SPATIAL MAPPING OF SOCIAL NETWORKS

King County Prosecutor's Office
Police-Prosecution Partnership (3PI)
August 2-4, 2017

Presented by Julie Wartell

MAPPING PEOPLE & PLACES TOGETHER

WHY PUT SNA & GIS TOGETHER

Crime Pattern Theory
(Brantingham & Brantingham)

+

Routine Activity Theory
(Felson & Cohen)

+

Rational Choice Theory
(Cornish & Clarke)

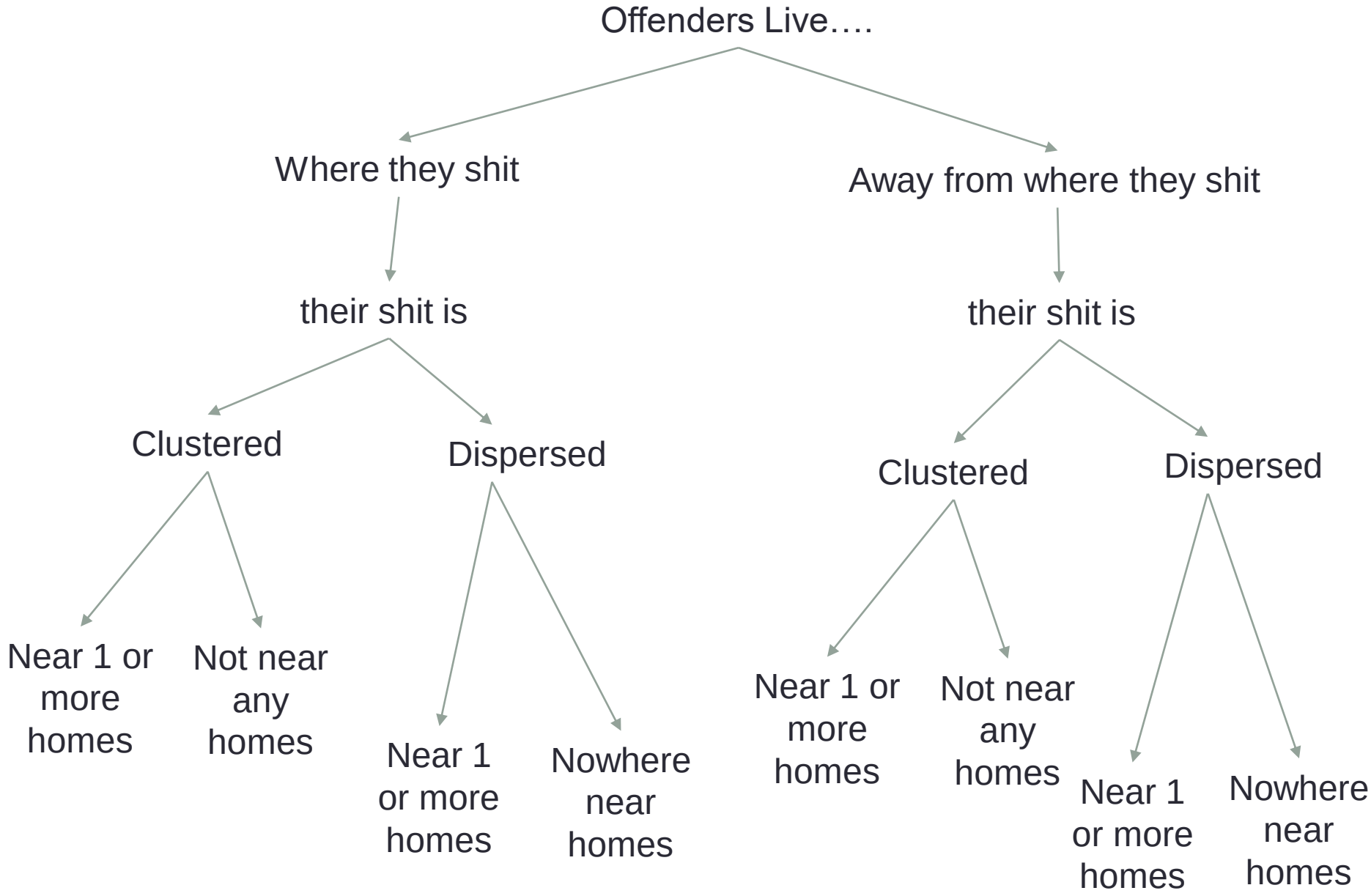
=

PROLIFIC OFFENDERS HAVE GEOGRAPHIC PREFERENCES

http://www.popcenter.org/learning/60steps/

What types of patterns can be revealed about the networks?

- Where they live in relation to where they commit crimes
  - Clustered
    - Crimes clustered near 1 or more homes
    - Crimes clustered but not near any homes
  - Dispersed
    - Crimes spread out but homes are clustered/nearby
    - Crimes spread out and nowhere near homes
- Live in one jurisdiction but commit crimes in another
  - Crimes and/or Homes Clustered v. Dispersed
- Arrest location
  - Near or far from home and/or crime locations



Credit to John Eck.

OK… what do we do with this info?

