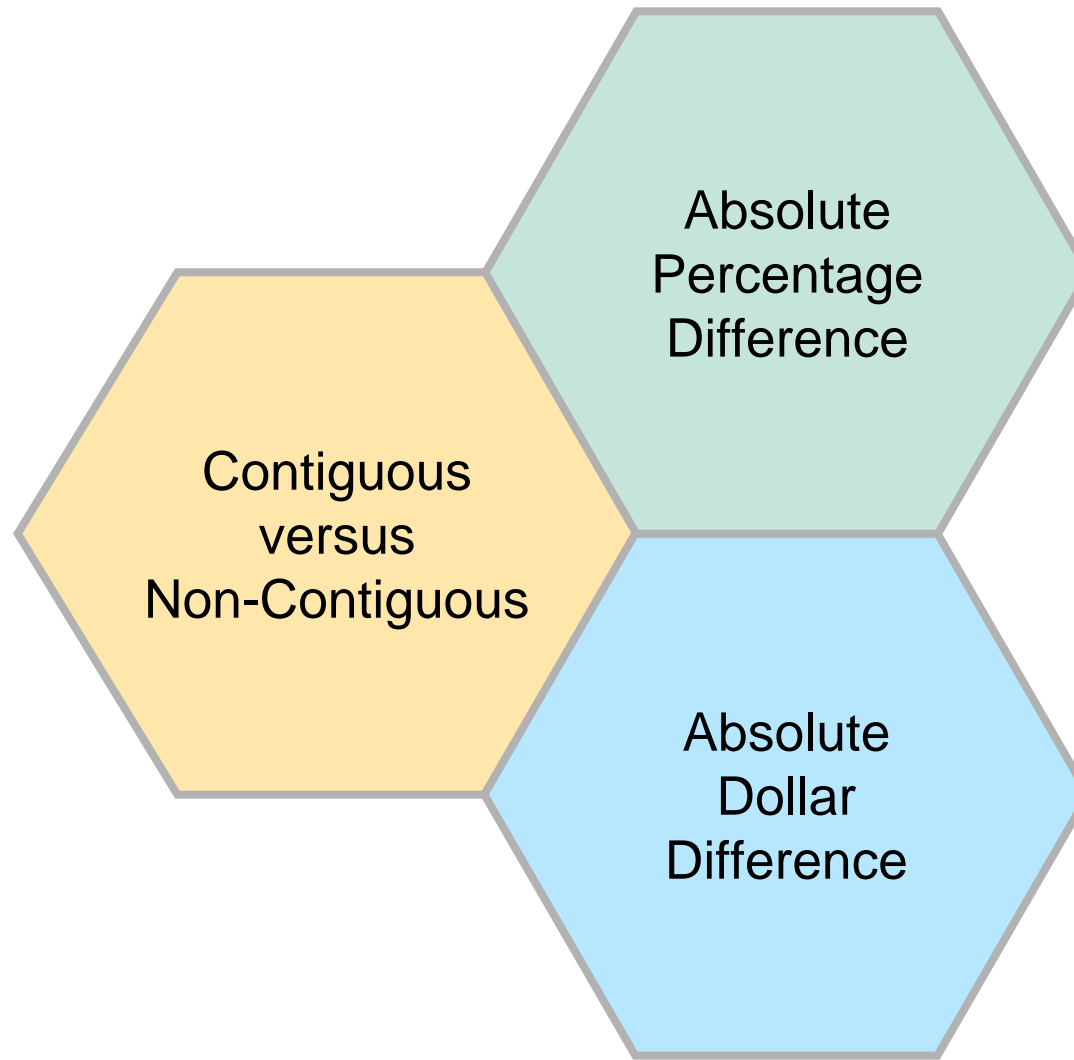


Credibility

- No “right” answer
- We commonly use:
 - 3,000 Claims
 - With complement applied to:
 - Neighborhood Pure Premium
 - Within Two Miles
 - One Mile Extensions

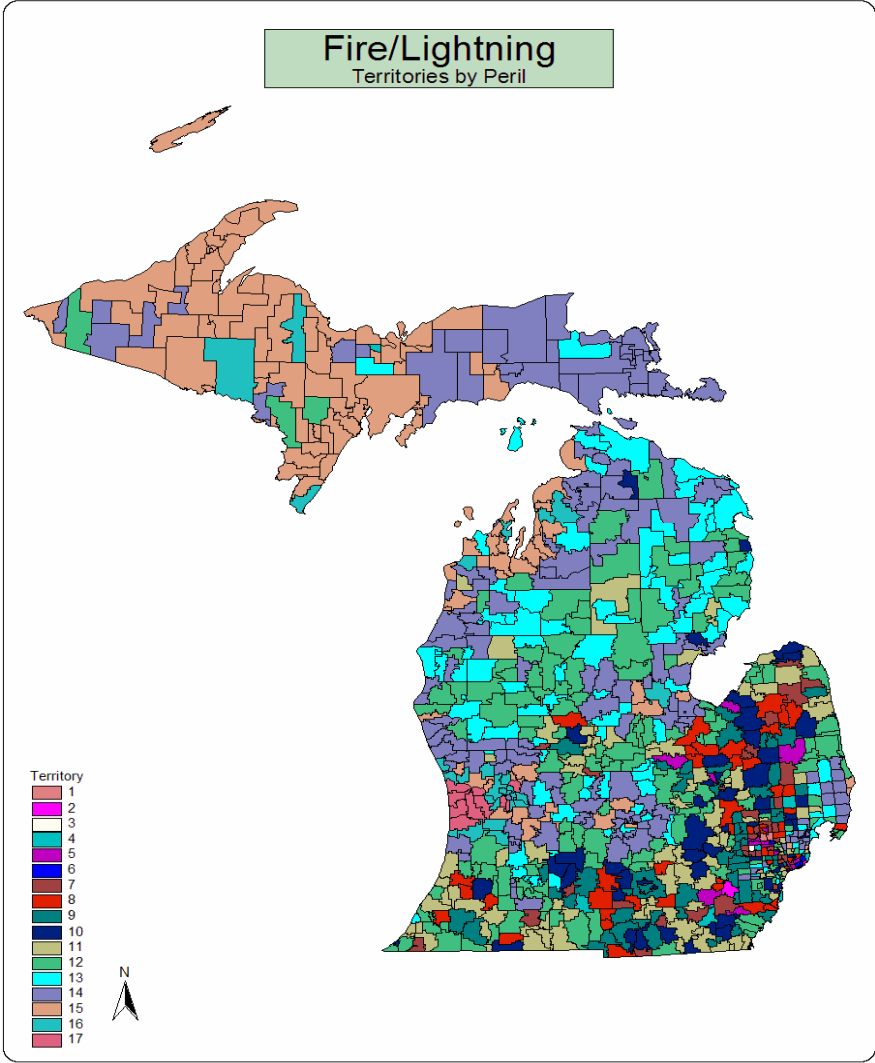


Clustering

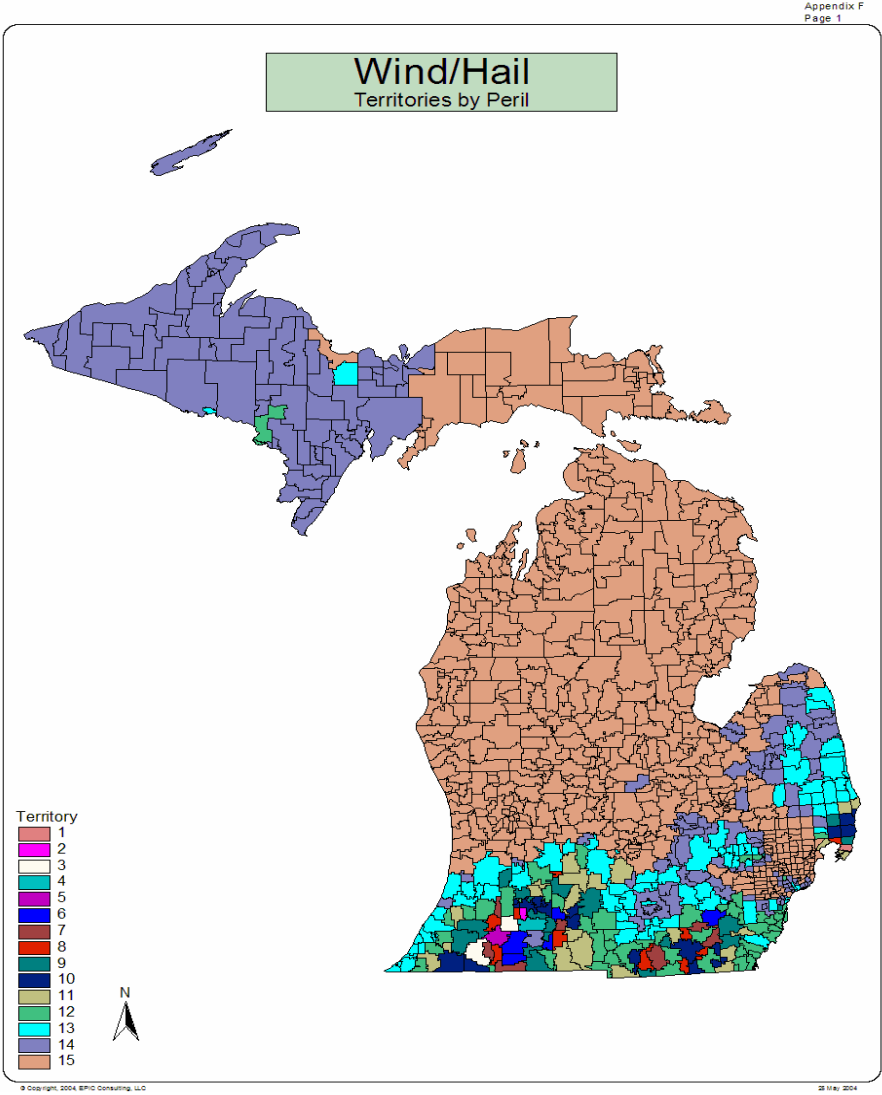


Michigan Industry Homeowners Fire (Non-Contiguous)

