

# Lightning Density in Mid-South Synergy Service Territory

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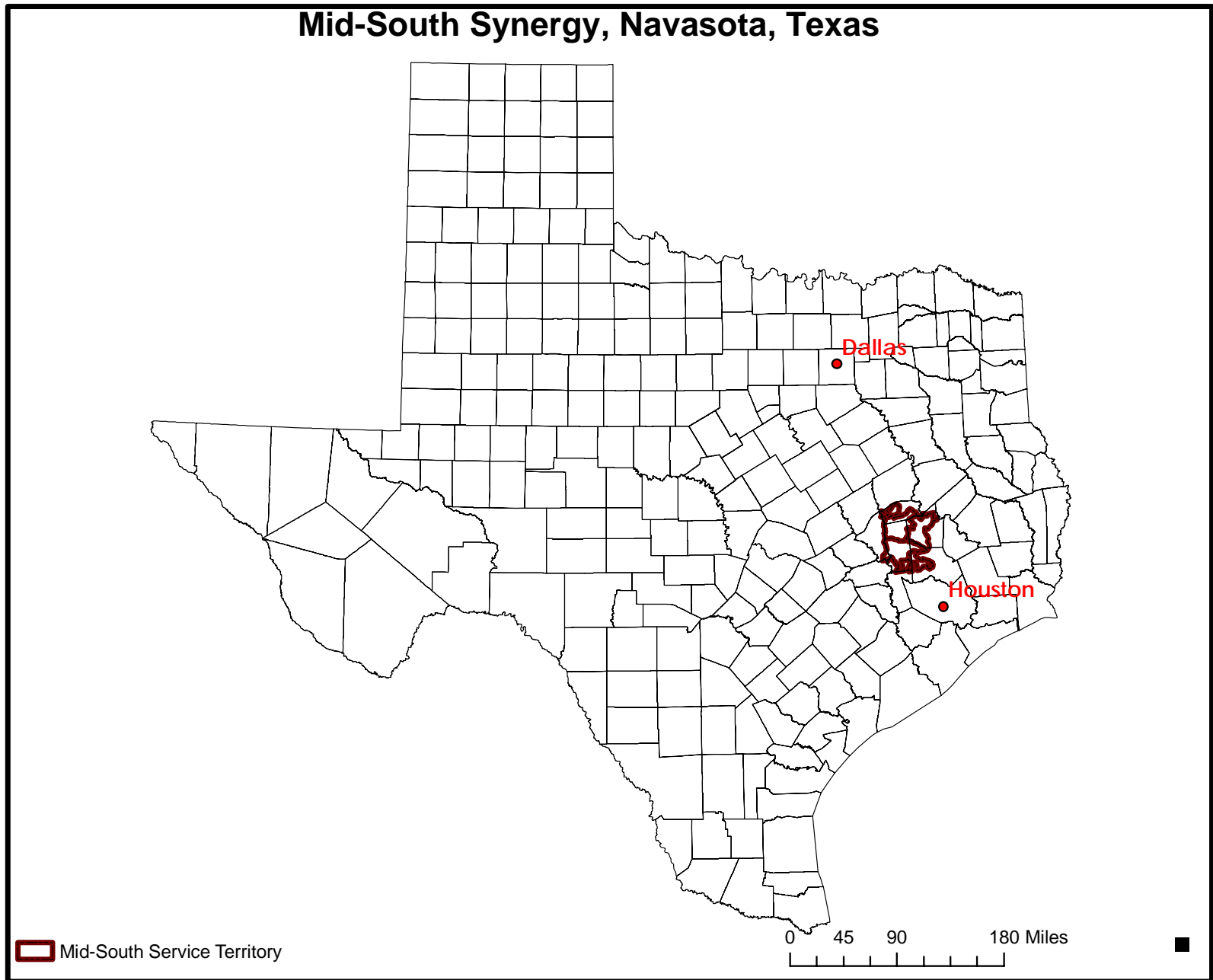
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# Introduction

- Mid-South Synergy (MS) serves ~2000 customers
- ~3000 miles of line
- ~3000 sq mile territory
- Six-county service territory

Fig. 1



# Mid-South Synergy GIS- evolution

- Converted from CAD to ArcGIS in 2007
- GIS Interfaces with CIS, Staking, & Engineering Analysis software
- Current MS GIS Applications:
  - Facilities management
  - EA model production and validation
  - Vegetation management
  - Research : *Lightning Strike Analysis*

# Rationale

- There are more than 20 million cloud to ground lightning strikes in the USA/yr
- Texas ranks high in lightning related fatalities
- More than 4000 power outages in MS service area over a 3 yr period
- 50 % of outages are lightning related

# Objectives

- Spatially represent:
  - lightning strikes
  - Outage events in MS service territory
- Incorporate the lightning density results into the construction work flow for better decision making

# Data and methods

- US Lightning Detection Network data
  - Time, amplitude, location, polarity, and multiplicity of a strike
- MS 3 yr outage data
- ArcGIS (9.2) Spatial and Geo-statistical Analyst extensions