- Do more analysis of course!
  - Examine clusters within the maps
  - Assess relationships of the people to the places
  - Collect more info…
    - More locations for individuals
    - More relationship data on connected individuals (relative, friend, etc.)
- Focus efforts based on social **and** spatial connections

SNA & GIS EXAMPLES FROM THE FIELD

Jackson, MS & Linn County, IA

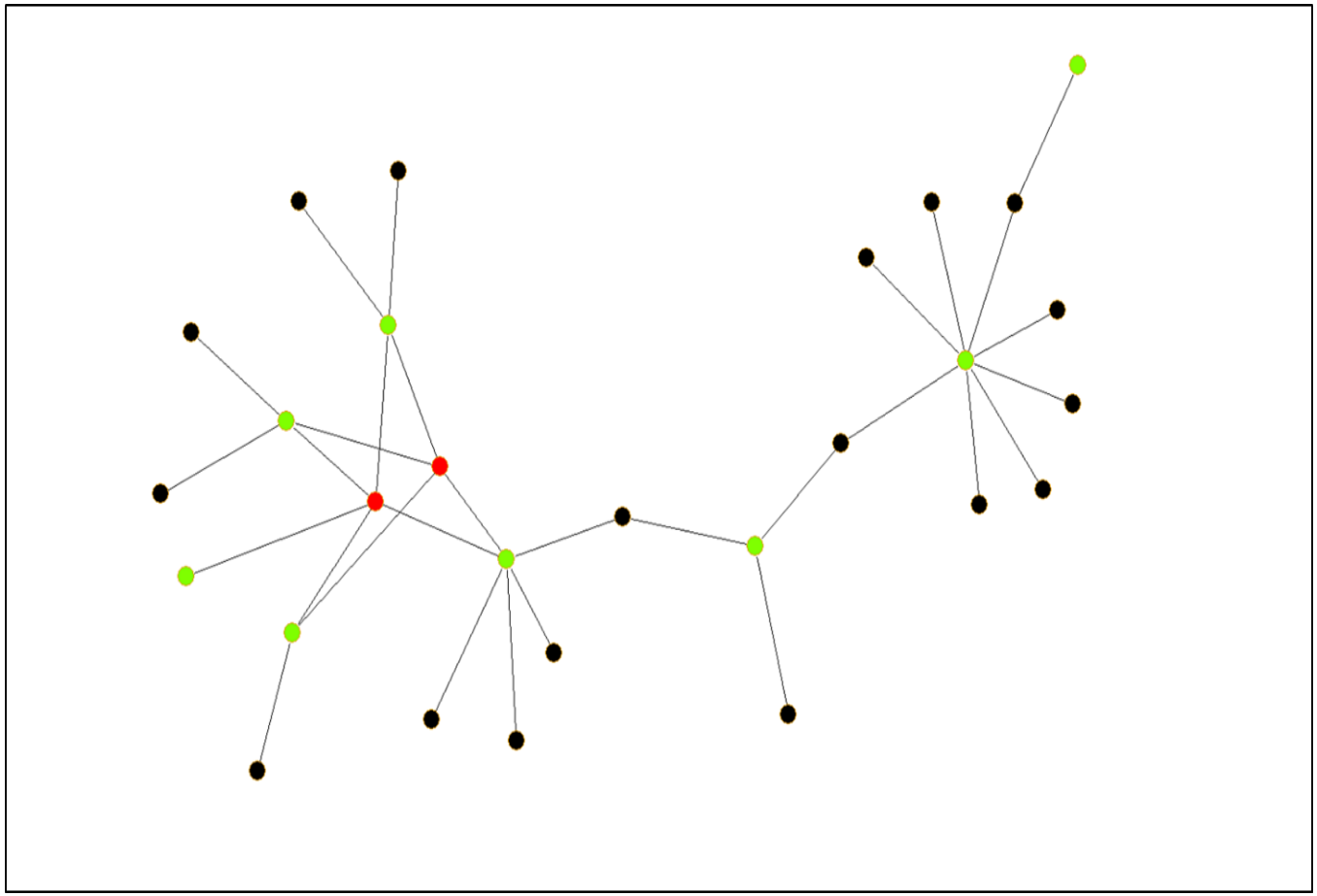
Jackson, MS PD

- Data from Dec 1, 2014 – Nov 30, 2016
  - Crime Reports
  - Arrests
- Analytic Strategies
  - Geographic
    - overall violent* crime and gun-related hot spots
    - cluster locations
  - Network analysis – clustering of individuals associated through arrests

**We defined "violent" crime to include the following categories: murder; rape and sexual battery; robbery; assault (aggravated and simple); shootings; and firearm and weapon violations. It should also be noted that only aggravated assaults, shootings and some weapon violations specifically state a gun was involved; with the data provided, we were unable to determine which murders, rapes and robberies were gun-related.*