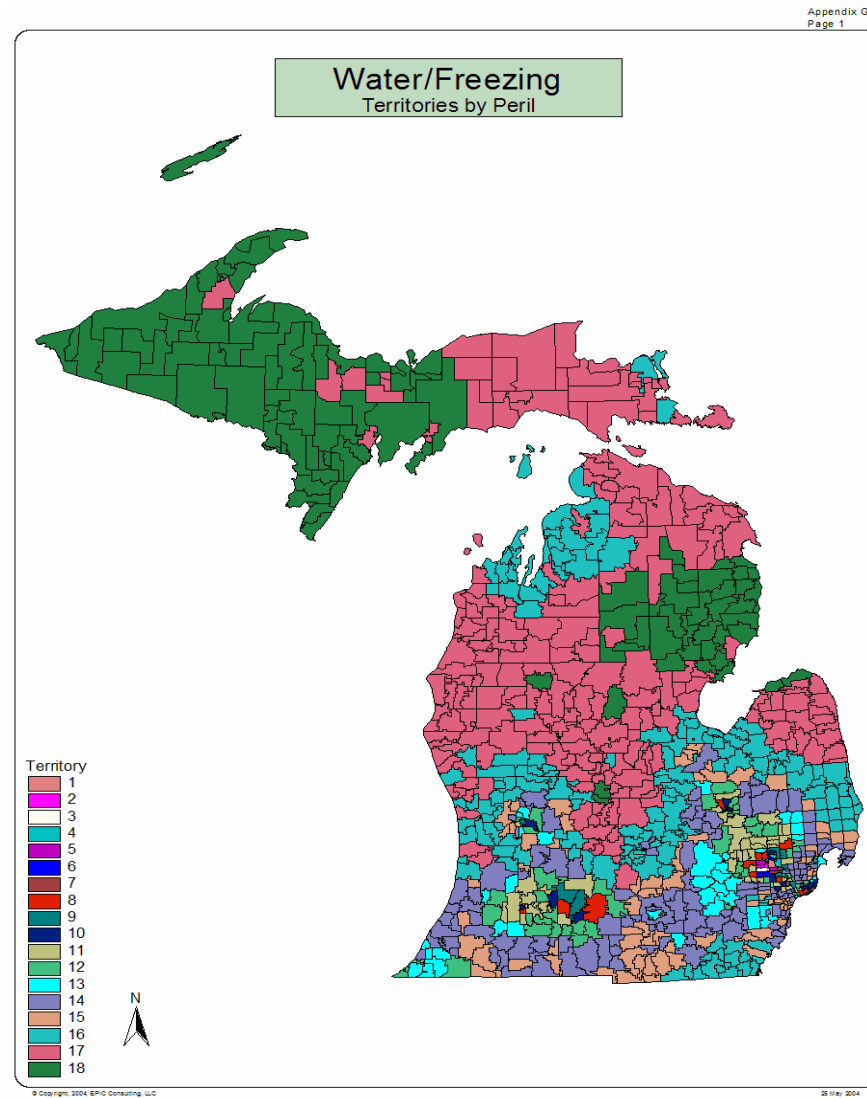
Appendix E
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Michigan Industry Homeowners Wind/Hail (Non-Contiguous)

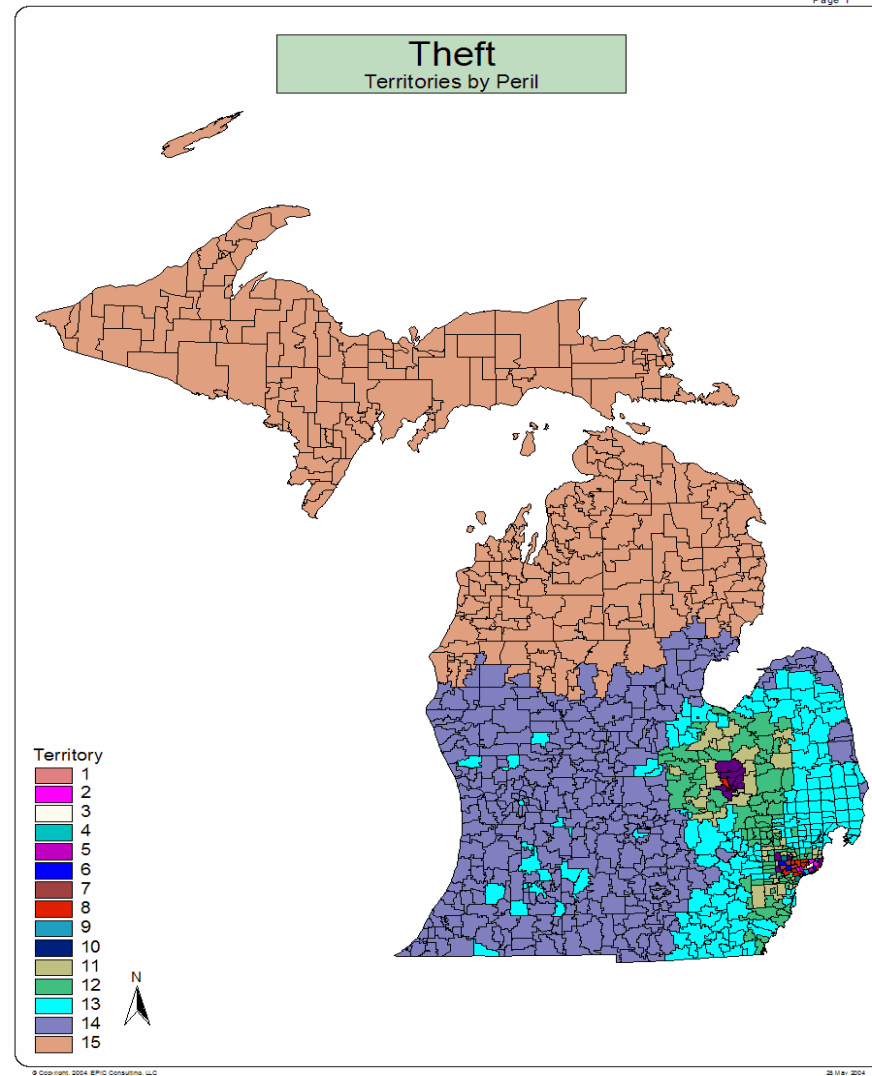


Michigan Industry Homeowners Water/Freezing (Non-Contiguous)

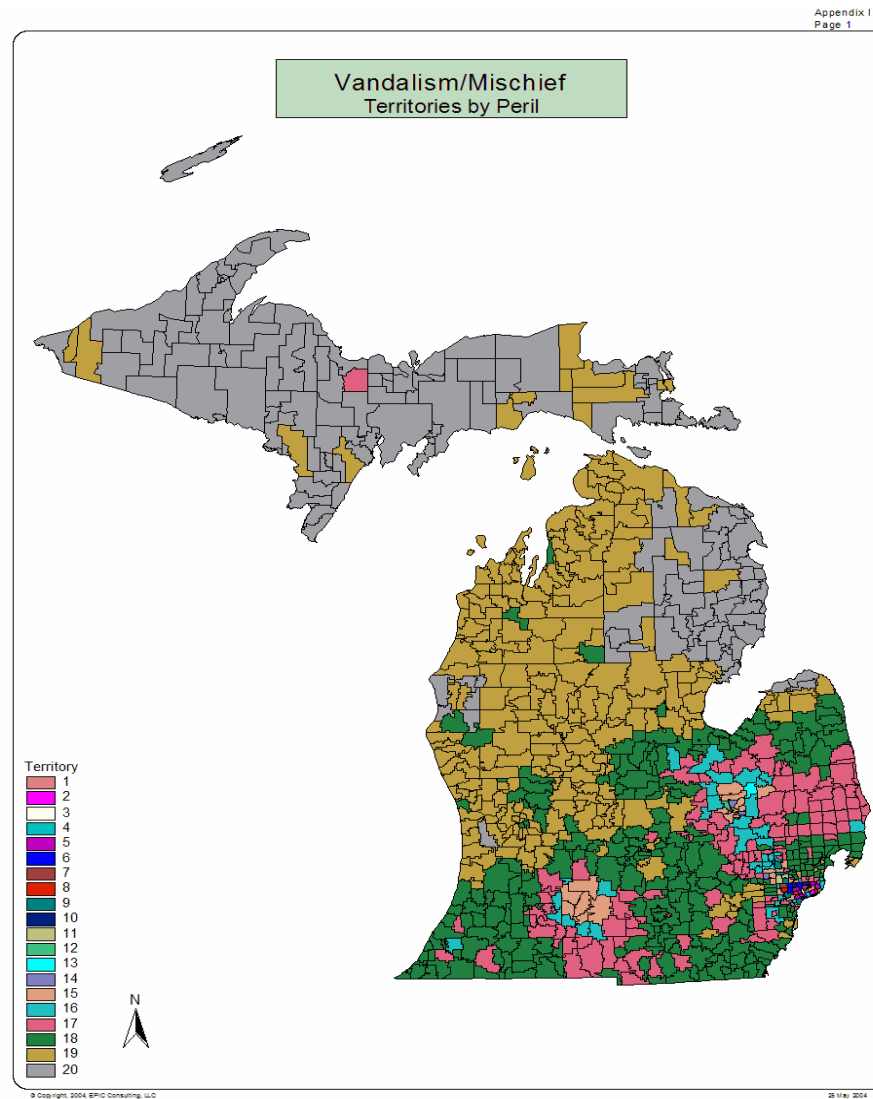


Michigan Industry Homeowners Theft (Non-Contiguous)

Appendix H
Page 1

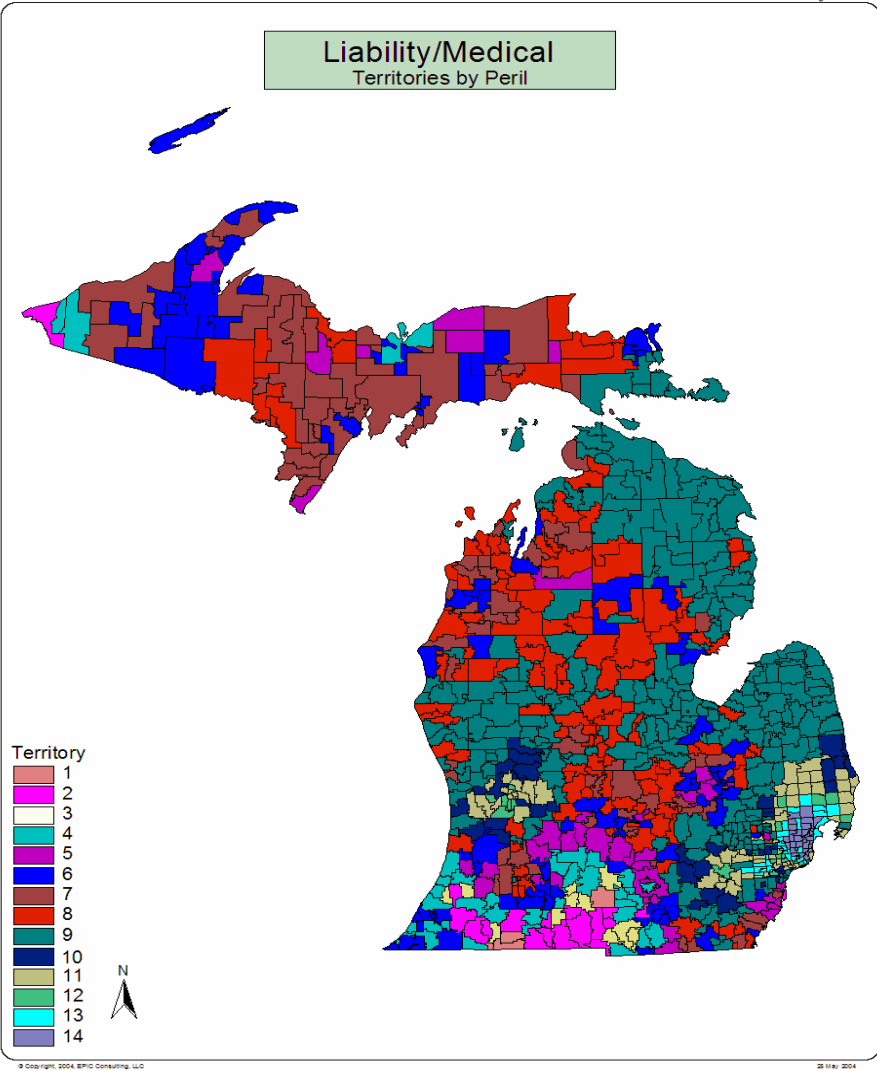


Michigan Industry Homeowners Vandalism (Non-Contiguous)