# Results

- 474175 Cloud to Ground lightning strikes (2005-2008)
- 90% negative lightning strikes
- Highest negative amplitude was 2400 kA and 836 kA positive lightning
- Average stroke duration was ~ 500 msec



# Results

- Fig. 2: Power outages
- Fig. 3: Power outage density
- Fig. 4: Lightning stroke density
- Fig. 5: Lightning strike density trends
- Fig. 6: Outage/Lightning stroke density
- Fig. 7: Scatter Plot Matrix
- Fig. 8: Lightning stroke density (B)
- Fig. 9: Lightning contour map

# Results

- Lightning-related outages dominate MS territory (Fig. 2)
- East – West and North – South trends in lightning strike density (Fig.5)
- Fig. 7 and 7b show a weak positive correlation between outages and lightning stroke density ( $R^2=0.03$ )

Fig. 2

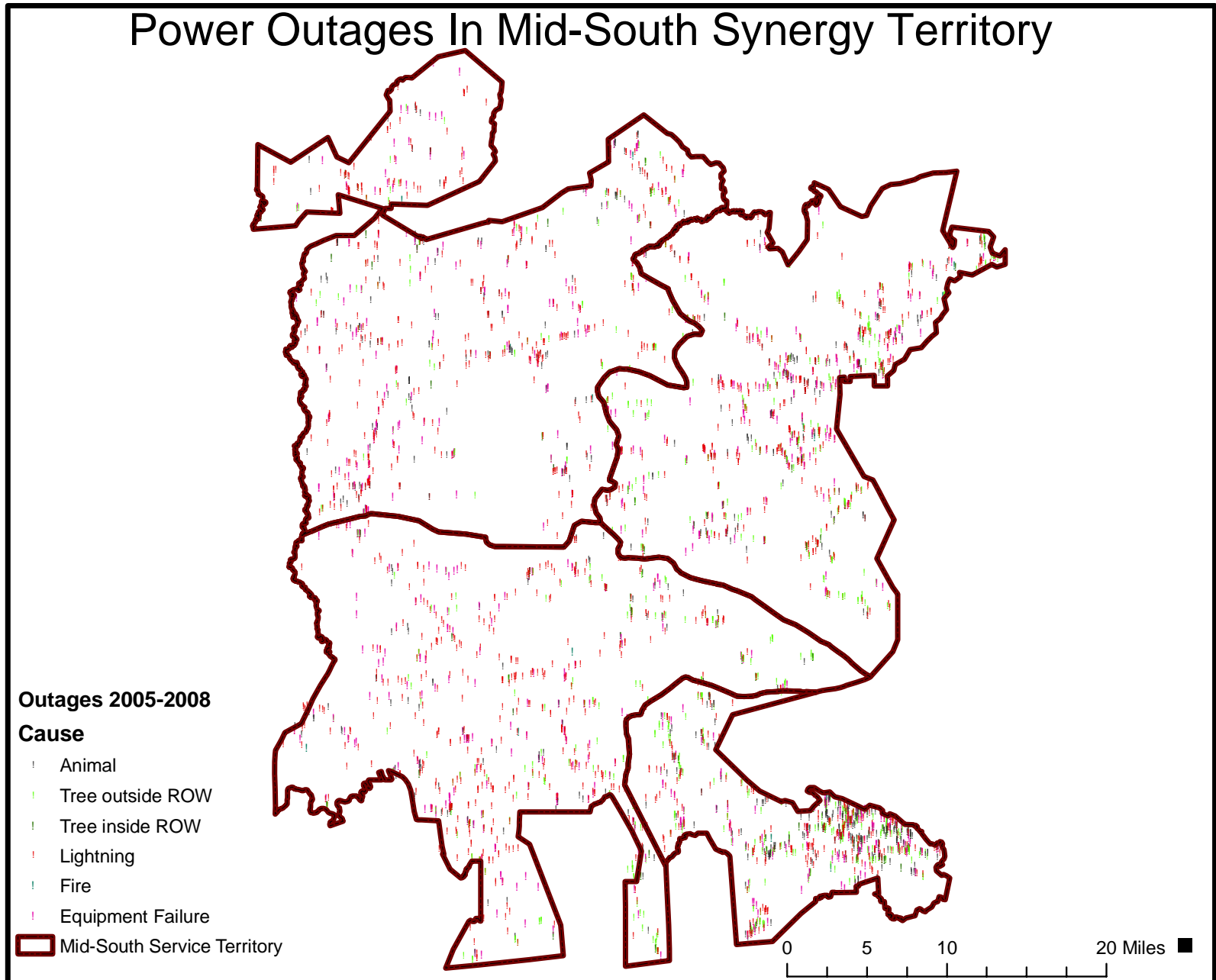


Fig. 3

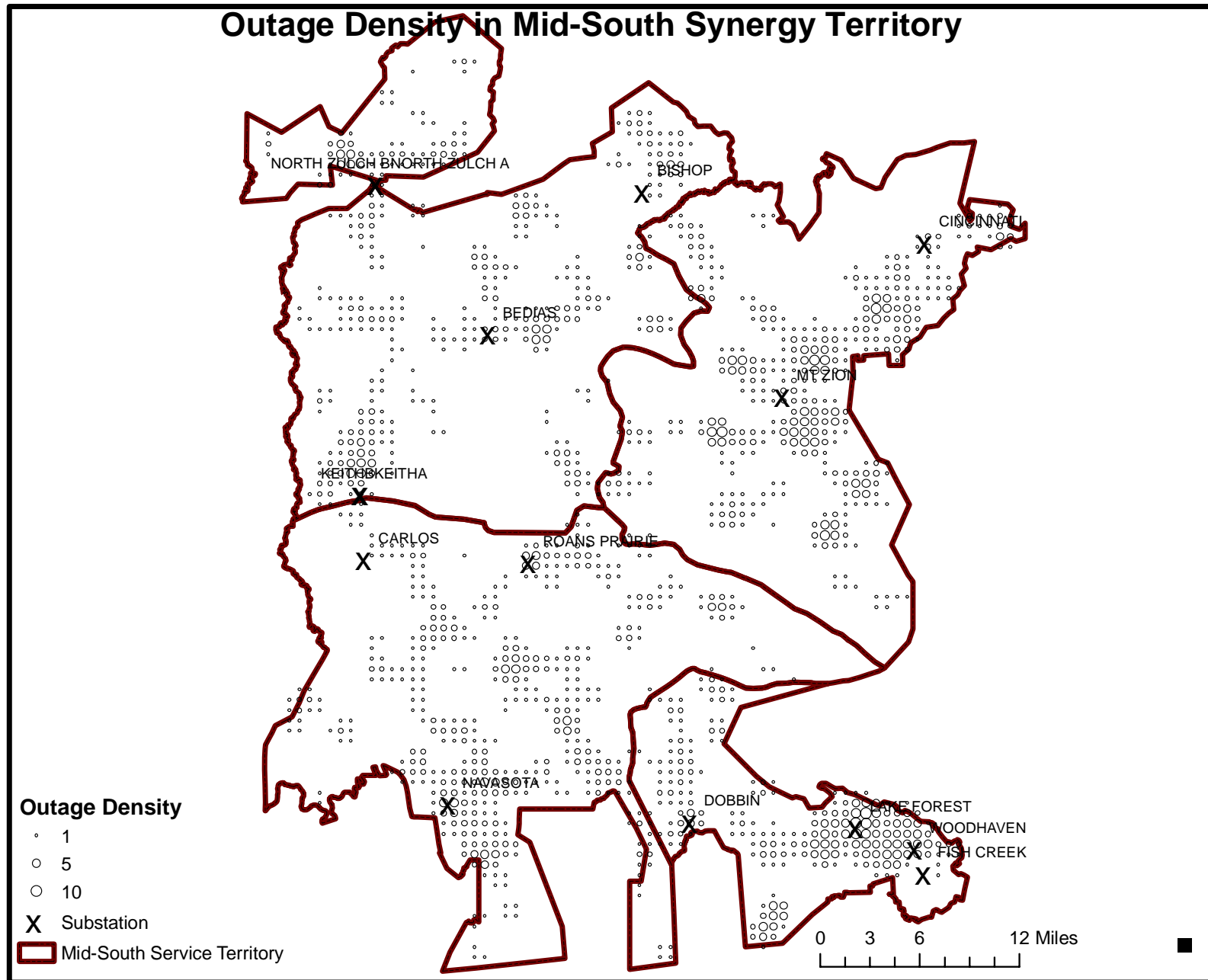


Fig. 4