Jackson: Social Network Analysis

Two-mode co-arrest network, violent cluster 1 without labels



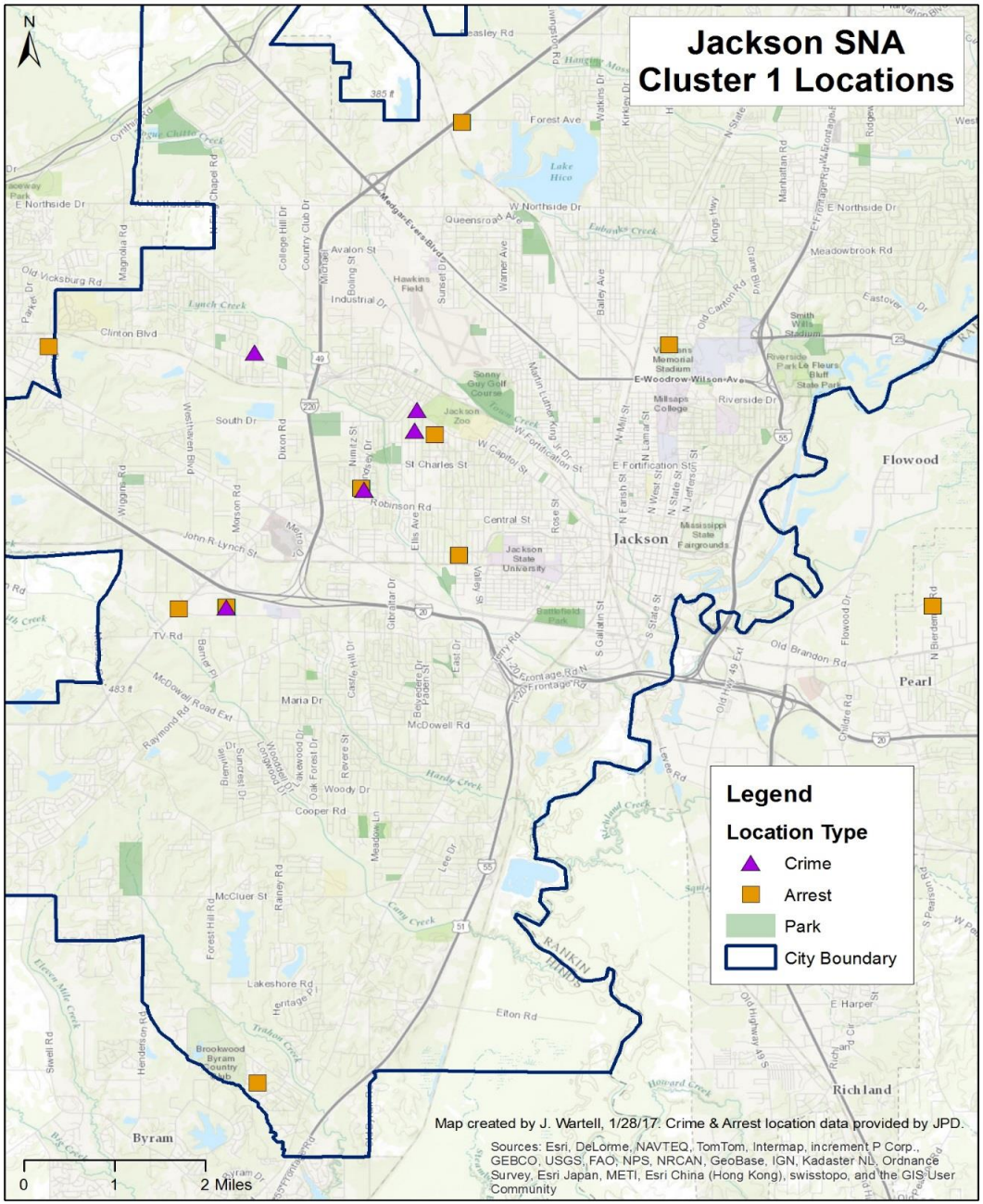
Note:

Black = non-violent incident

Red = violent incident

Green = person

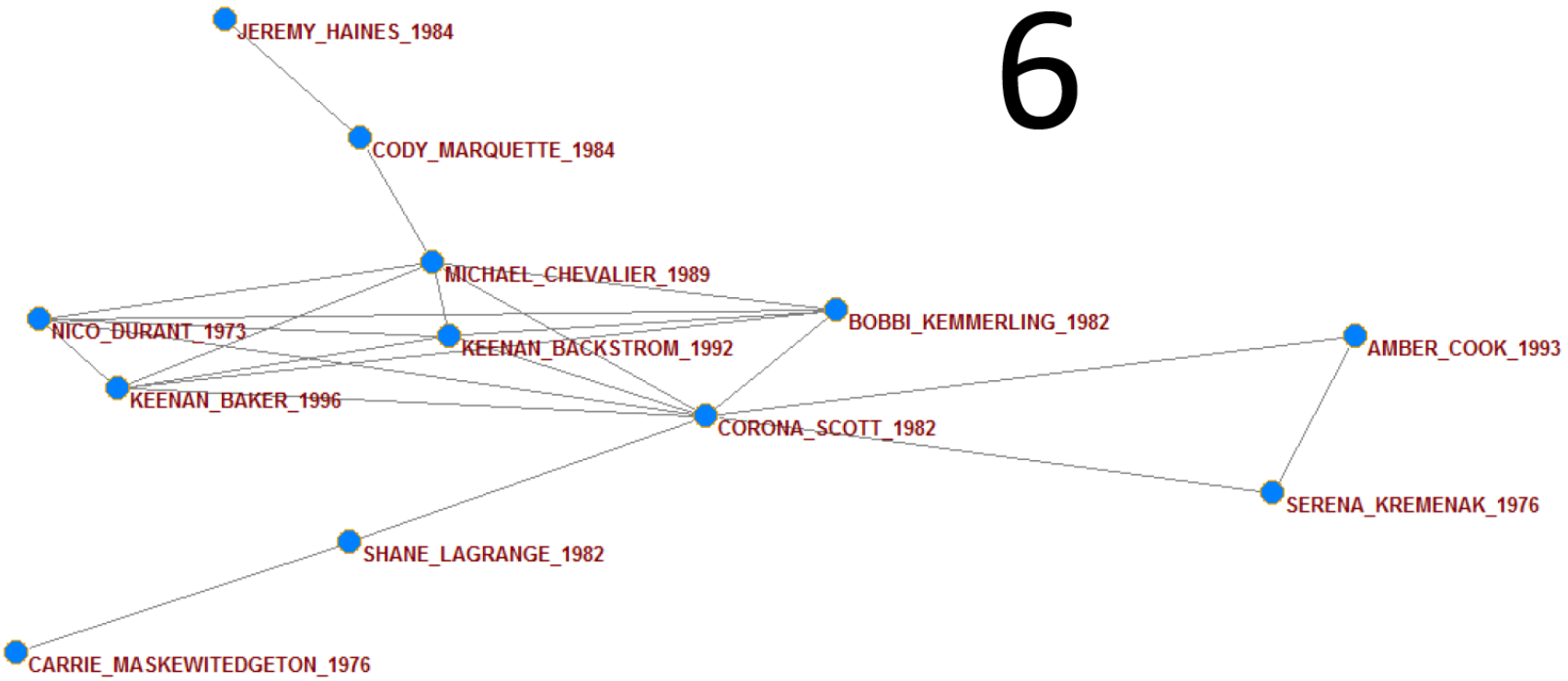
Jackson: SNA on a Map



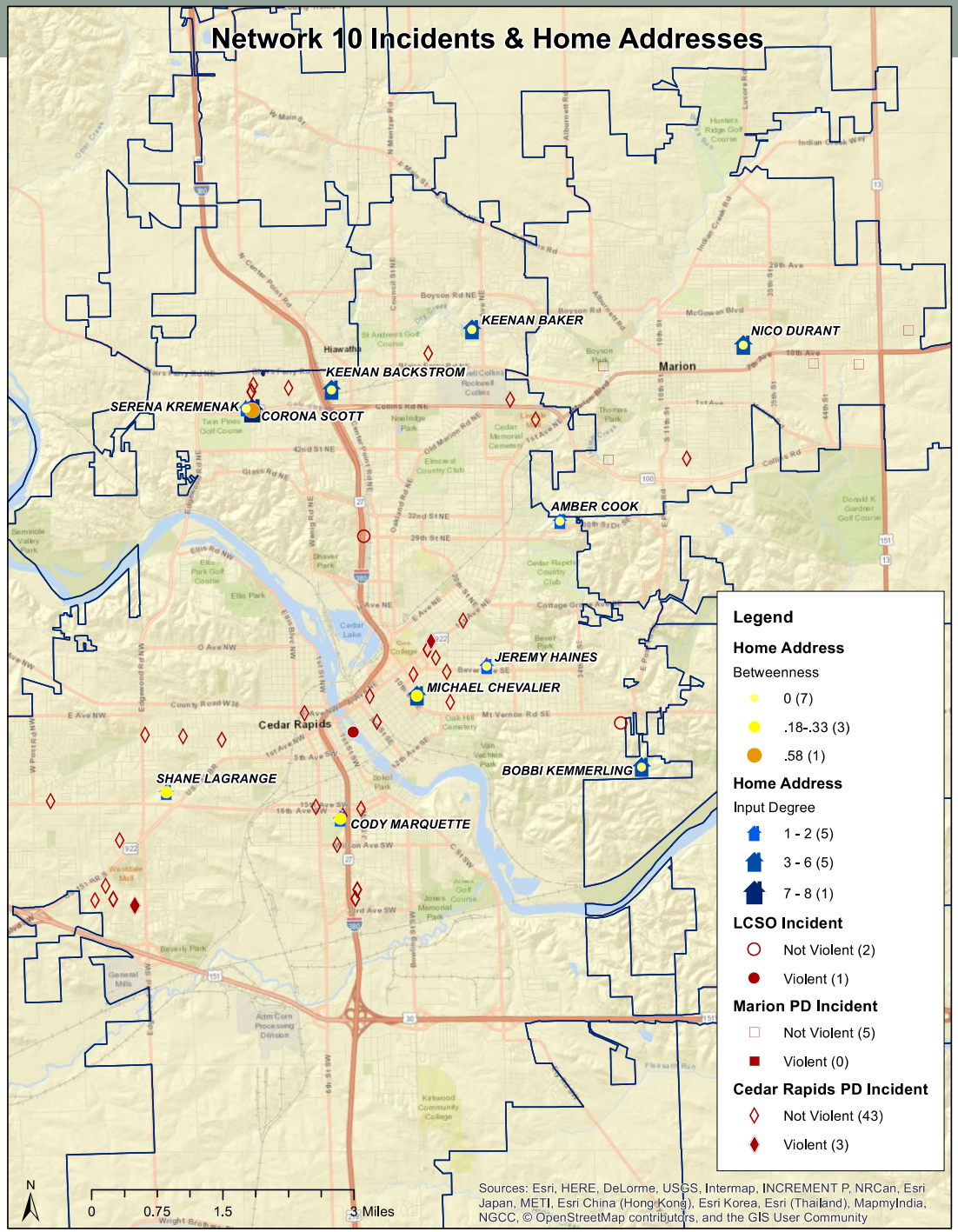
Linn County, IA
(Cedar Rapids, Marion, Linn County)

- Multi-jurisdictional
  - Cedar Rapids PD
  - Marion PD
  - Linn County SO
- Data from May 1st, 2015 through April 30th, 2017
  - All Incidents and Field Interviews
  - Home Addresses
- Analysis
  - Two mode network connecting people through incidents
  - Mapping of incidents and home locations