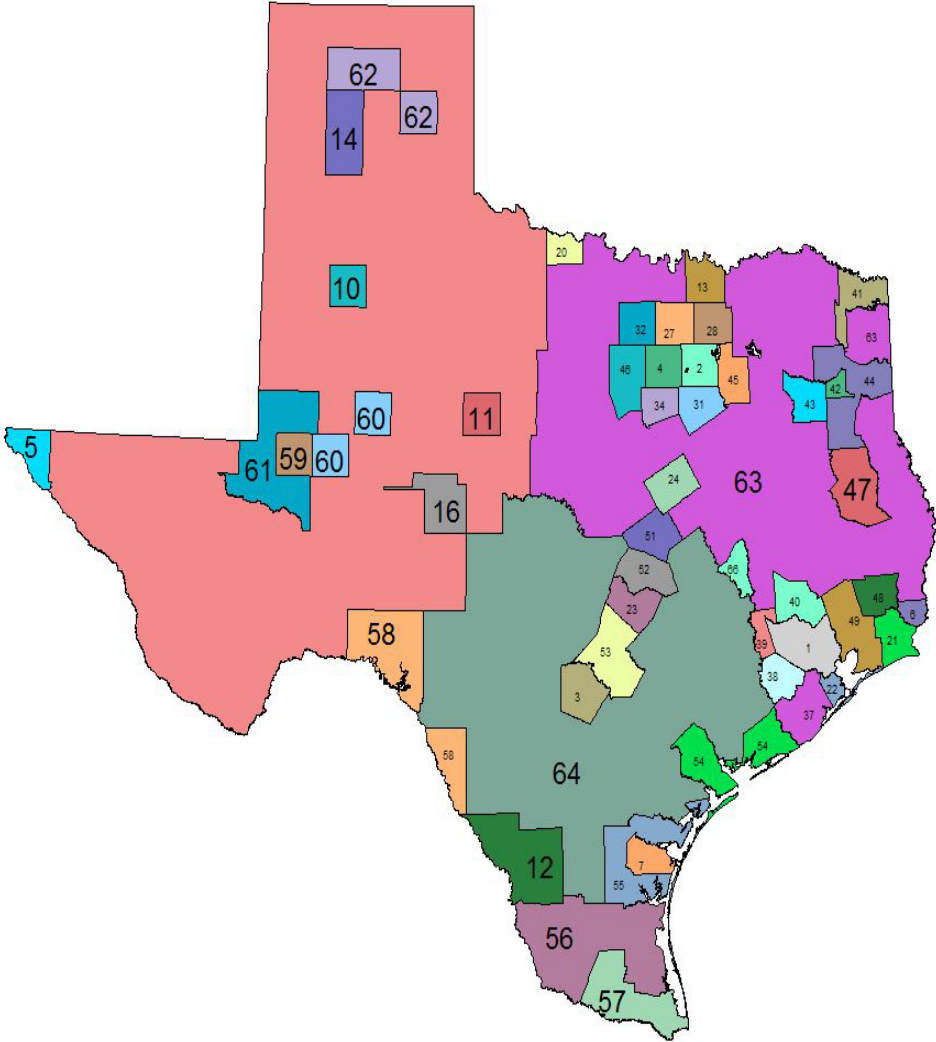
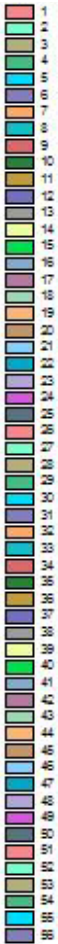
Michigan Industry Homeowners Liability (Non-Contiguous)

Appendix J
Page 1



Texas Auto Benchmark

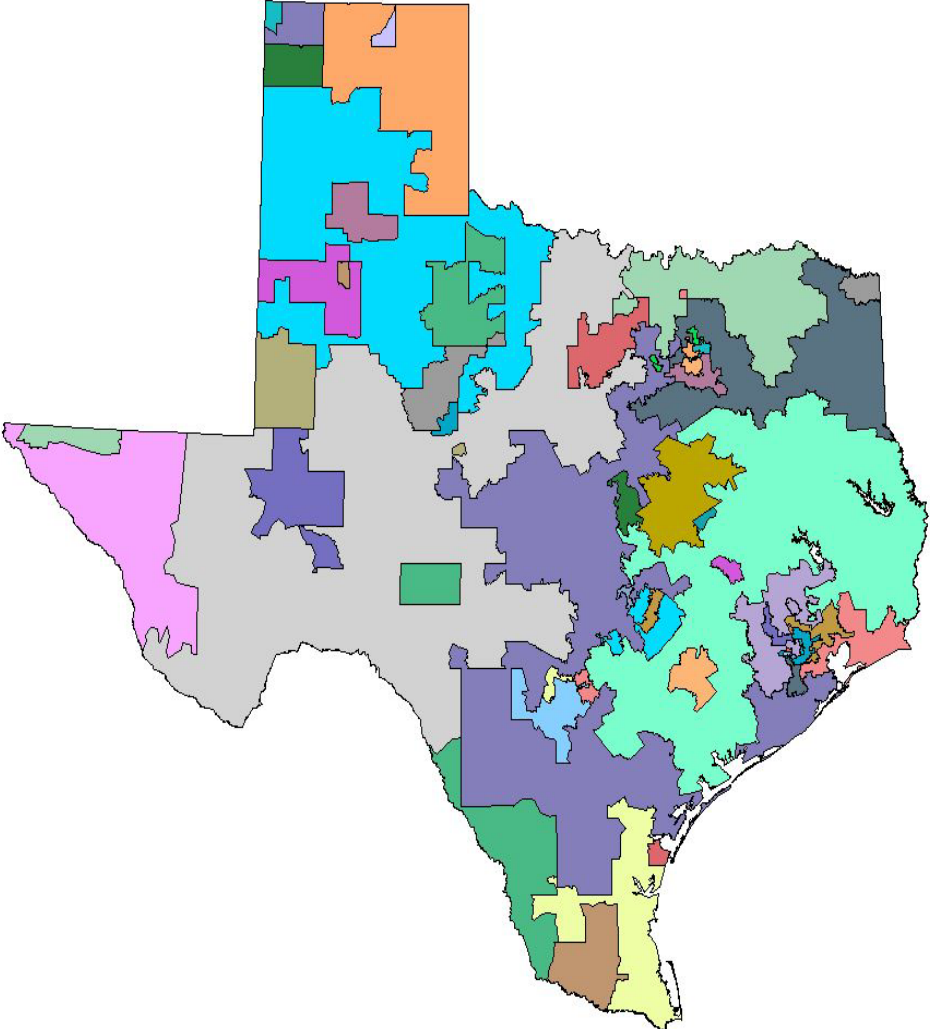
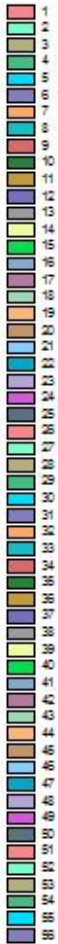
AUTO BENCHMARK



Indicated Auto Territories — All Coverages (Contiguous)