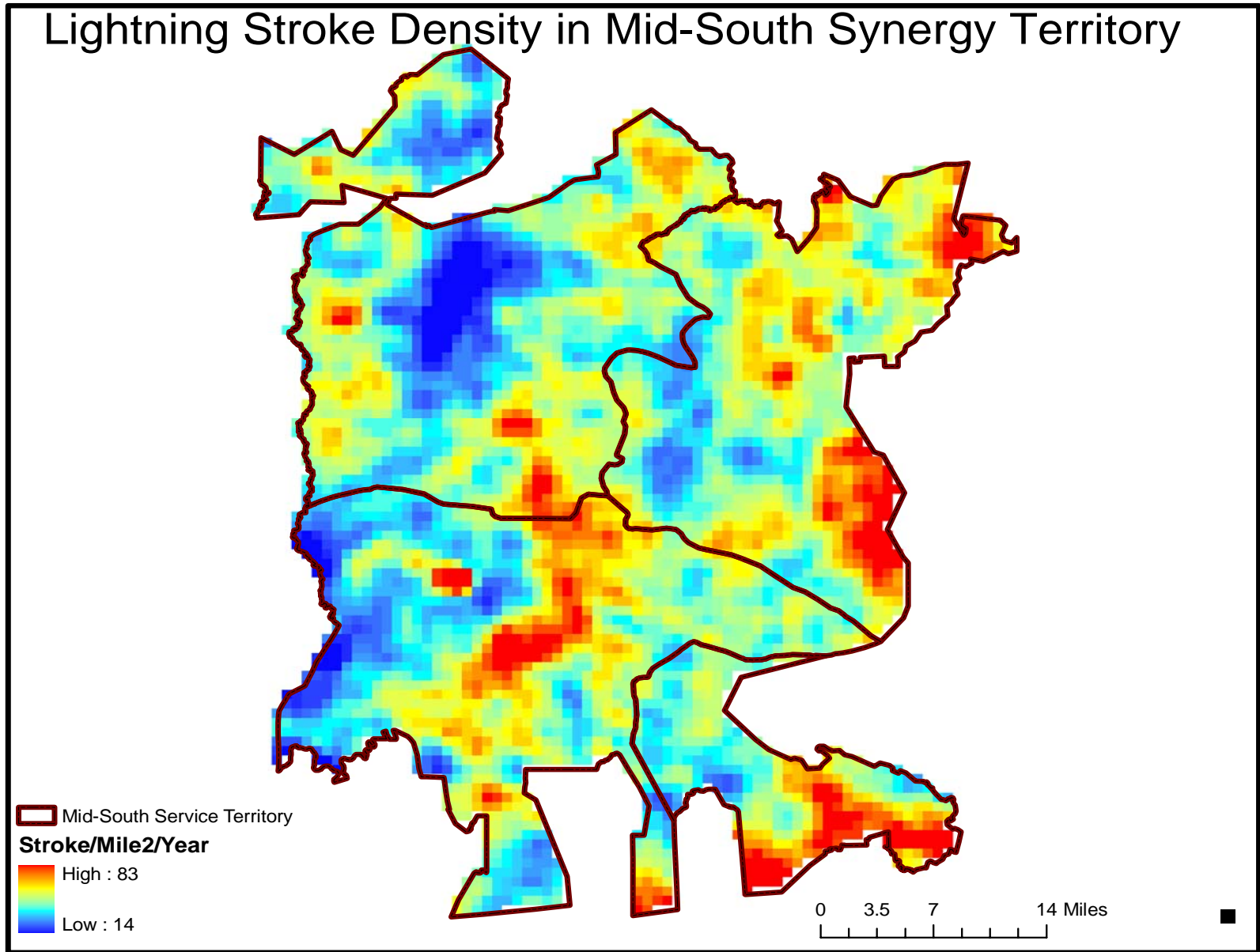


Fig. 5

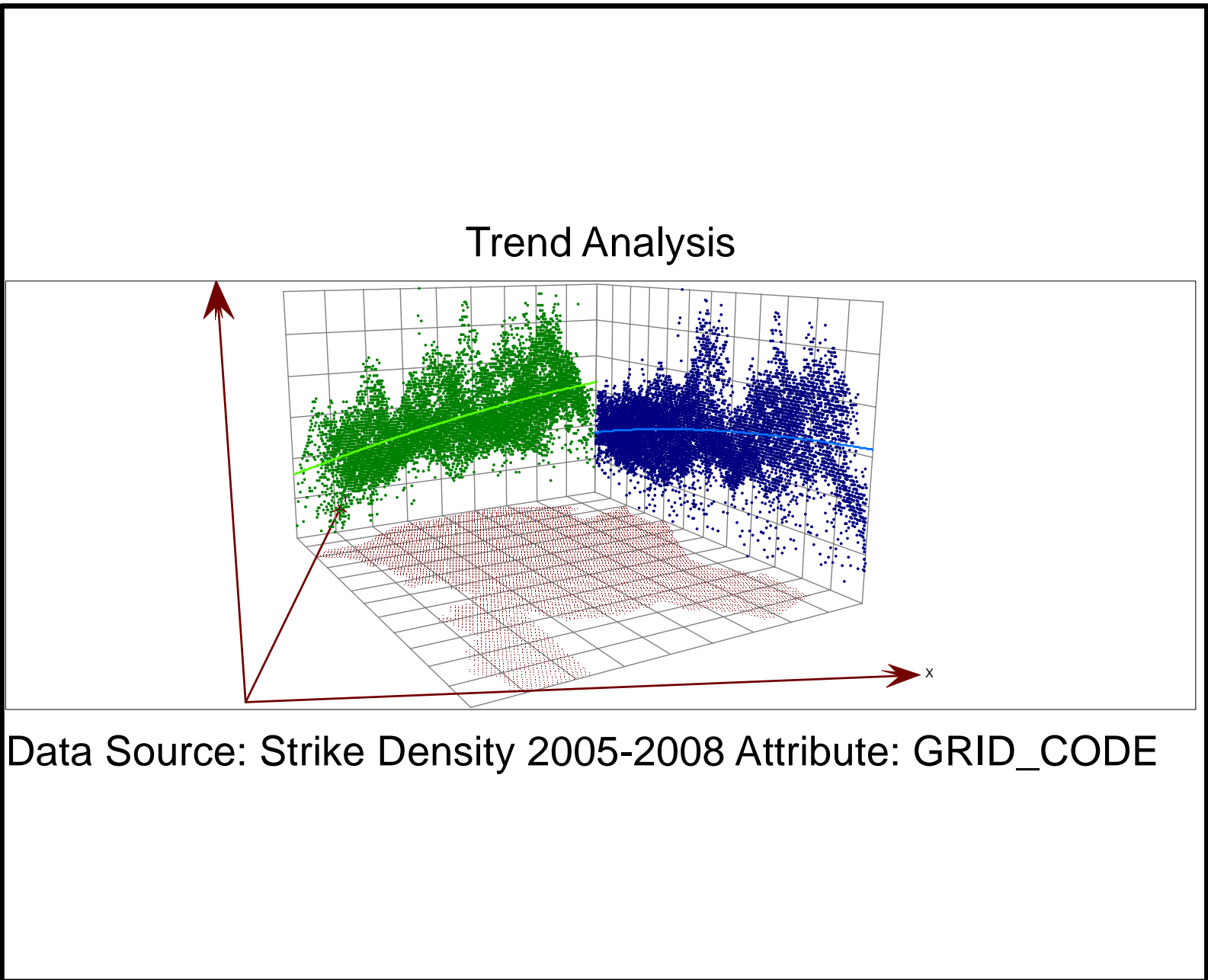


Fig. 6

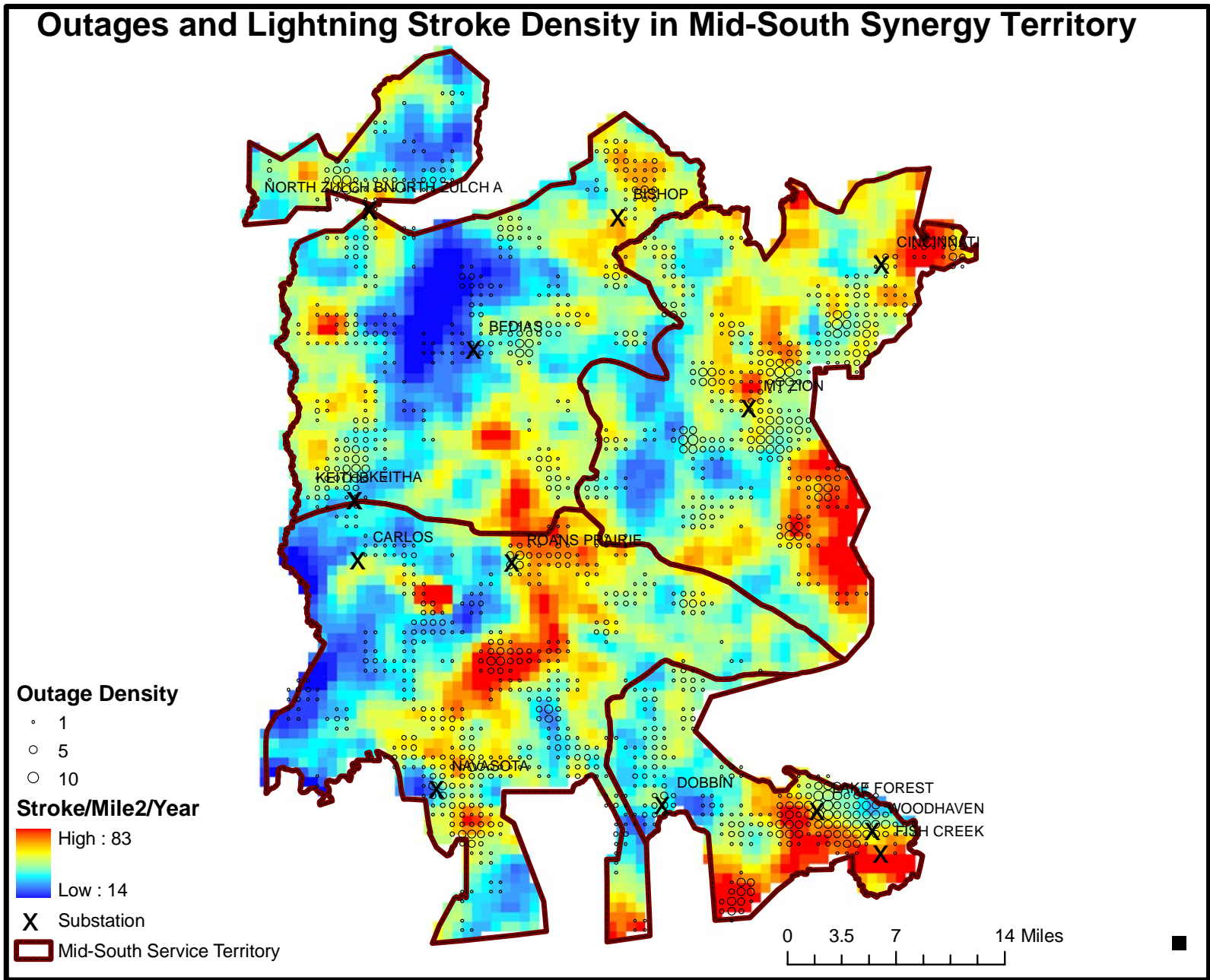


Fig. 7

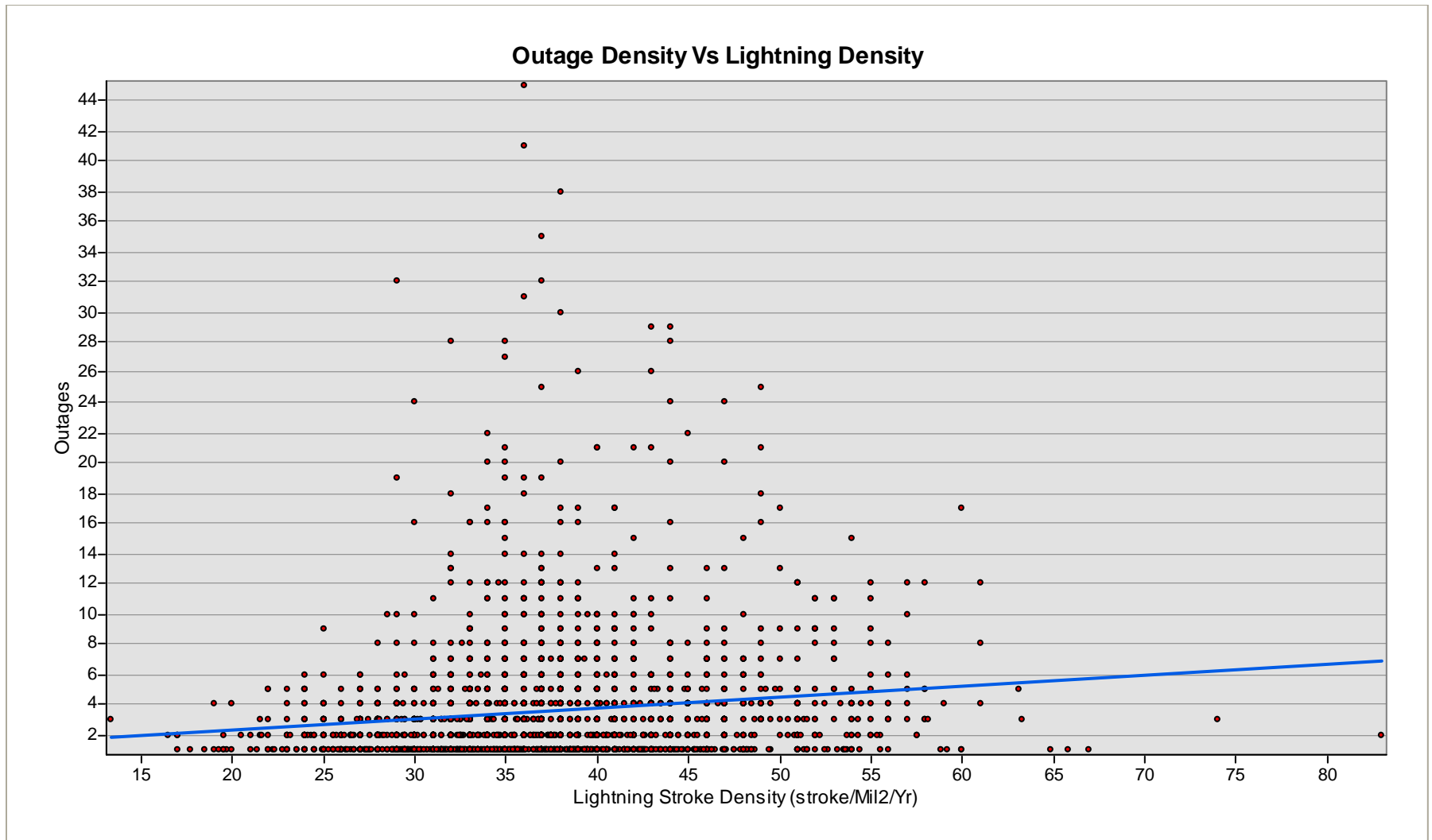




Fig. 7b

