Geo Bureau
Geographic Information Specialists

Ordnance Survey Developer Partner

ESRI AUTHORIZED DEVELOPER

GIS and Crime Mapping

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Contents

- Background
- Historical review
- GIS Techniques
- CANDDIS
- The Future
- Summary and Questions

Background

- Introduction
- Geo-Bureau Ltd
- GIS for Local Government and Community Safety
- Community Safety is all relevant organisations with a responsibility of some aspect of Crime & Disorder
- Systems include:
  - Domestic Violence, Anti-Social Behaviour, Monthly Crime Statistics, CCTV Reports, Community Referrals

Crime Mapping in the UK

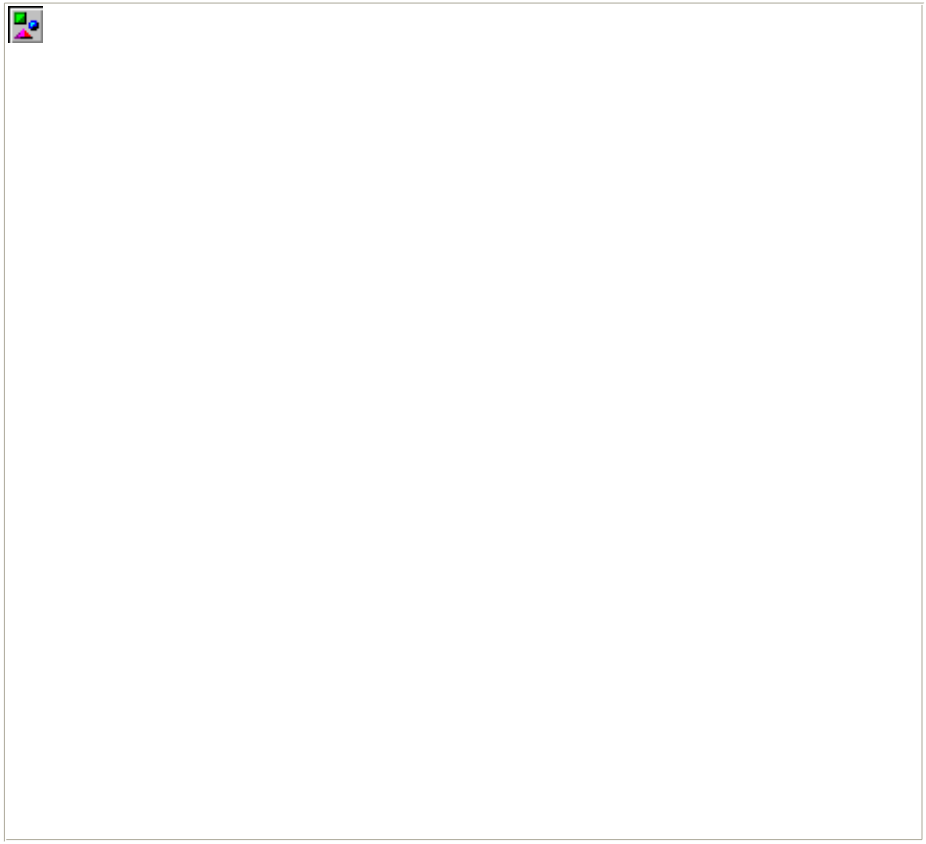
- Crime & Disorder Act 1998 placed a statutory duty on organisations dealing with issues of Crime and Disorder to form Partnerships
- Partnerships include: Local Authority, Police, Probations, Local Health Authorities
- Partnerships share data and information
- Statutory duty extends to production of tri-yearly audit and measuring performance against self-set targets
- GIS & Crime Mapping is used to help identify issues of crime and disorder and the audit is heavily reliant on GIS analysis

History of Crime Mapping

- Cartographic years France 1830's
- Interest by geographers since 1970s
- Use of computing to automate the mapping process
- Incorporation of spatial techniques to further interrogate the crime data sets
- Incorporation of additional technologies e.g. GPS

A typical pin map

A virtual pin map



Types of mapping systems

- Time Critical Systems
  - e.g. Resource allocation
- Non-Time Critical Systems
  - e.g. Tactical and strategic analysis

Non-Time Critical Systems

- What crime maps should do and how they should do it?
- How to choose the right kind of crime map.
- Types of thematic maps.
- How to choose class intervals in numerical data. What is involved in crime map design.
- How crime map design, abstraction, and legibility are related.