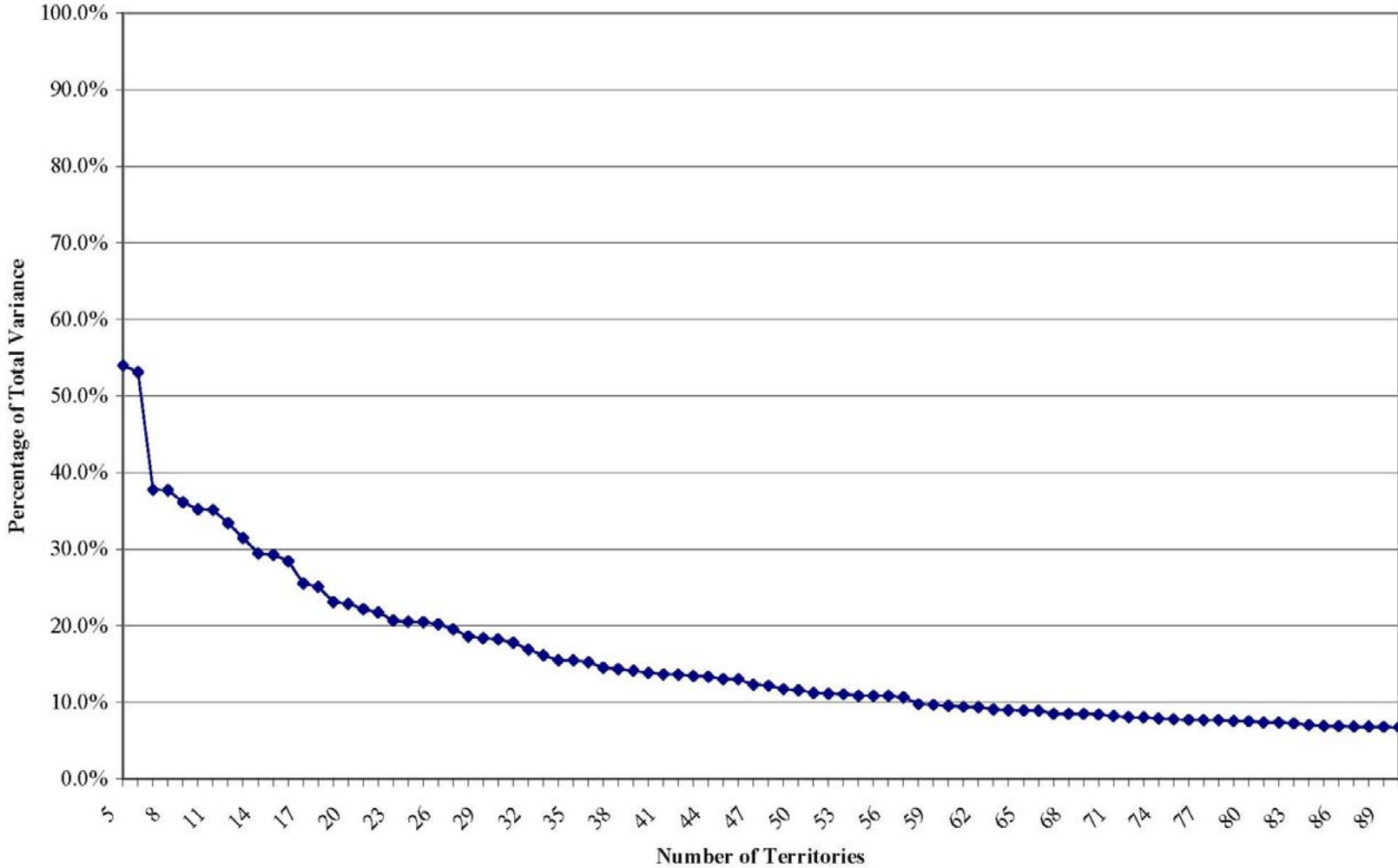
Texas

ALL COVERAGES



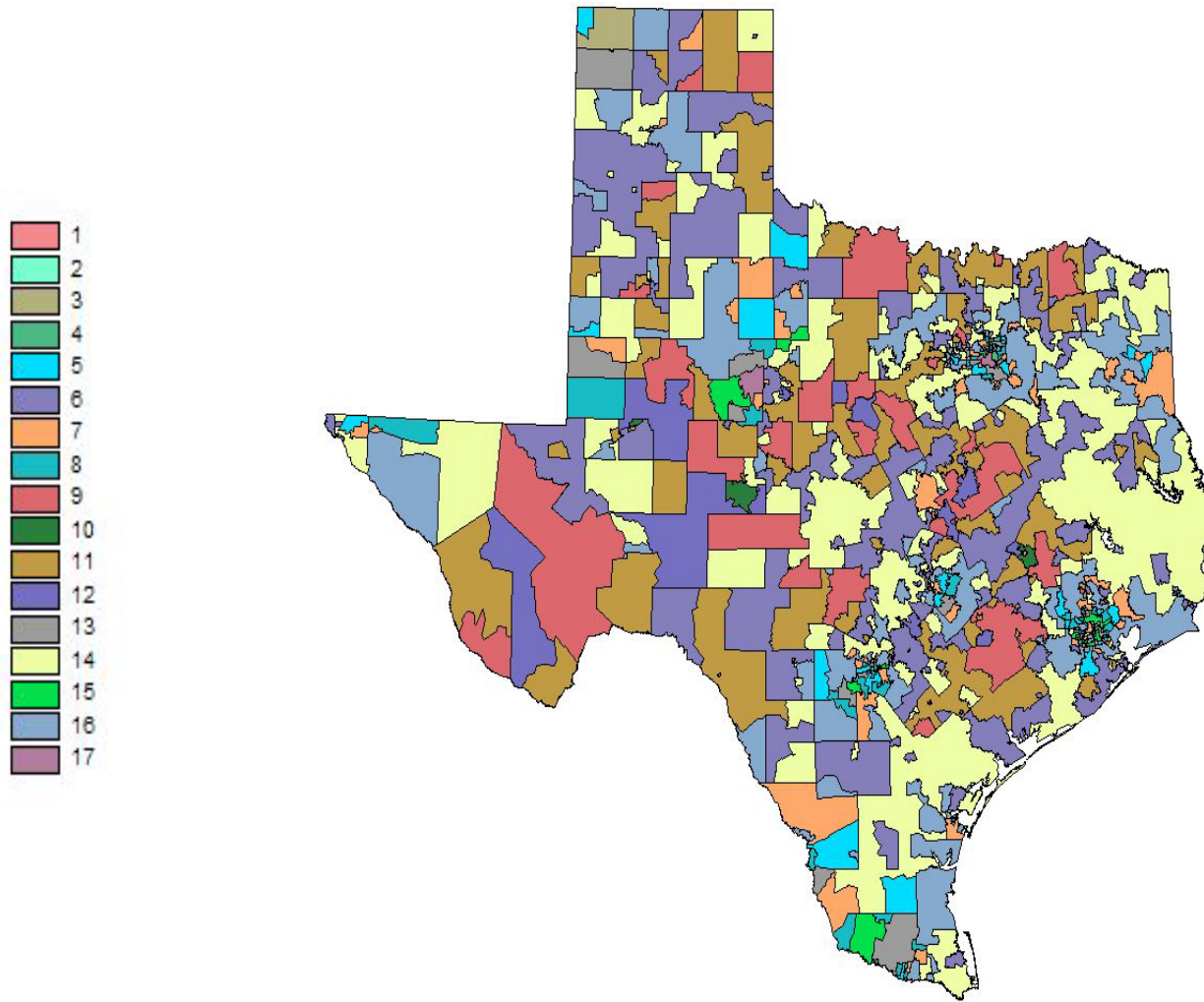
Within Territory Variance as a Percentage of Total Variance — All Coverages (Contiguous)

Texas



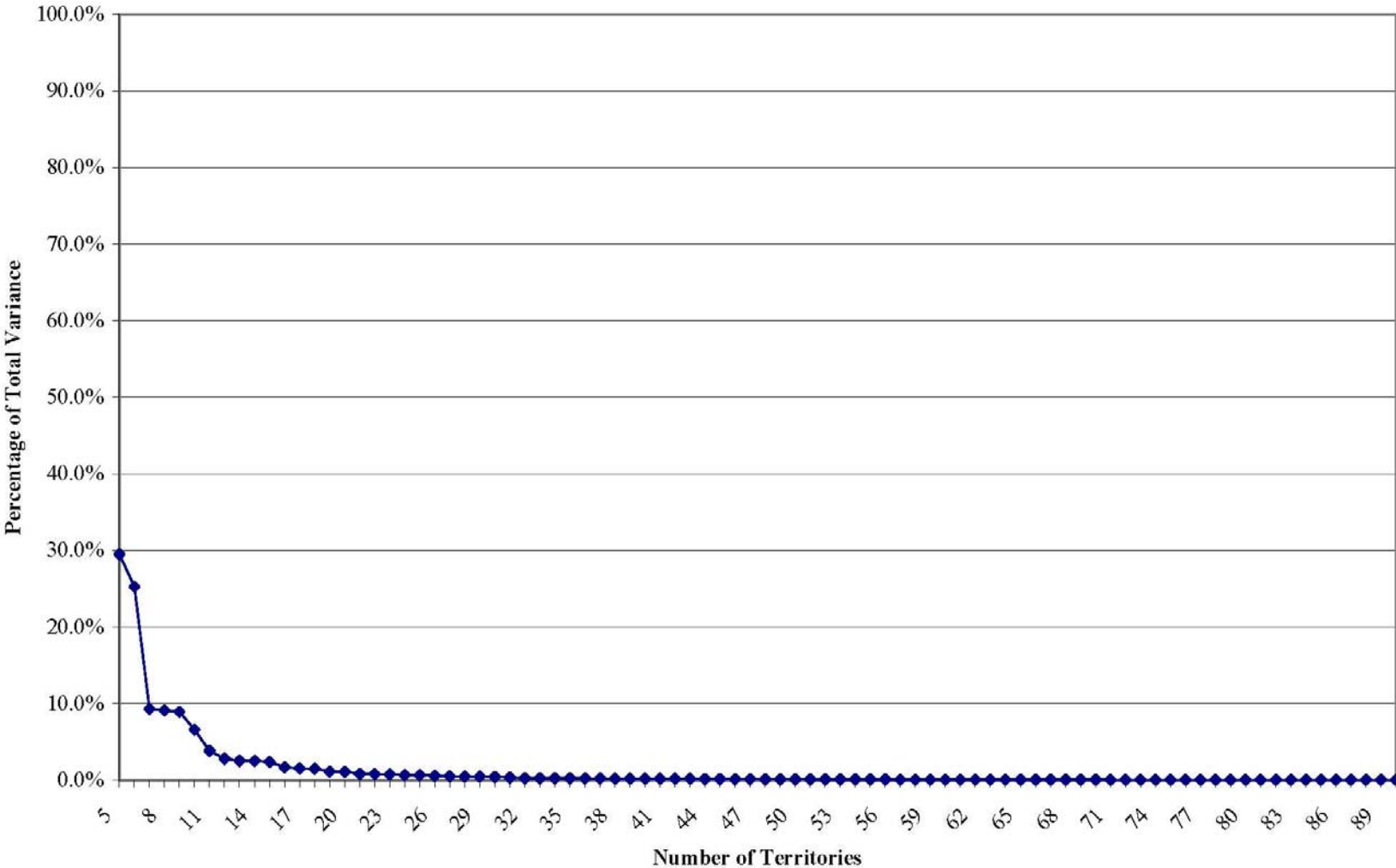
Indicated Auto Territories — All Coverages (Non-Contiguous)

Texas



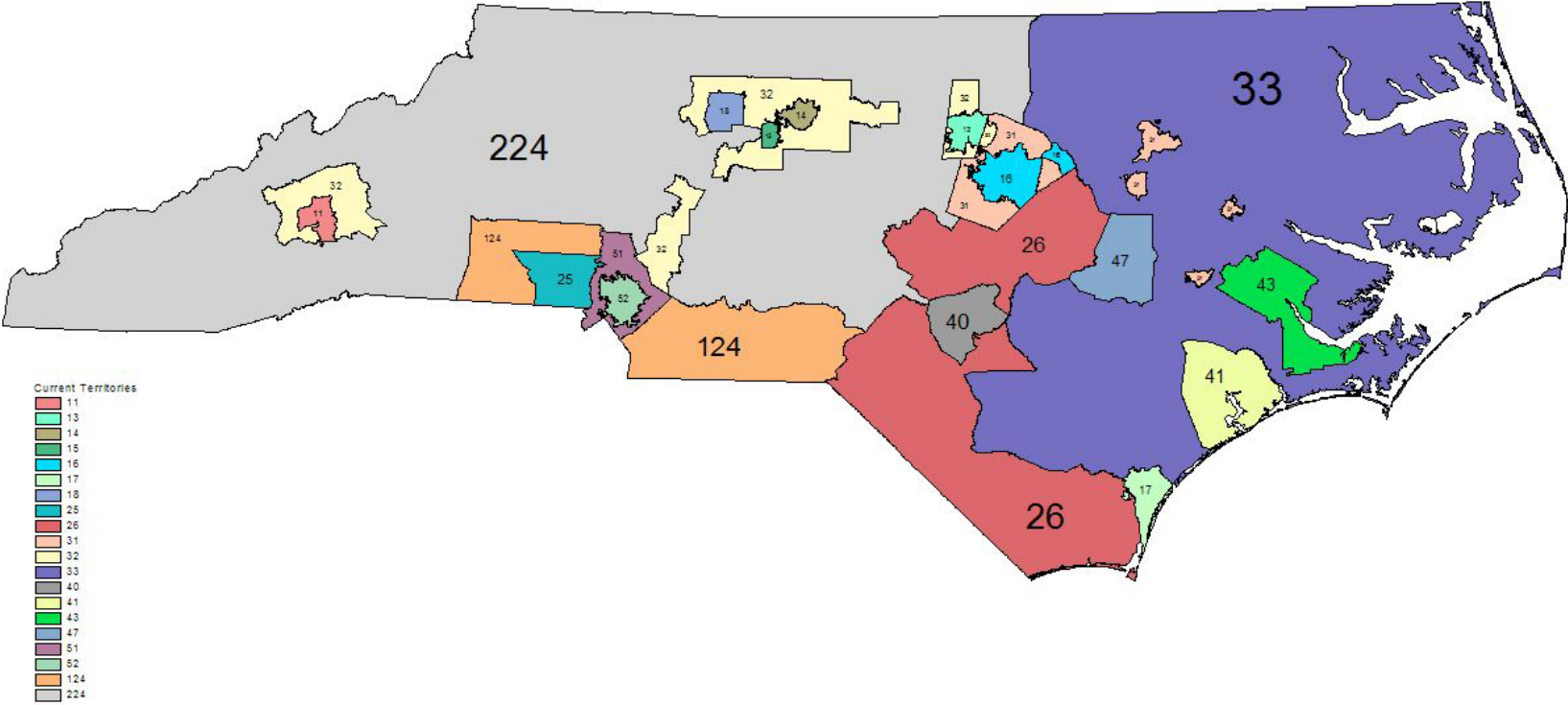
Within Territory Variance as a Percentage of Total Variance — All Coverages (Non-Contiguous)