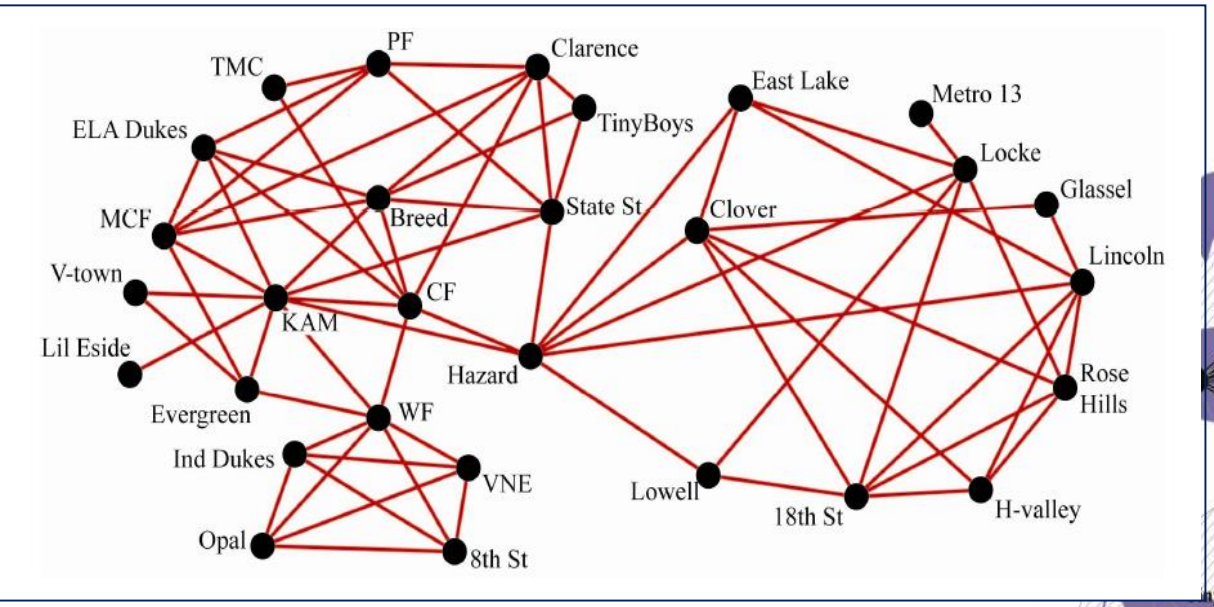
Linn County: Social Network Analysis

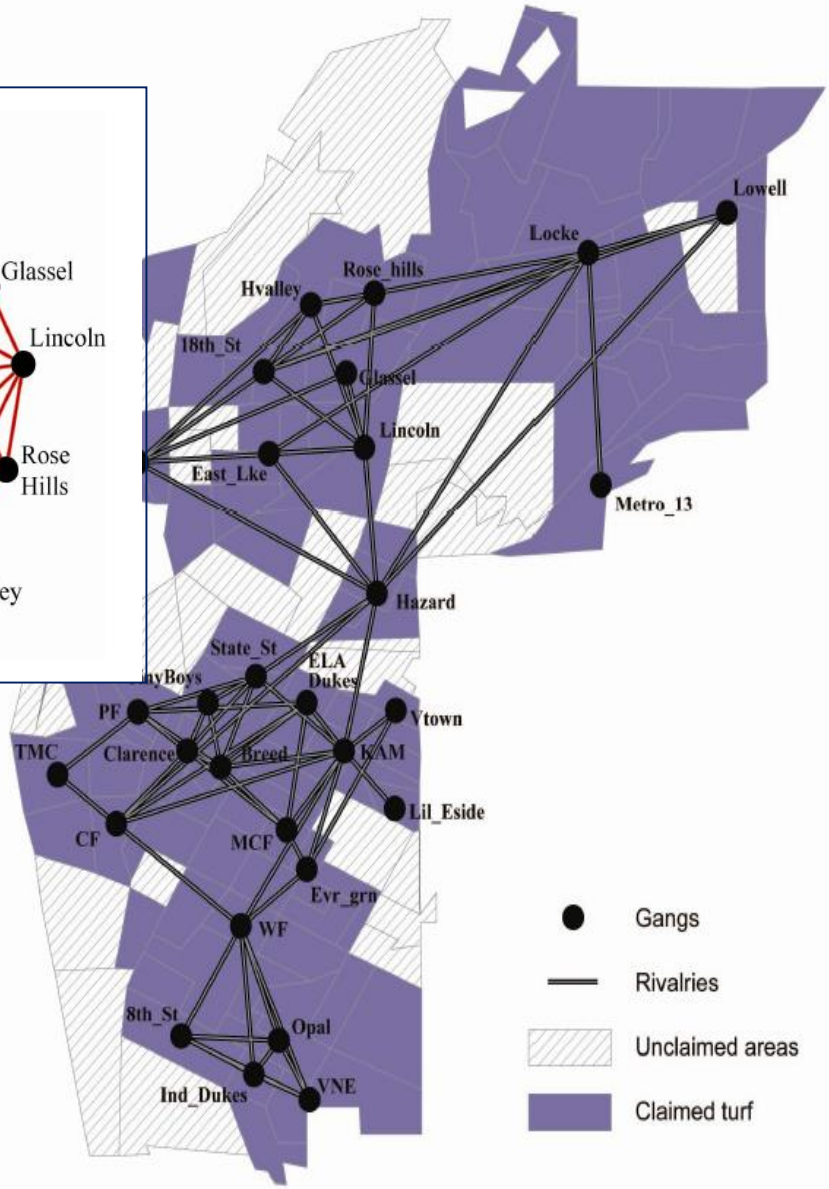


Linn County: SNA on a Map



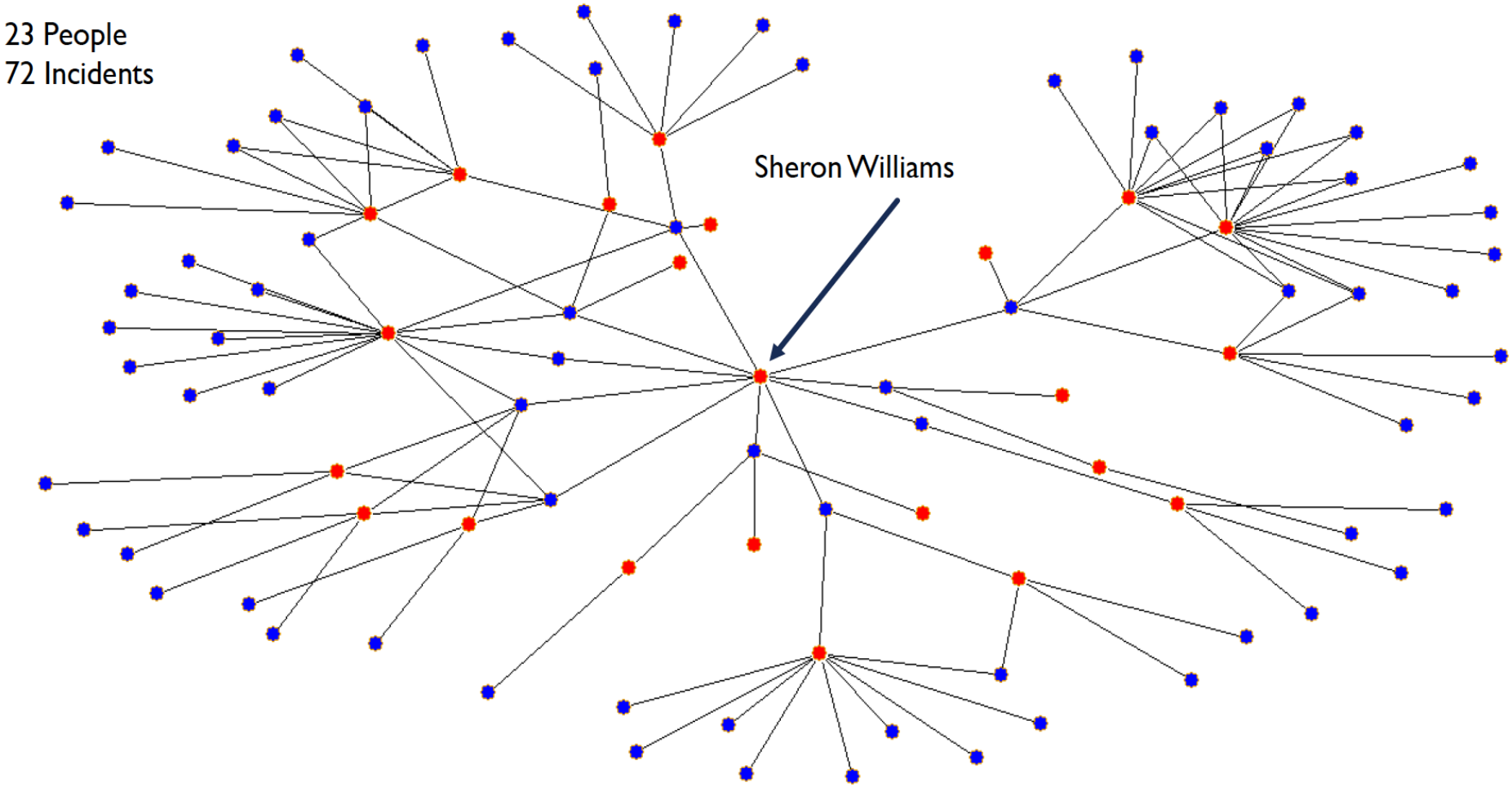