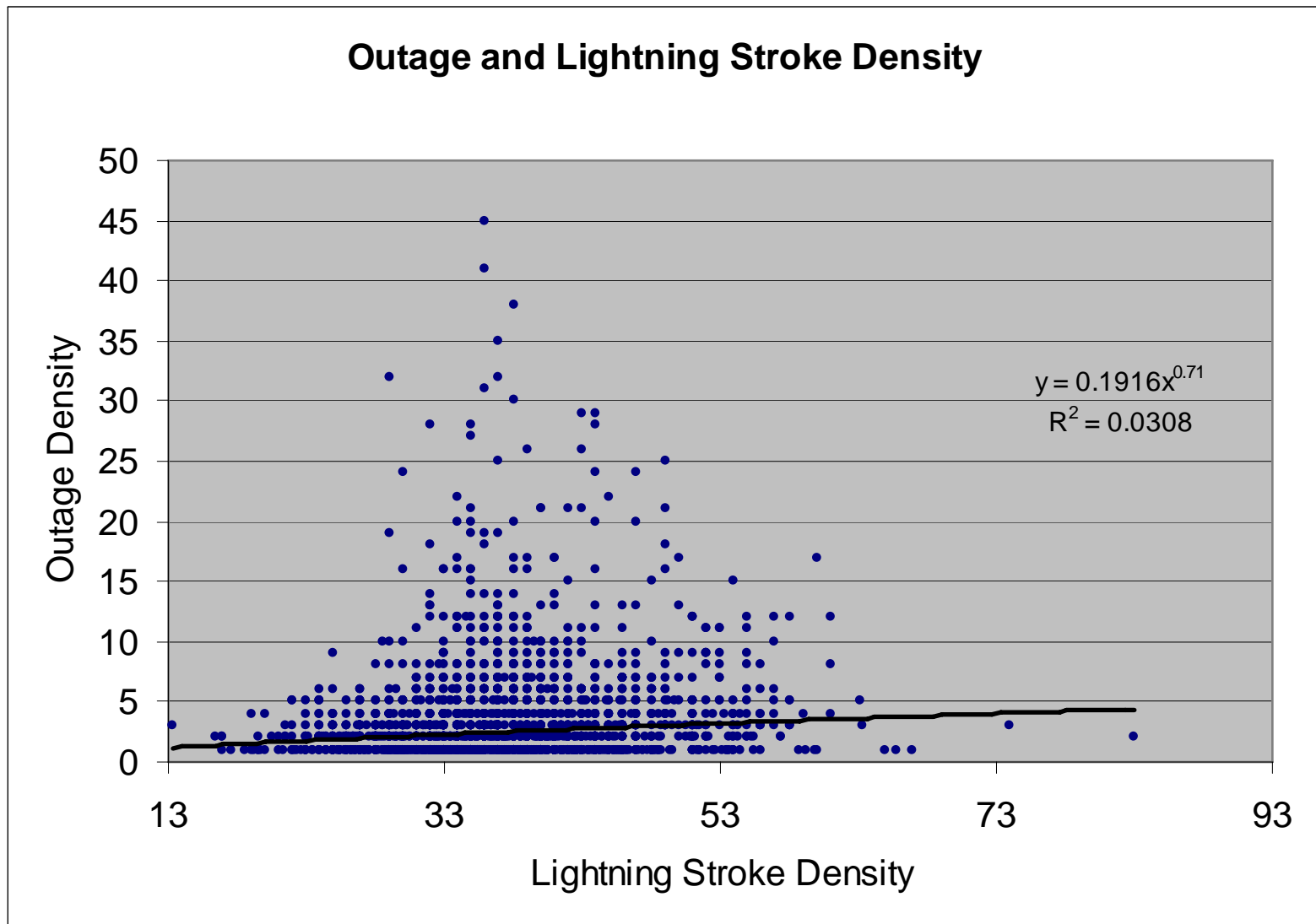


Fig. 8

# Lightning Stroke Density in Mid-South Synergy Territory

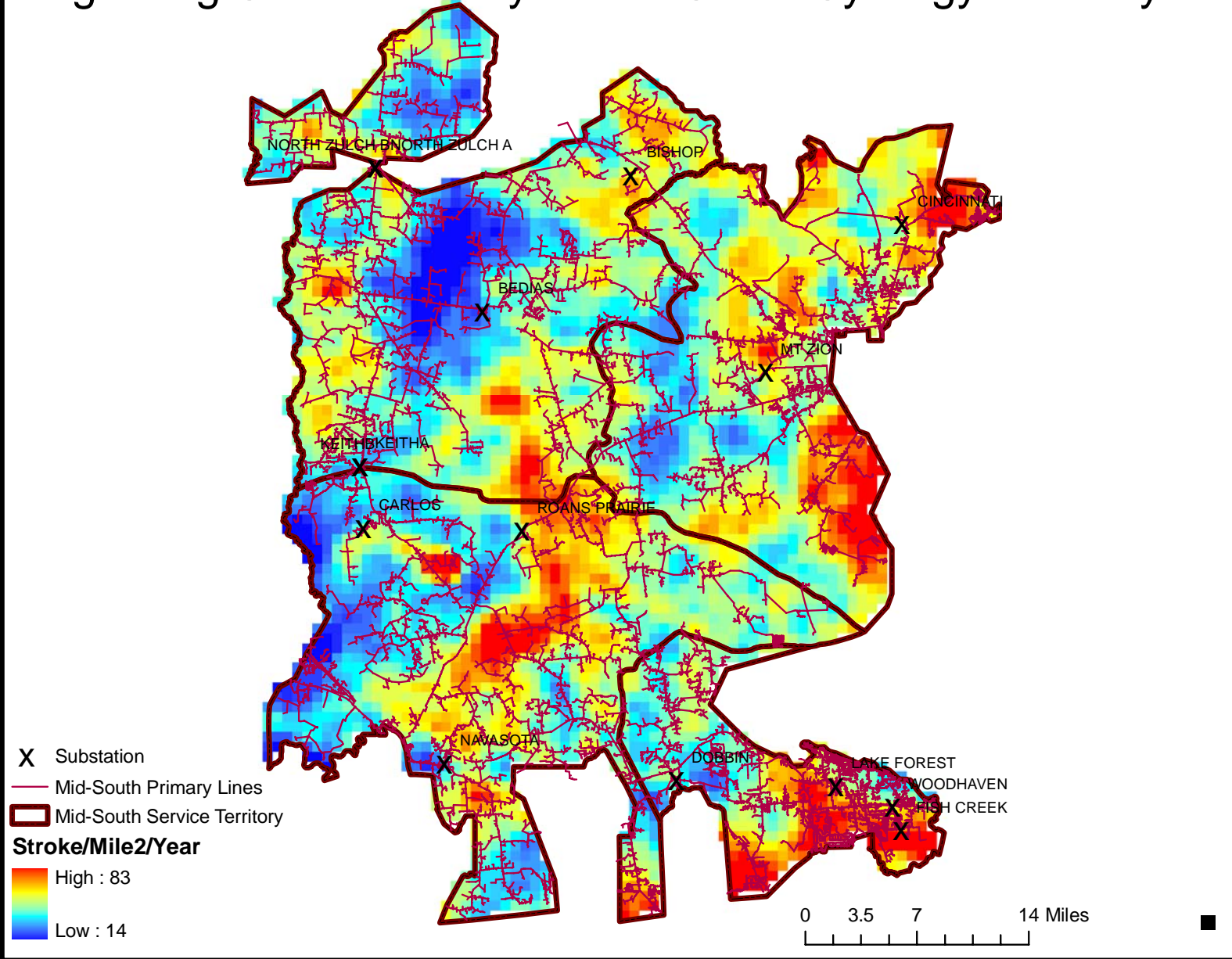
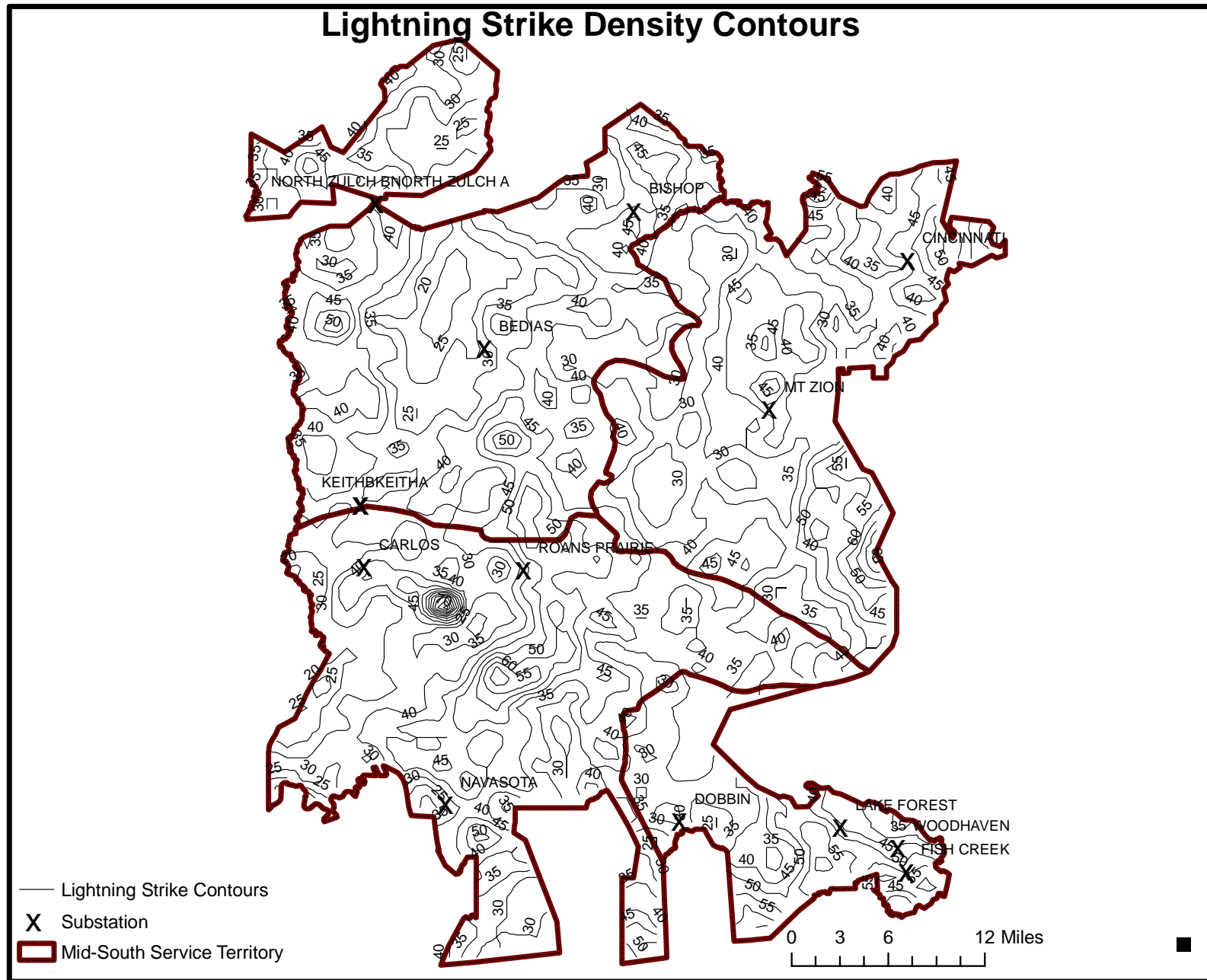


Fig. 9



# Discussion and Conclusion

- Great tool to help “non-GIS” professionals visualize geographic data
  - Outage Locations
  - Lightning Strike locations
- Lightning strike density regions incorporated into construction workflow

# Questions?