Texas



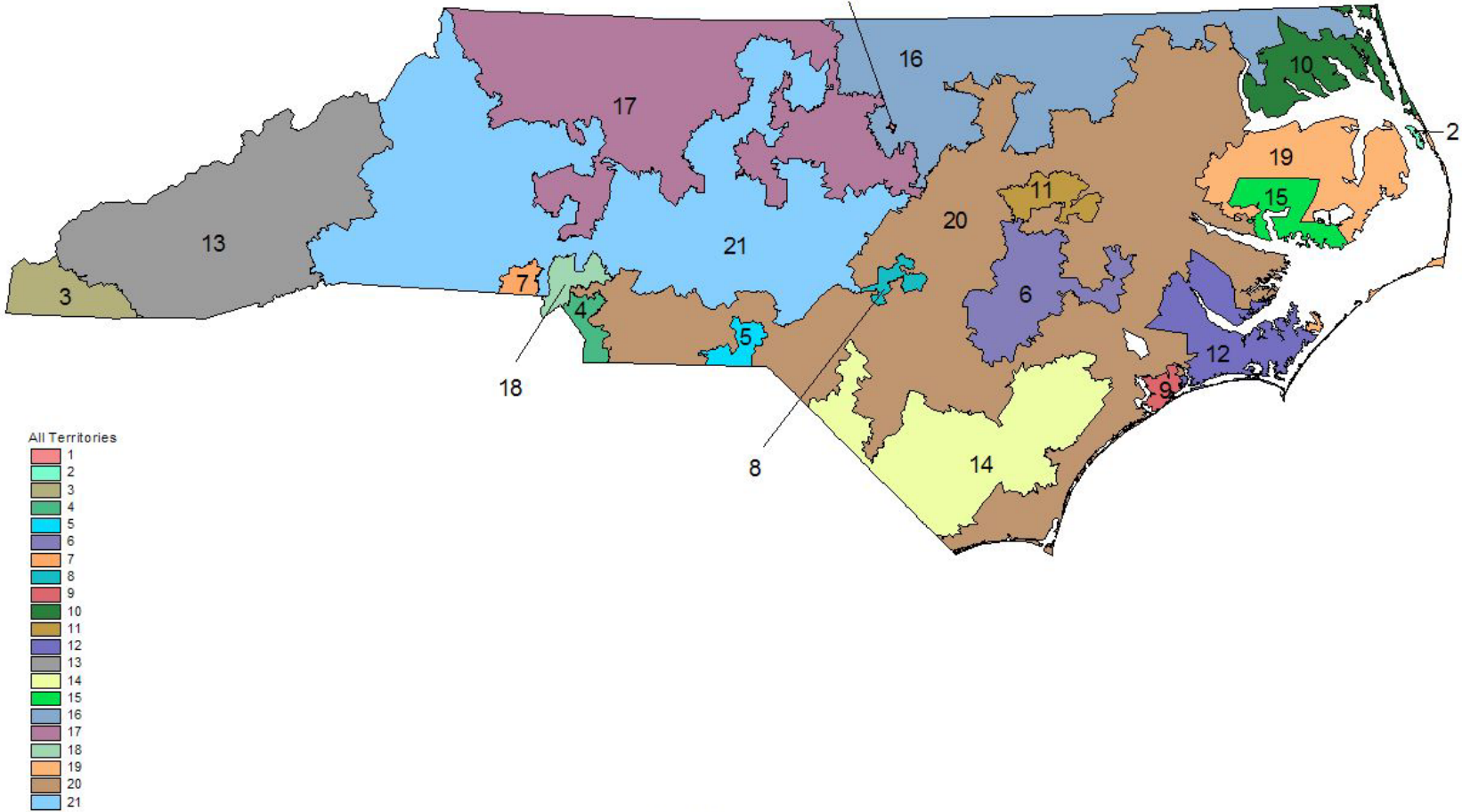
Current Auto Territories — All Coverages

North Carolina



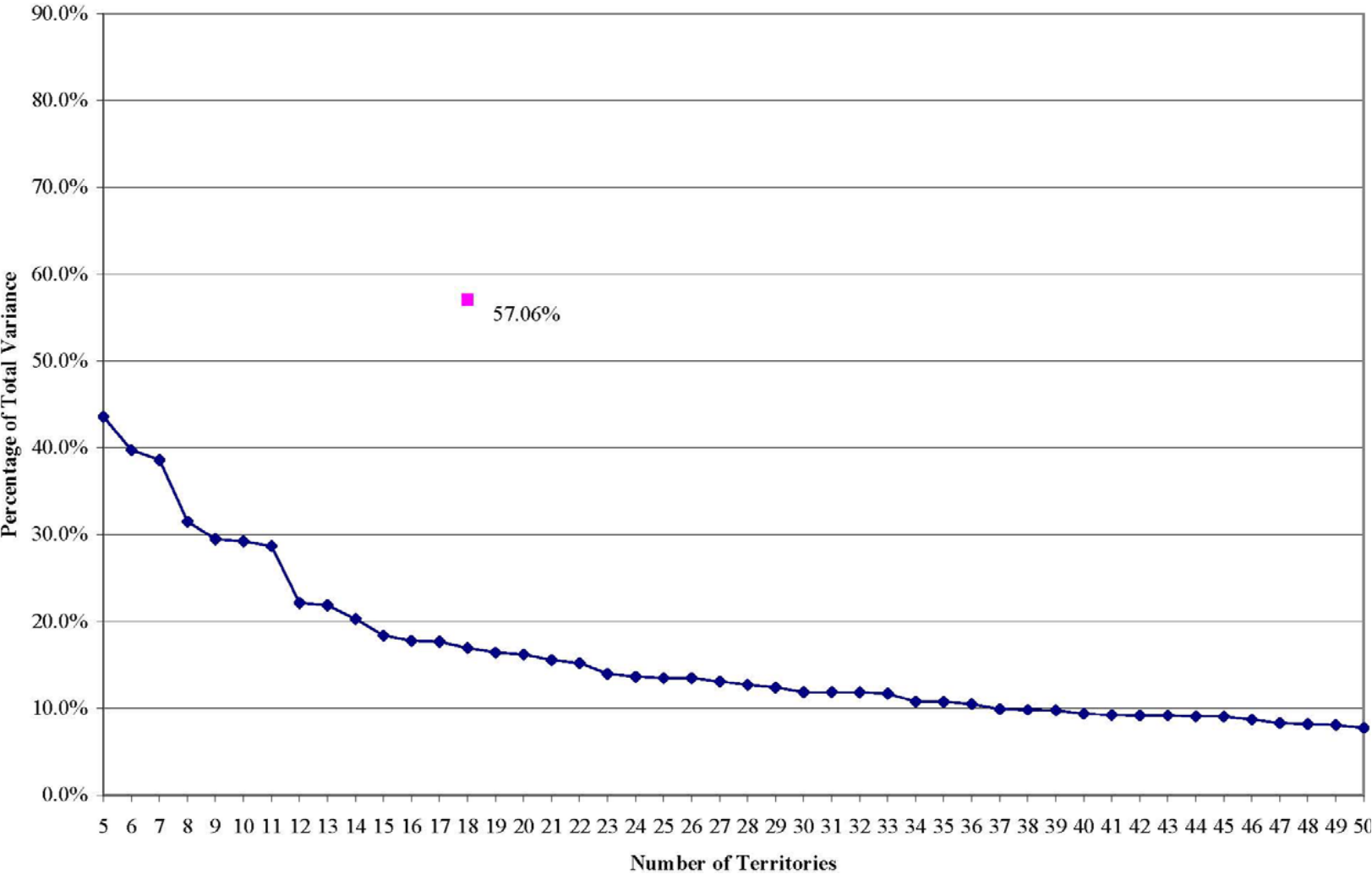
1997 – 1999 Indicated Auto Territories — All Coverages (Contiguous)

North Carolina



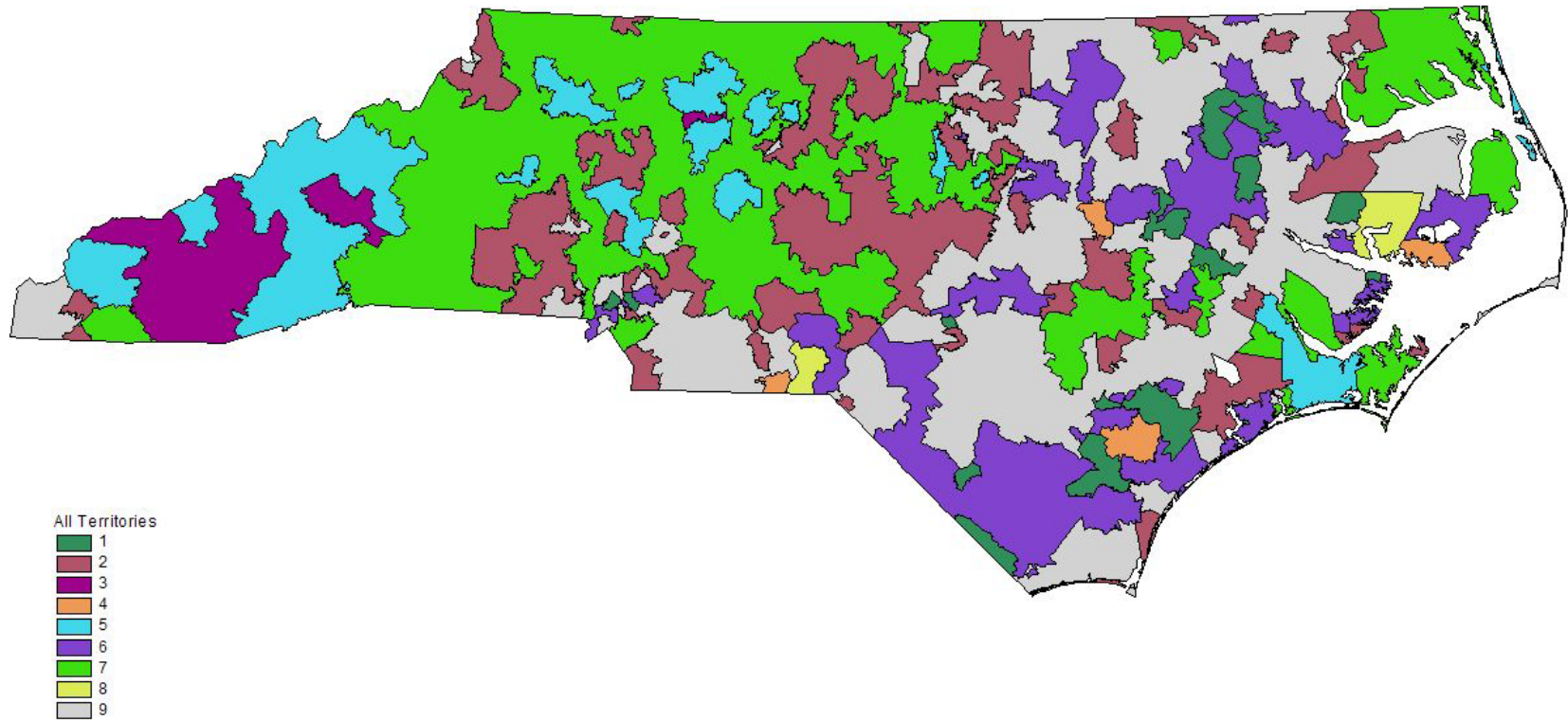
Within Territory Variance as a Percentage of Total Variance — All Coverages (Contiguous)

North Carolina



1997 – 1999* Indicated Auto Territories — All Coverages (Non-Contiguous)