Another Example…LA Gangs



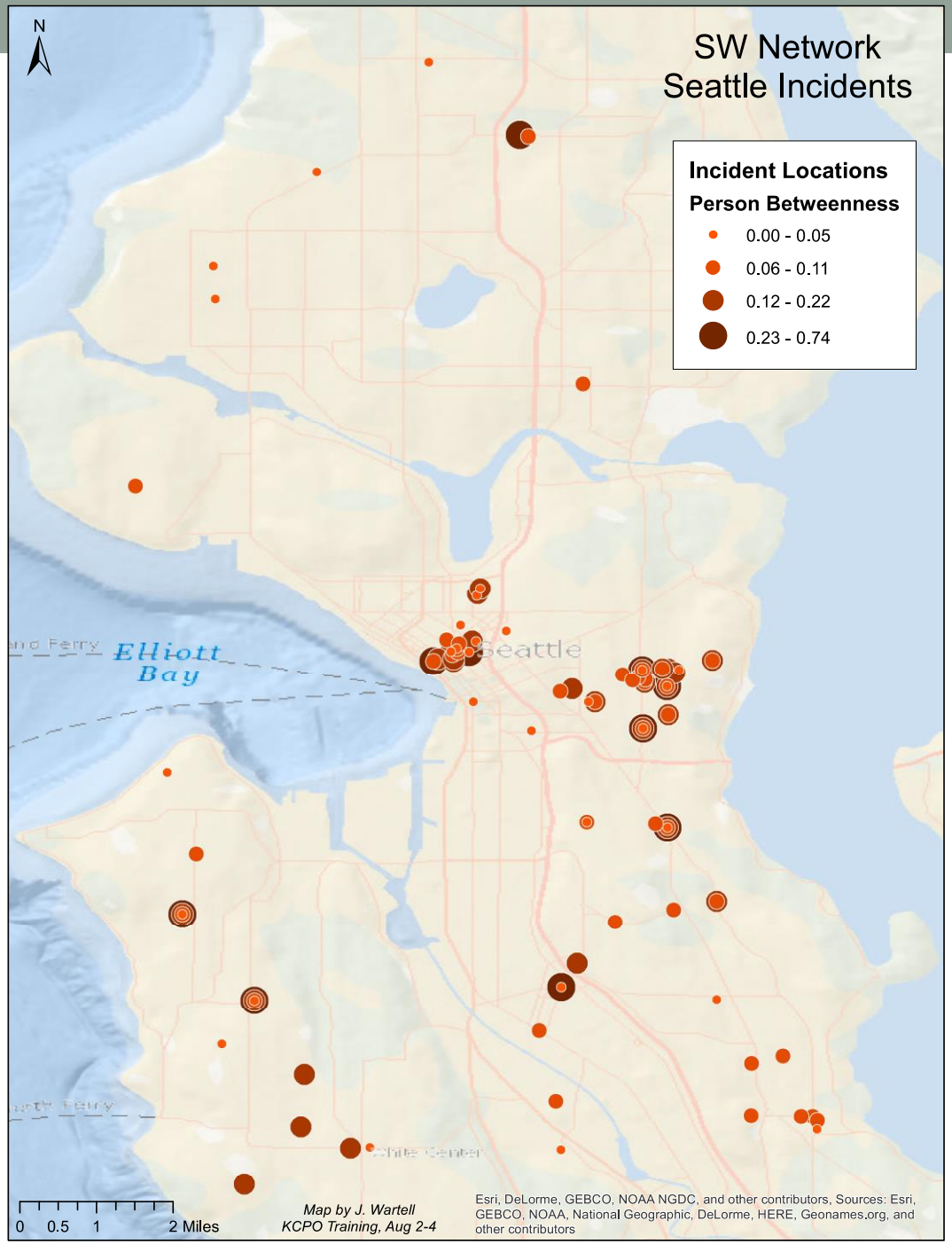


"Spatializing Social Networks: Making Space for Theory in Spatial Analysis"
Dissertation by Steven Radil