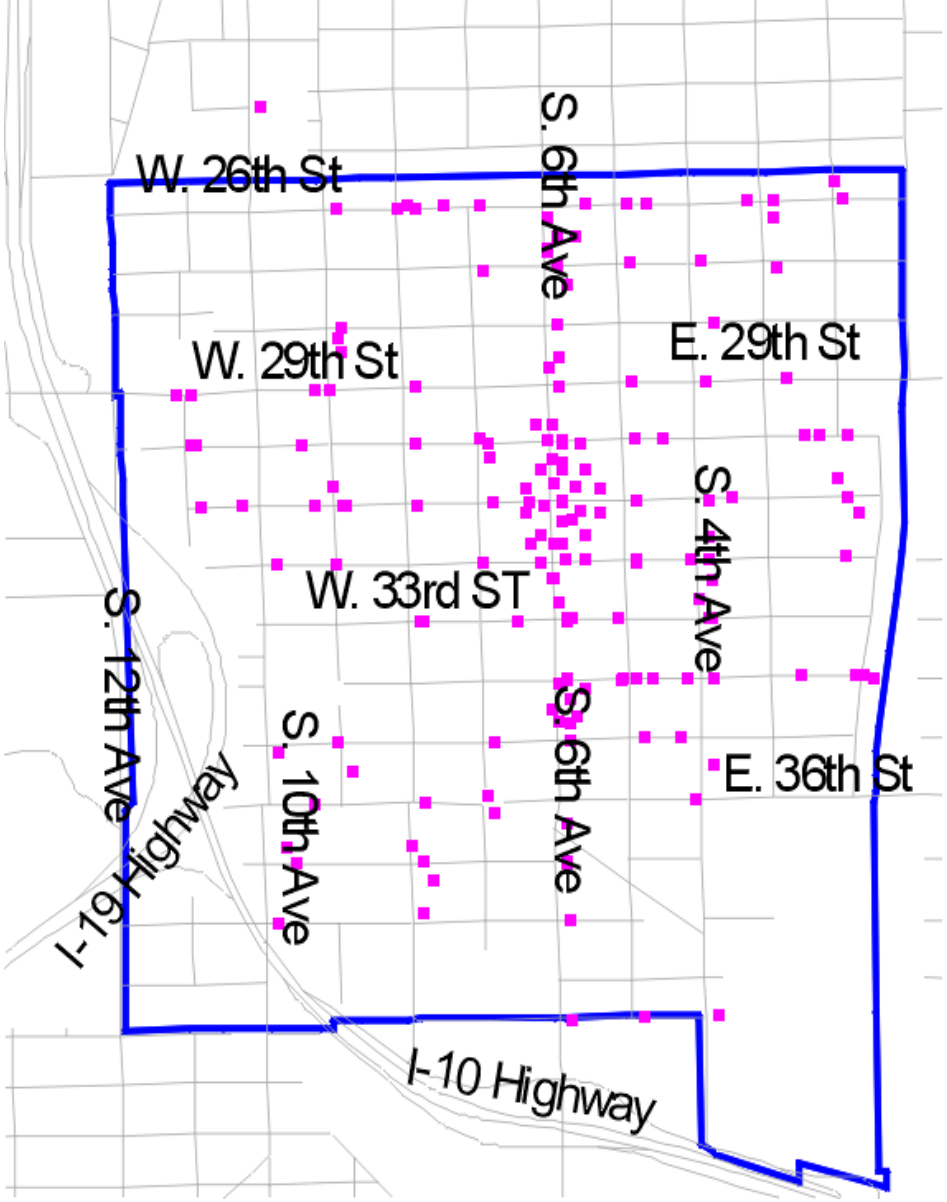
What crime maps should do and how they should do it?

- Visual comprehension
  - Eyesight, aptitude for visual comprehension, prior training
- Choosing a map
  - statistical point, choropleth, isoline, surface, linear