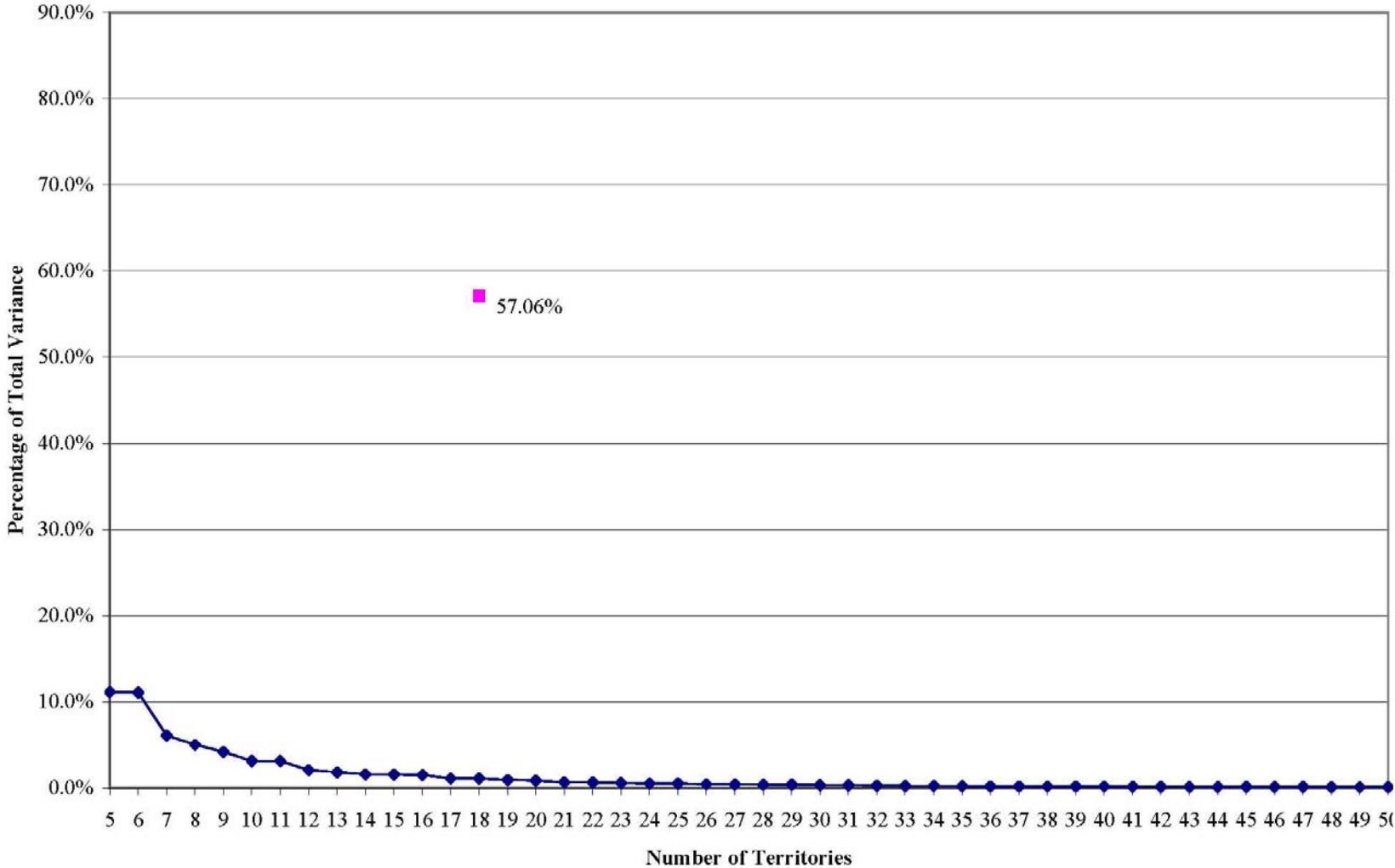
North Carolina



* 1993 – 1999 for Comprehensive

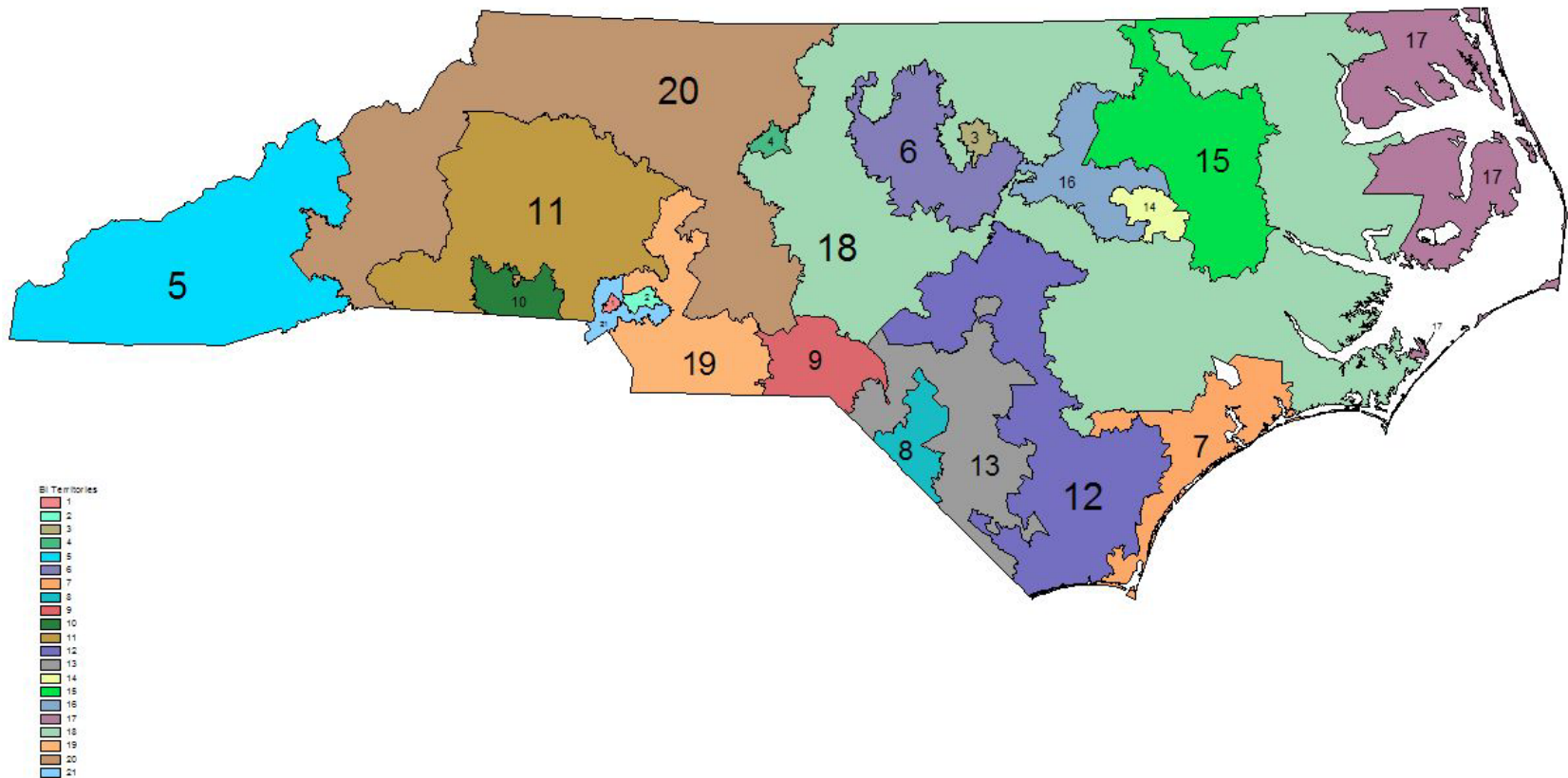
Within Territory Variance as a Percentage of Total Variance — All Coverages (Non-Contiguous)

North Carolina



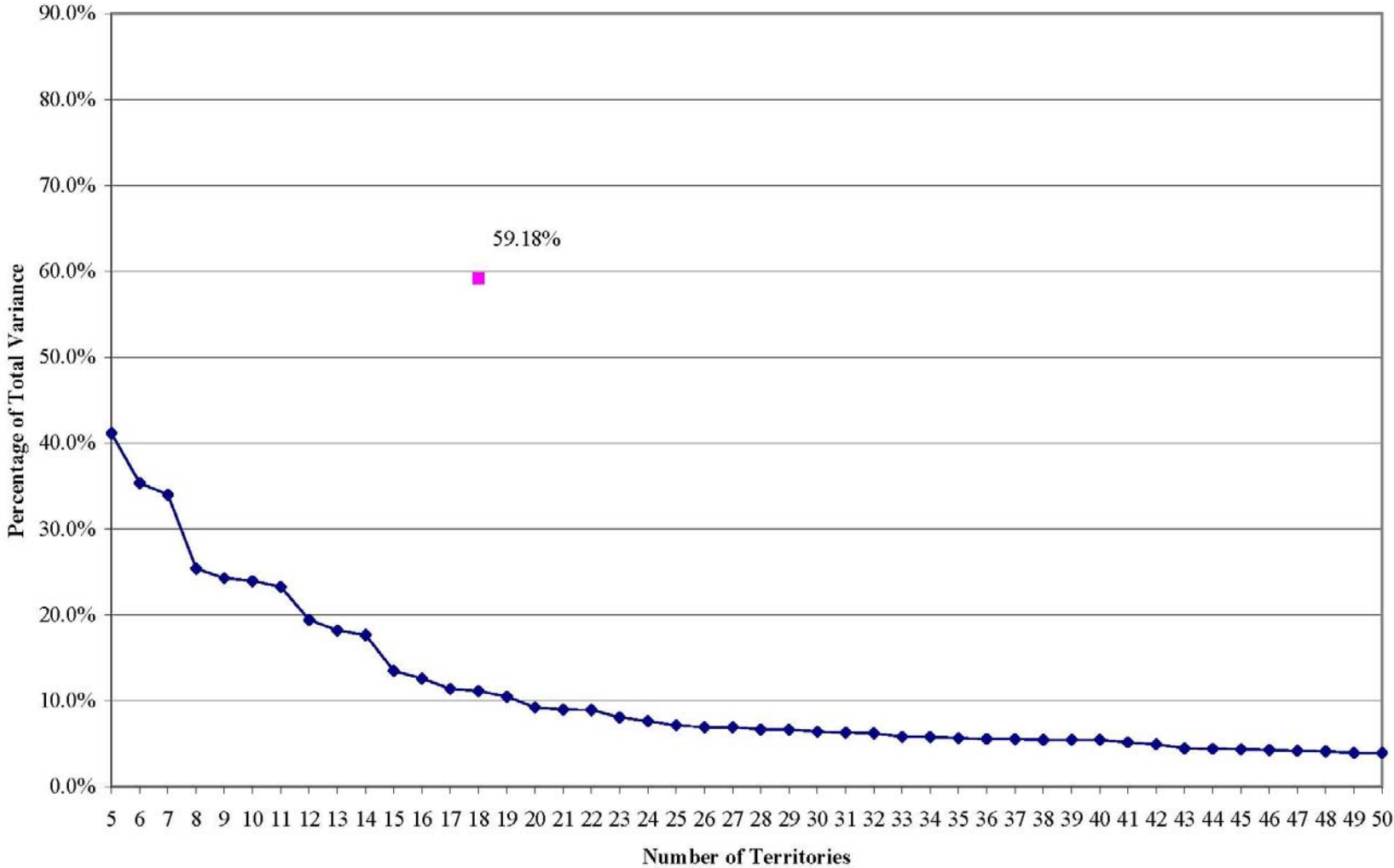
1997 – 1999 Indicated Auto Territories — Bodily Injury (Contiguous)