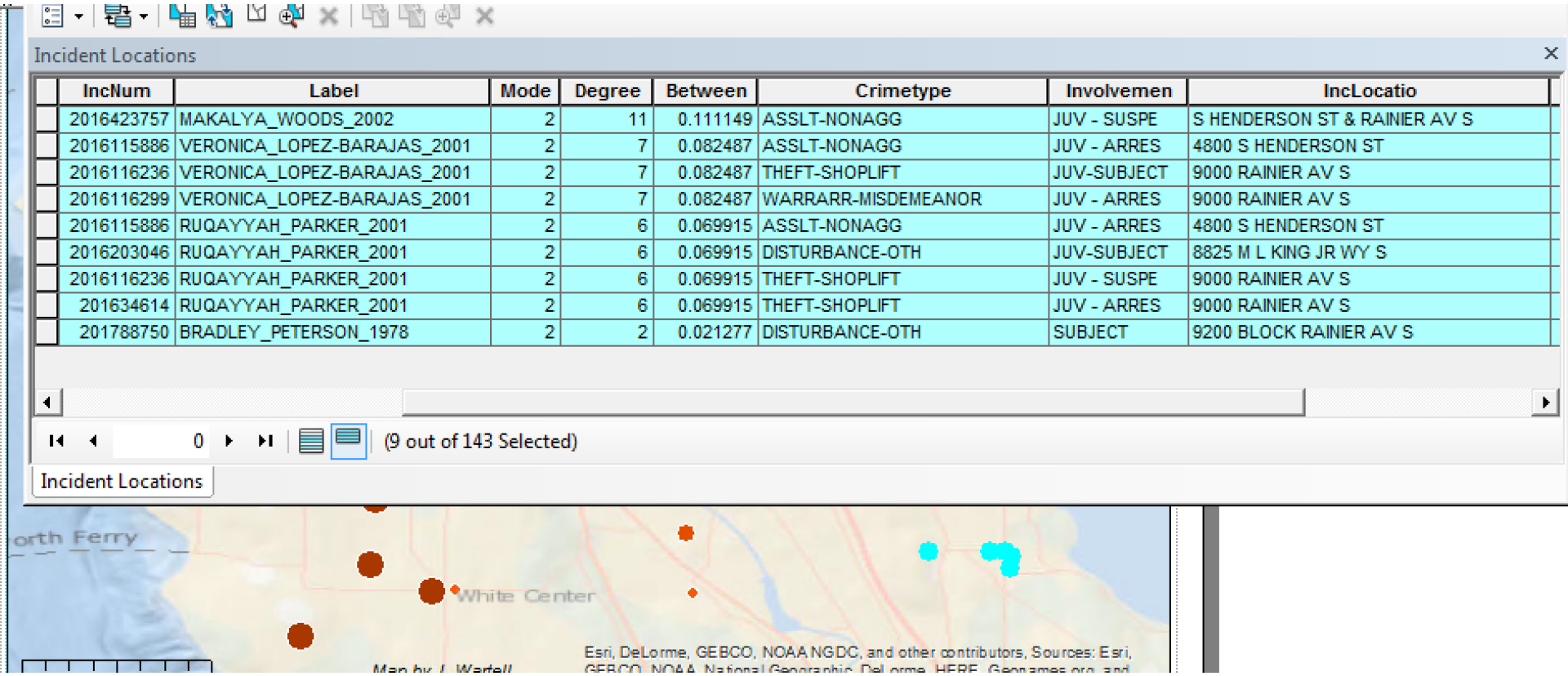
KING COUNTY EXAMPLE



GIS MAP OF SW NETWORK – SEATTLE



EXAMINING CLUSTERS



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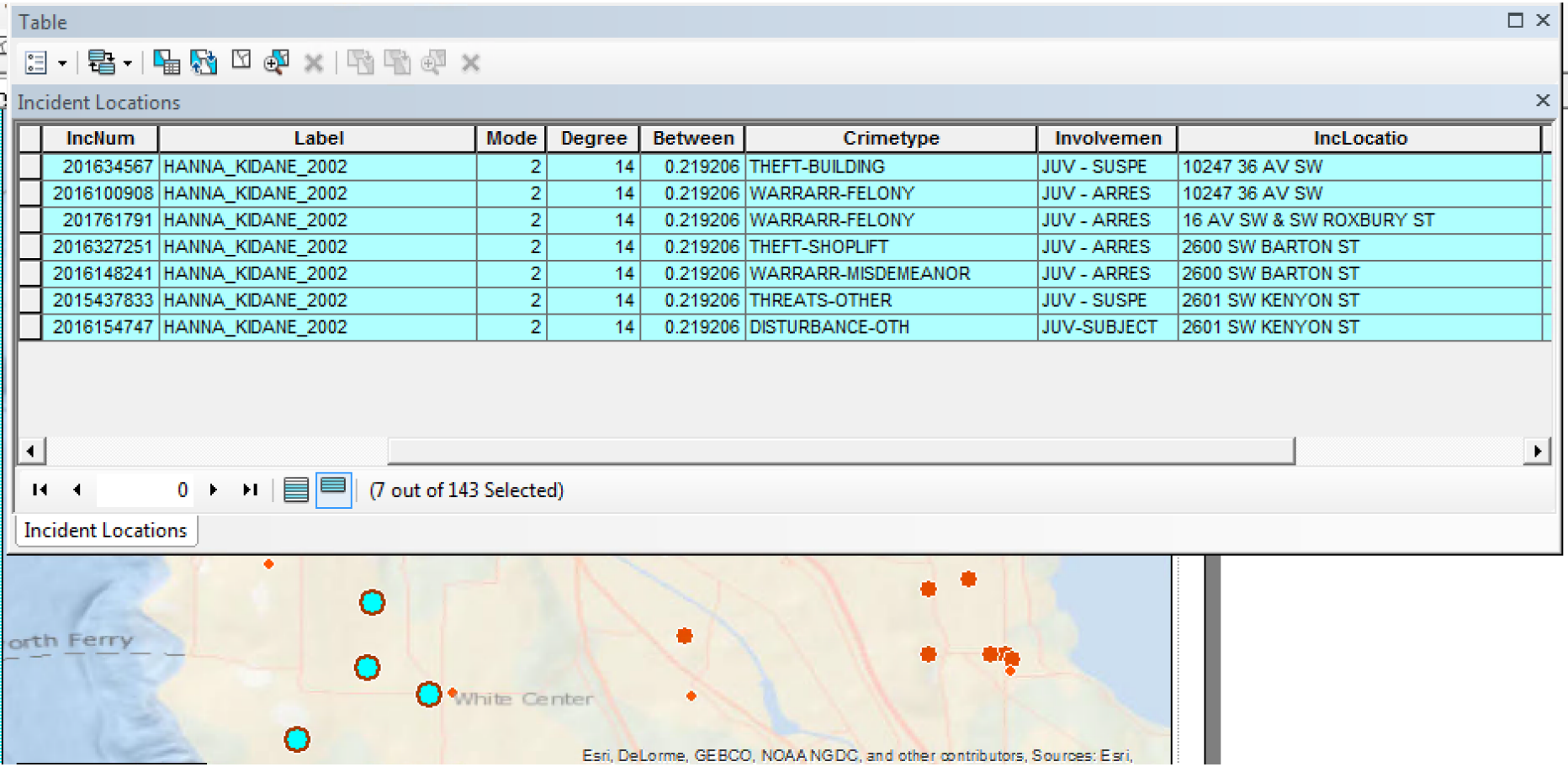

Once the Network is Mapped

Things to consider…

- How many incidents in each jurisdiction?
- How many people in each jurisdiction?
- How many different addresses in each?
- What does the clustering look like?
- Do the people with the strongest connections have close or further away locations?

LET'S DO THIS!

Step by Step Guide to Combining SNA with GIS

DATA

- Network nodes (people and incidents)
  - Unique identifier
  - Network number
  - Betweenness score
  - Centrality score
- Incidents/Crimes, Arrests, Field Interviews
  - MINIMUM
    - Unique identifier
    - Addresses
      - Location of Incident, Arrest, FI
      - Home(s)
  - OTHER THAT YOU MAY WANT TO CONSIDER
    - Crime Type/Charge/Group (eg. Violent, gun-related, etc.)
    - Incarceration Status
    - Parole/Probation Status
    - Outstanding Warrants

PREPPING YOUR DATA

Make sure…

- ✓ Dupes are deleted
- ✓ Addresses are geocoded (if you have x,y already, bonus!)
- ✓ Unique identifiers match (*beware of dupes from differing agencies – create new if needed!)
- ✓ There is a field that designates (may need to create!) whether address is home, crime, or arrest
- ✓ Crime charges/groups are consistent
- ✓ Any additional data/fields are consistent

PREPPING YOUR DATA, PART 2

Combining/Linking Data

- Combine multiple jurisdictions (*already done for this class)
  - Just the fields you will use, for keeping it simple
- Add incident address field(s) to network output table for incident (using VLookUp works well)
- For addresses associated with people, you will need to link tables to determine all addresses the person may be associated with (Access works well for this “one to many”)
  - Import your address data table
  - Import your network data table with the person label
  - Link on Network label to address table
  - Export linked table(s) back out to Excel

LET'S MAP!

- Add table(s) to ArcMap
- Convert to shapefile
- Add appropriate base layers (after downloading shp files - http://www5.kingcounty.gov/gisdataportal/)
  - Streets ("Street Address")
  - Jurisdictional boundaries ("Cities and Unincorporated King County")
  - Schools, Parks, Water features to give context
  - Other relevant data for your jurisdiction
    - Transit stations/stops
    - Gang territories
    - Patrol district/beat boundaries

MAKING THE MAP USEFUL

- Symbolizing your data
  - Creating graduated symbols
  - Choosing a color and size scheme
- Cartographic Elements
  - Title
  - Legend
  - Scale Bar
  - North Arrow
  - Date/Source