Point mapping

Arizona PD

All Simple Assaults: N=197

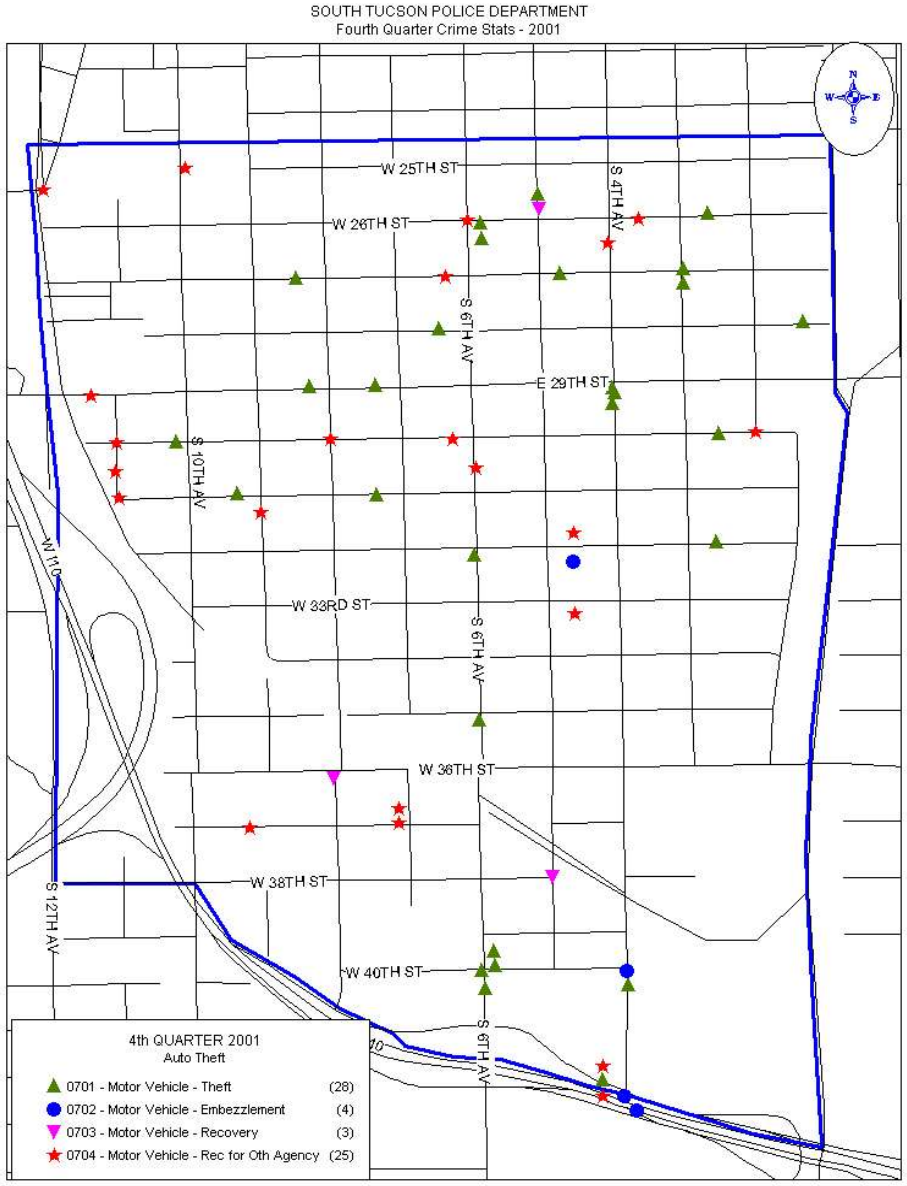