North Carolina



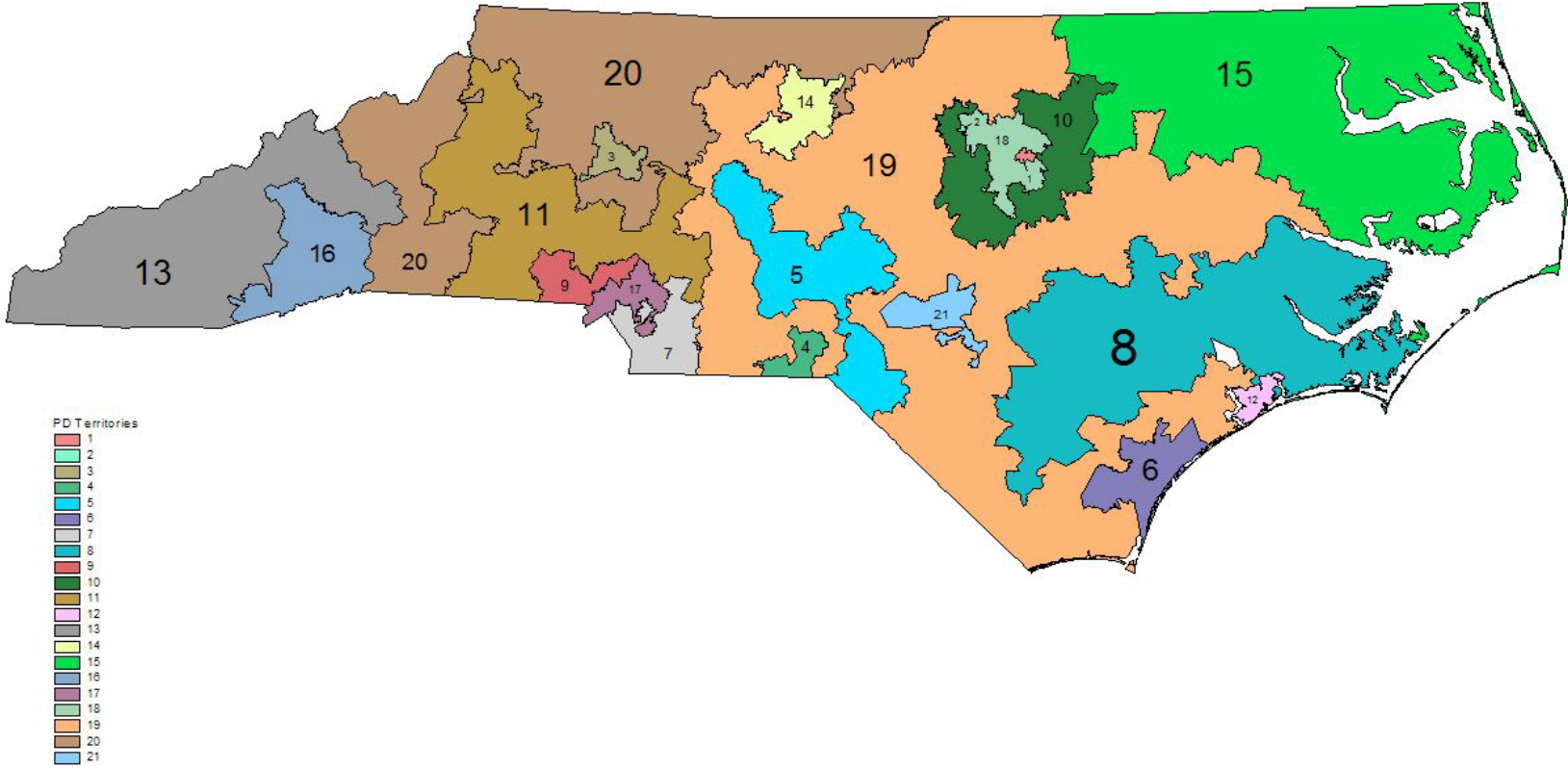
Within Territory Variance as a Percentage of Total Variance — Bodily Injury (Contiguous)

North Carolina



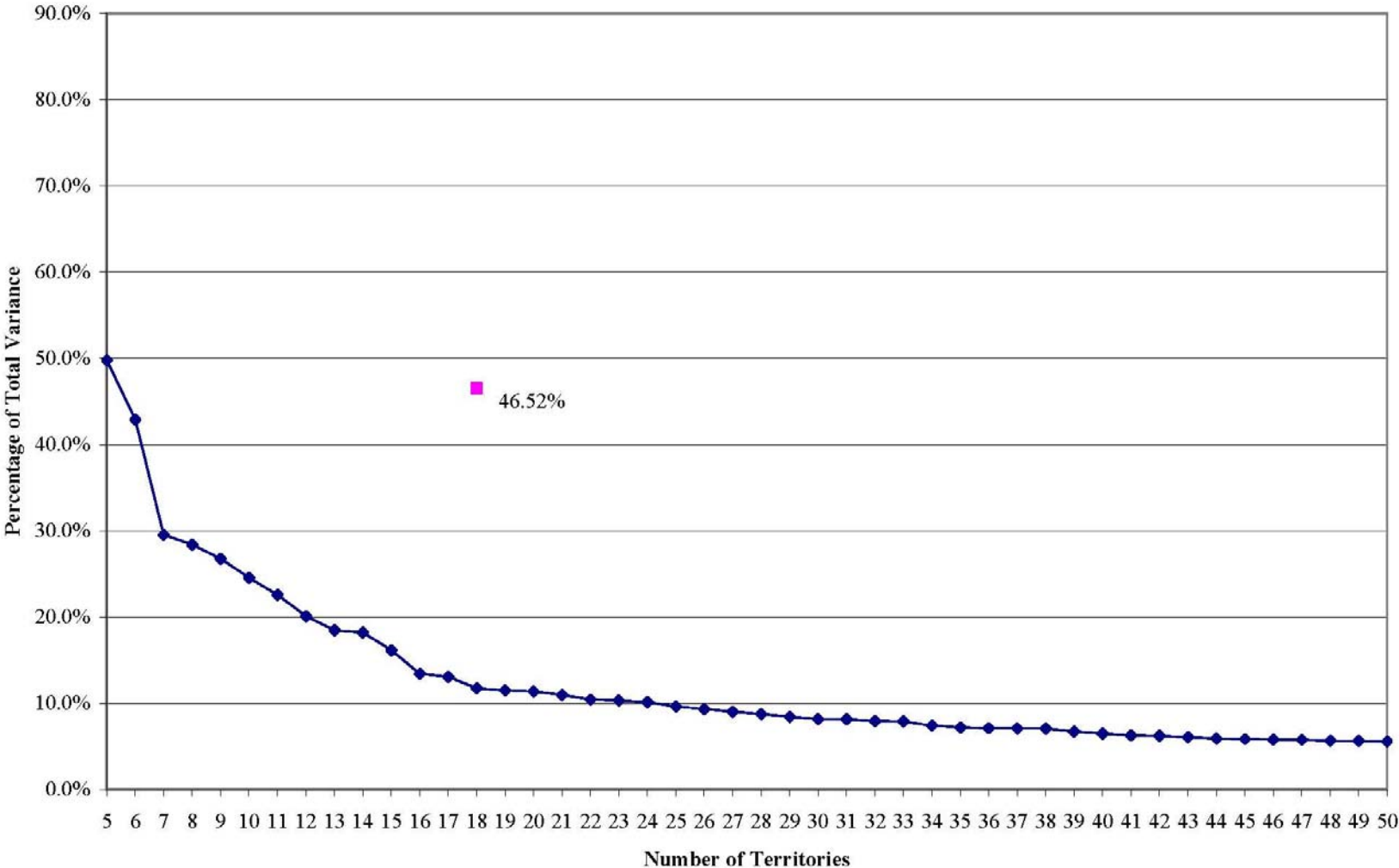
1997 – 1999 Indicated Auto Territories — Property Damage (Contiguous)

North Carolina



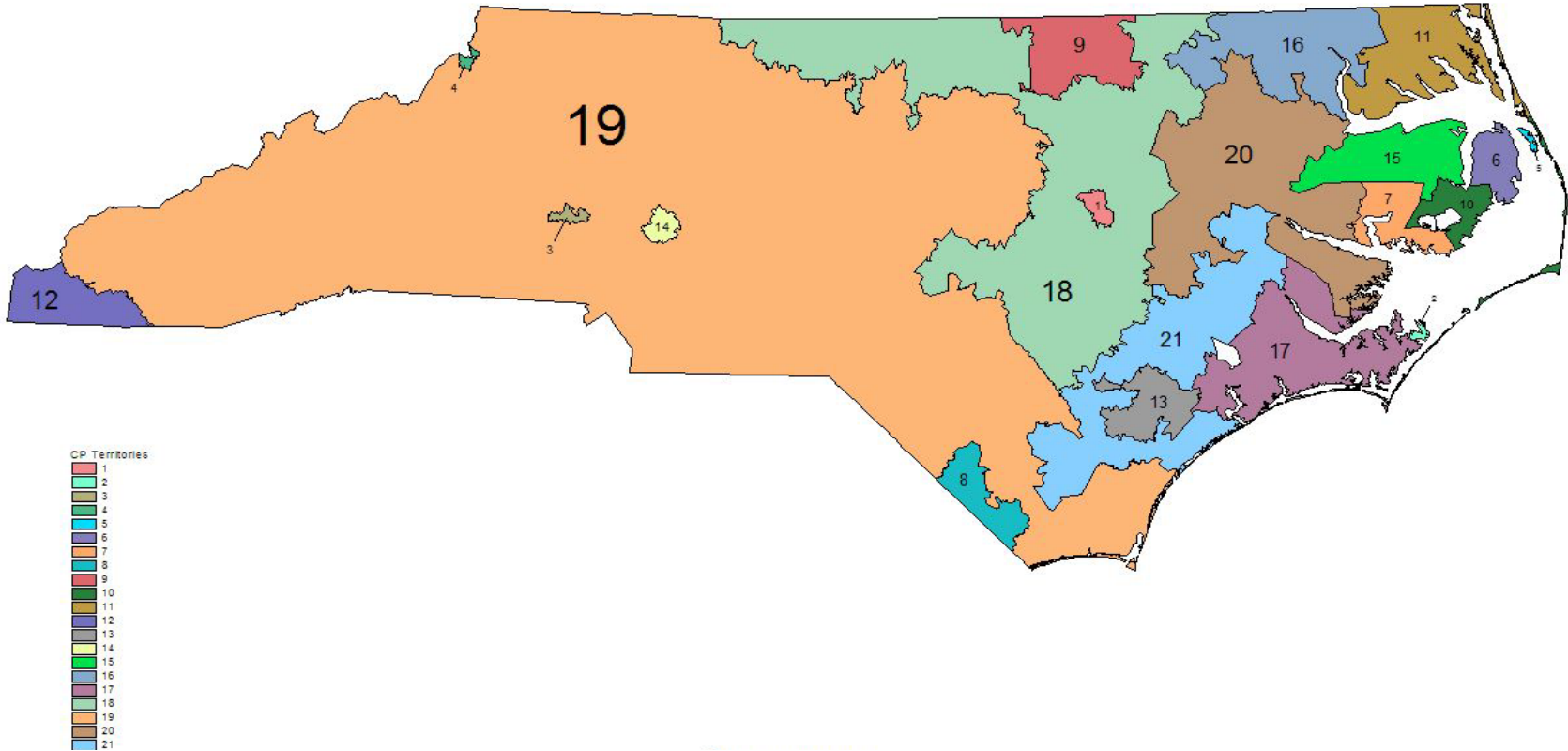
Within Territory Variance as a Percentage of Total Variance — Property Damage (Contiguous)