Point mapping

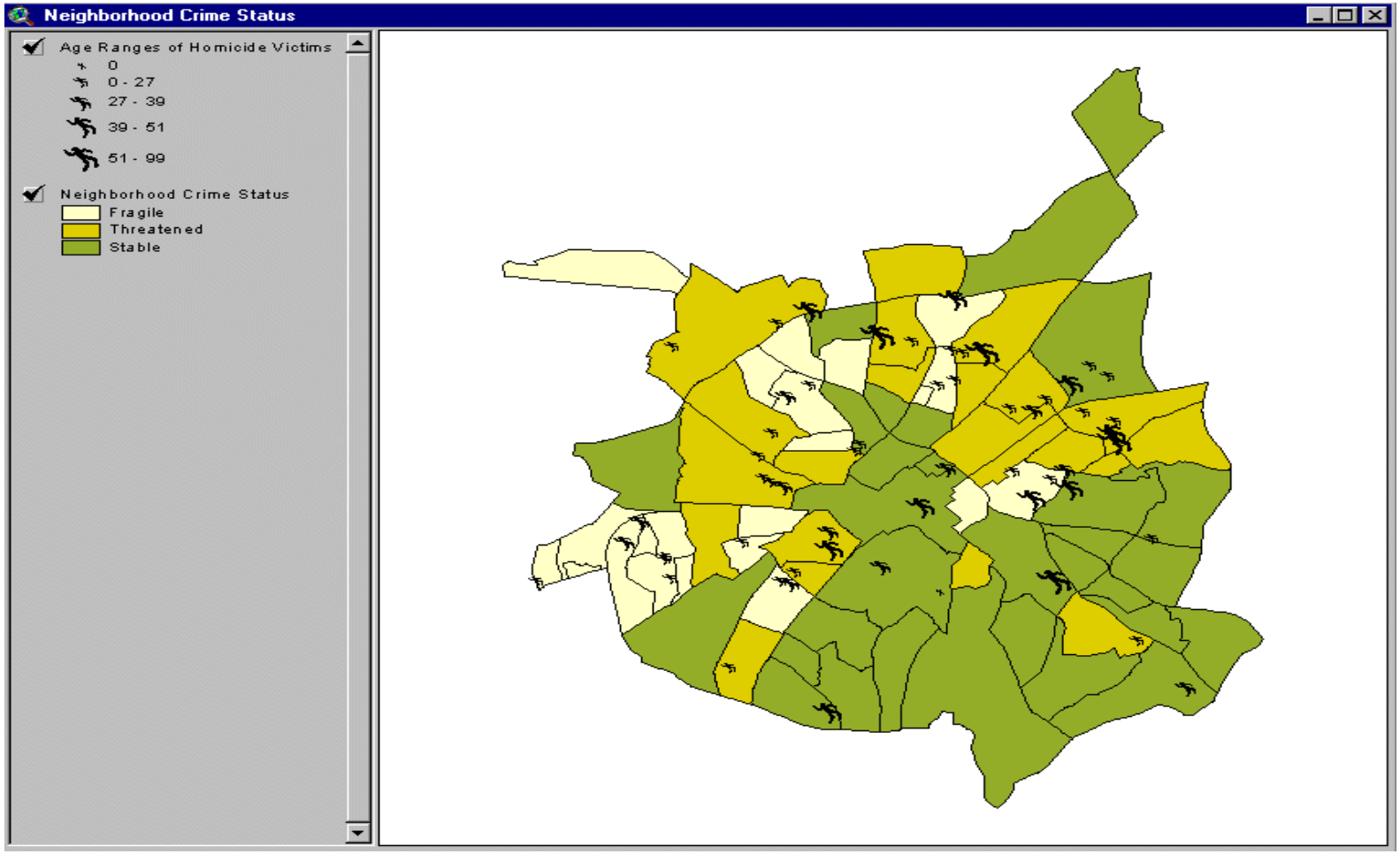
Arizona PD

Car Thefts:

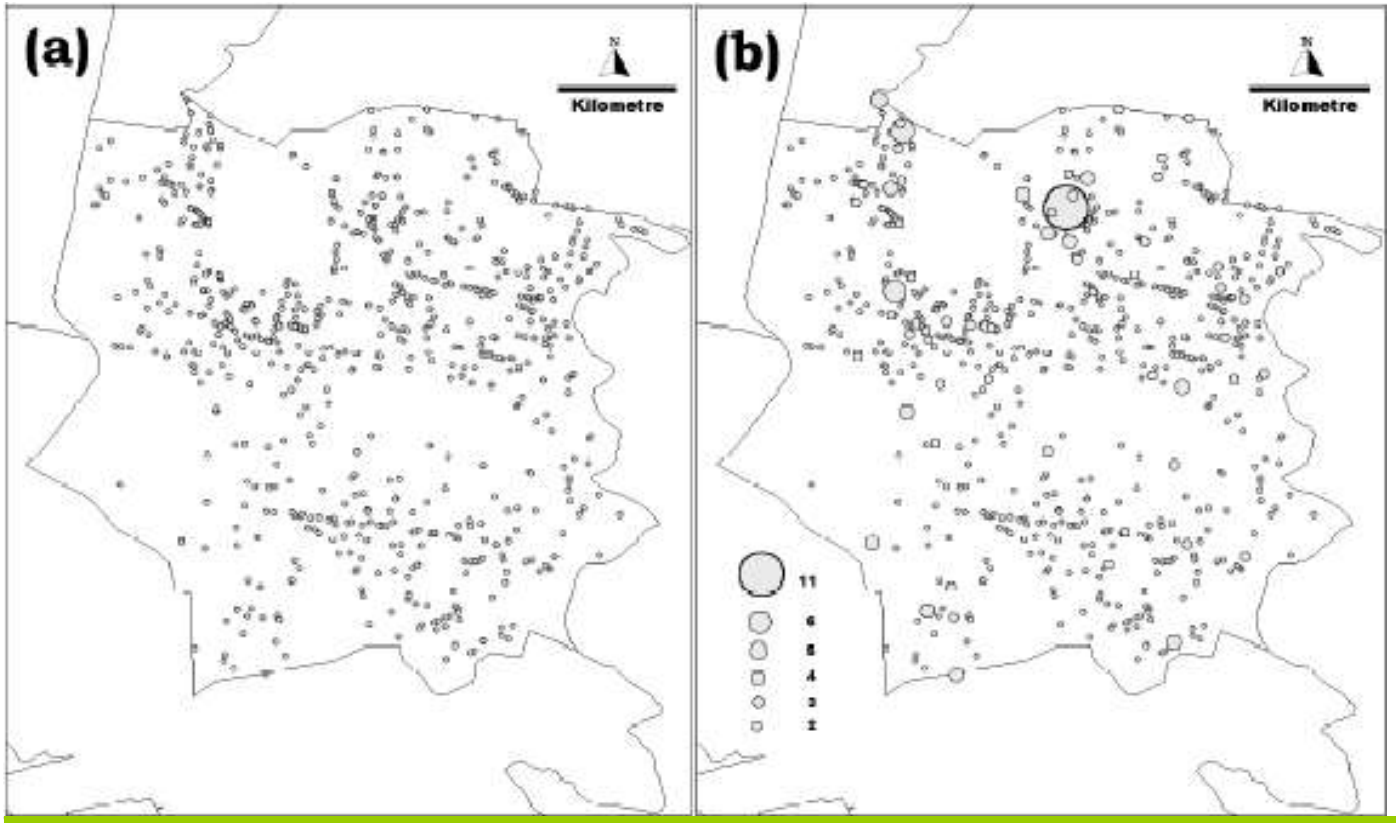
N=60



Thematic mapping using statistical symbols

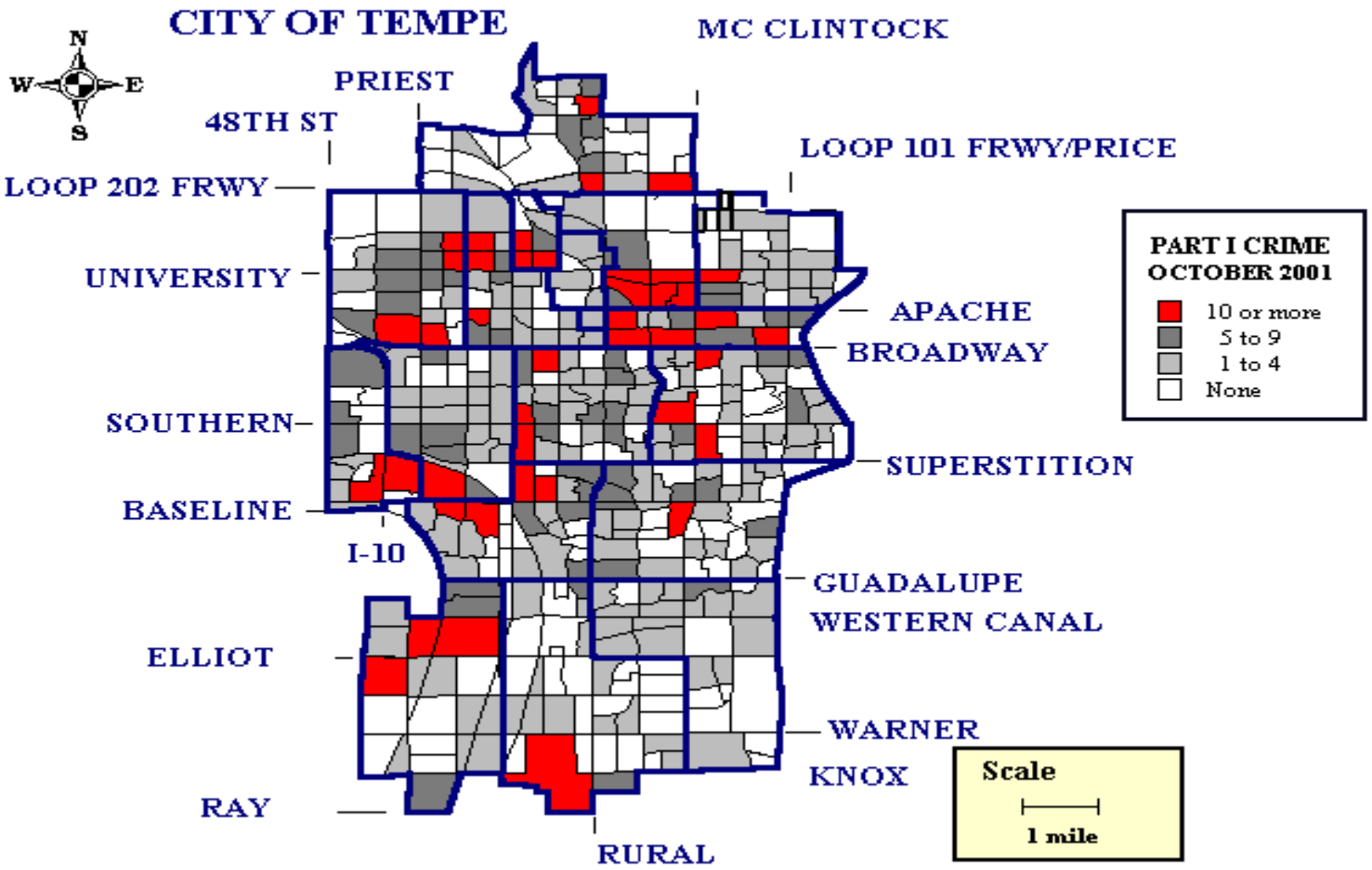


Thematic mapping using statistical symbols