North Carolina



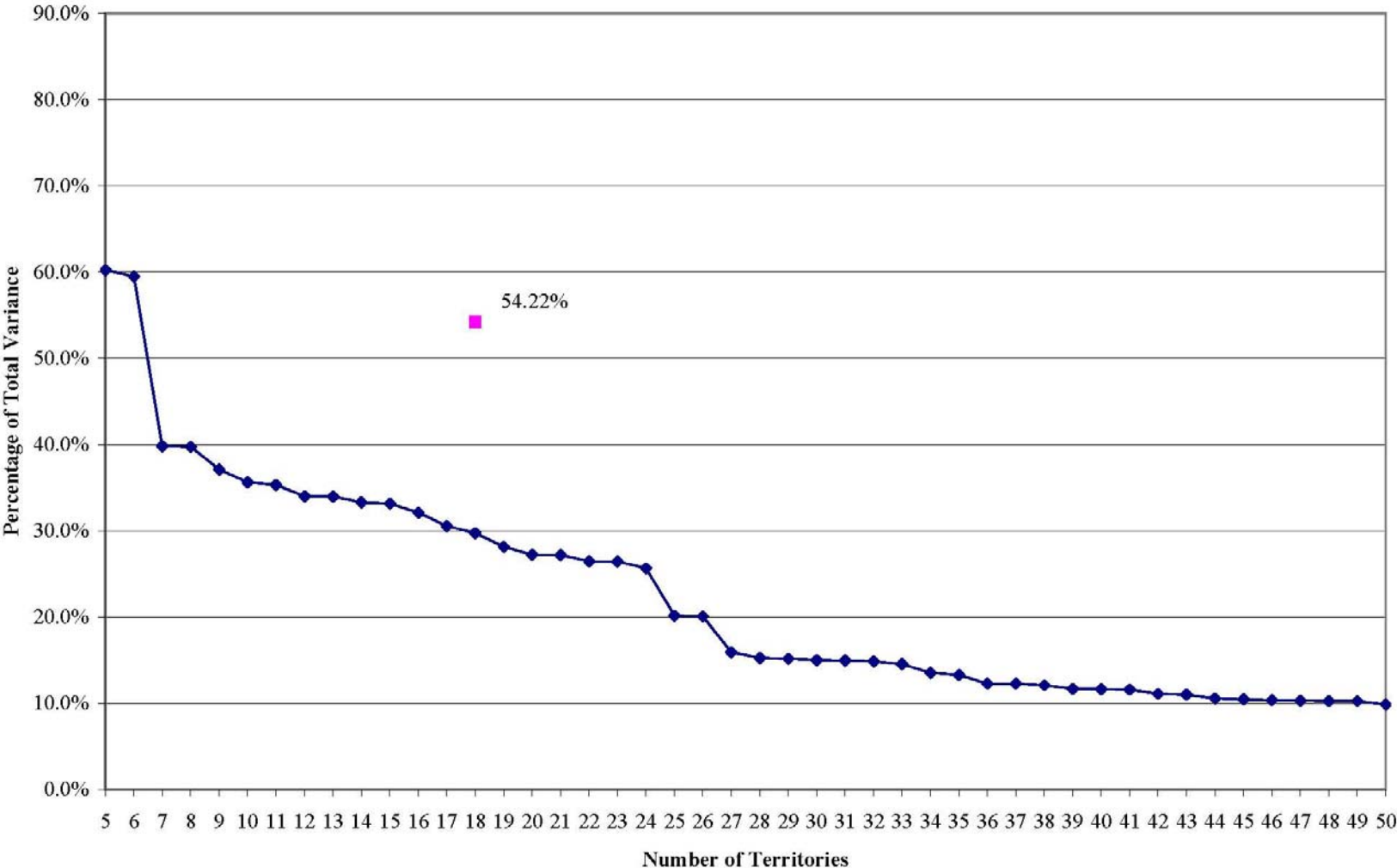
1993 – 1999 Indicated Auto Territories — Comprehensive (Contiguous)

North Carolina



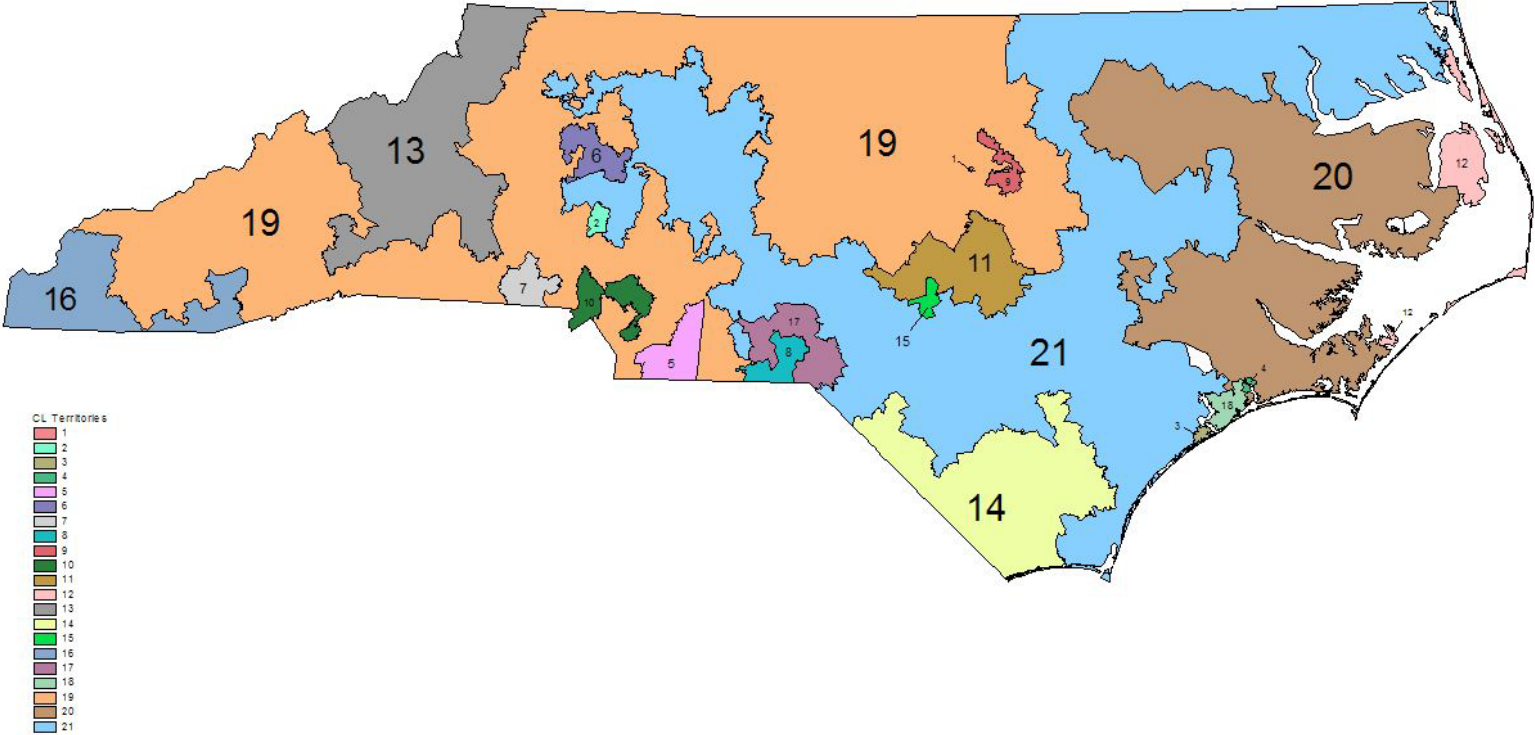
Within Territory Variance as a Percentage of Total Variance — Comprehensive (Contiguous)

North Carolina



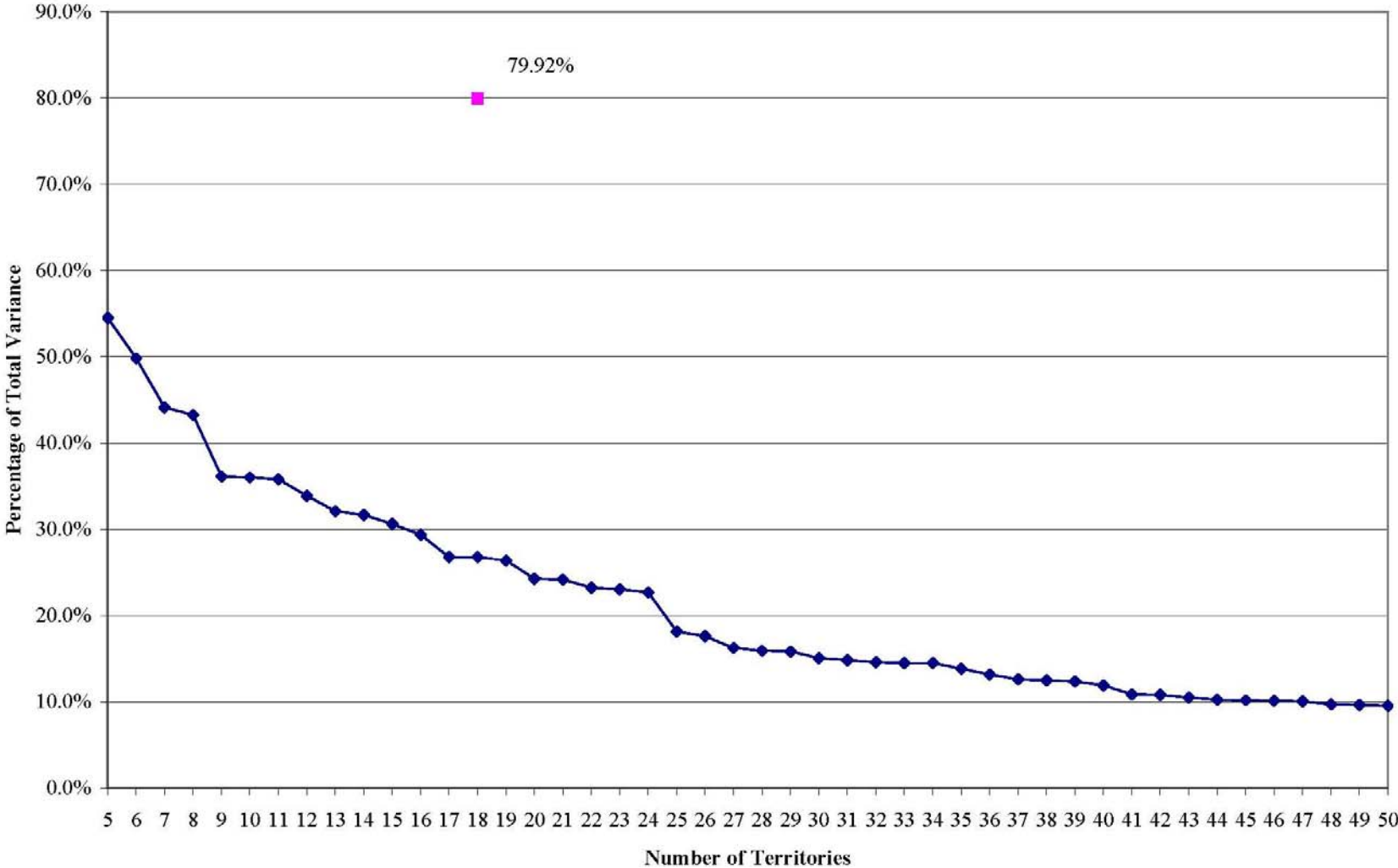
1997 – 1999 Indicated Auto Territories — Collision (Contiguous)

North Carolina



Within Territory Variance as a Percentage of Total Variance — Collision (Contiguous)

North Carolina



Stability and Implementation Considerations

Predictive stability

- Choice of perils included in data
 - Number of years of data
-

Implementation considerations/Rating stability

- Limit movement between zones
 - Use of capping
 - Use of confidence intervals to help analyze changes
-

Predictive Power and Stability

Predictive Power — Test #1

- 1993 – 1994 versus 1995 – 1996
- Correlation Coefficient
- Tested Boundaries Based on 1994 – 1996
- Non-Contiguous Better



Predictive Power — Test #2

- 1993 – 1995 versus 1994 – 1996
- Tested Boundaries Based on 1994 – 1996
- Within Variance Only Marginally Better for 1994 – 1996 Data

Stability

- 1993 – 1995 Clusters versus 1994 – 1996 Clusters
- Compared Indicated Boundaries and Relativities
- Little Dislocation