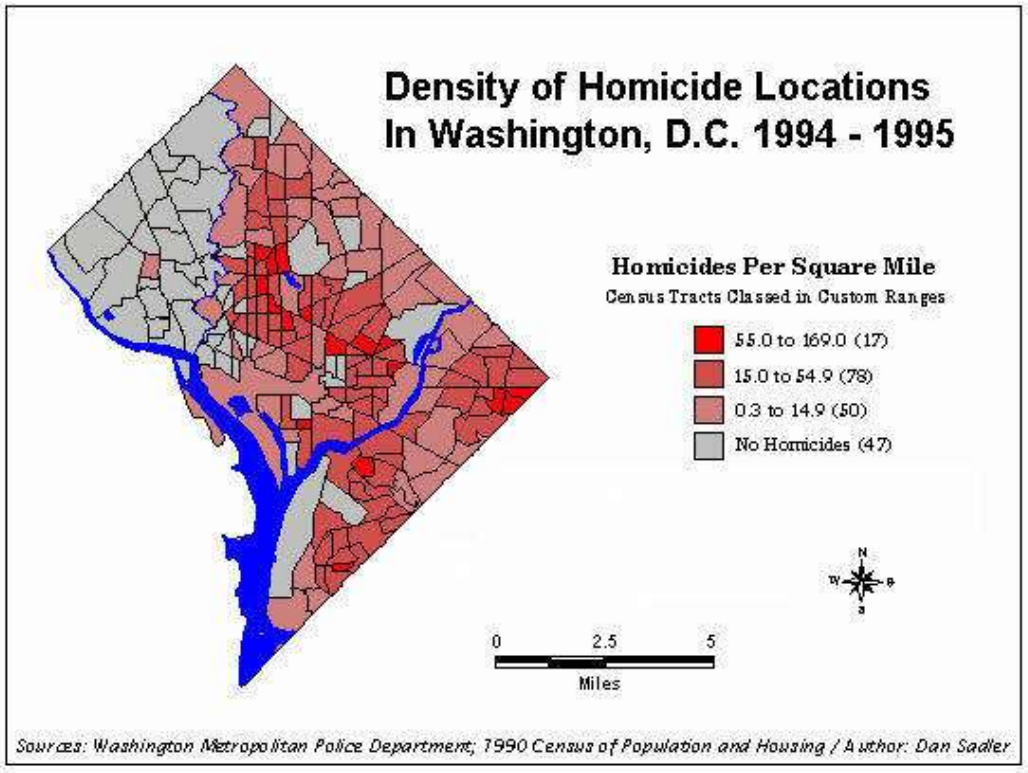


Source: Ratcliffe,J.AIC conference Crime
Mapping: Adding Value to Crime Prevention, Adelaide, September 2000.

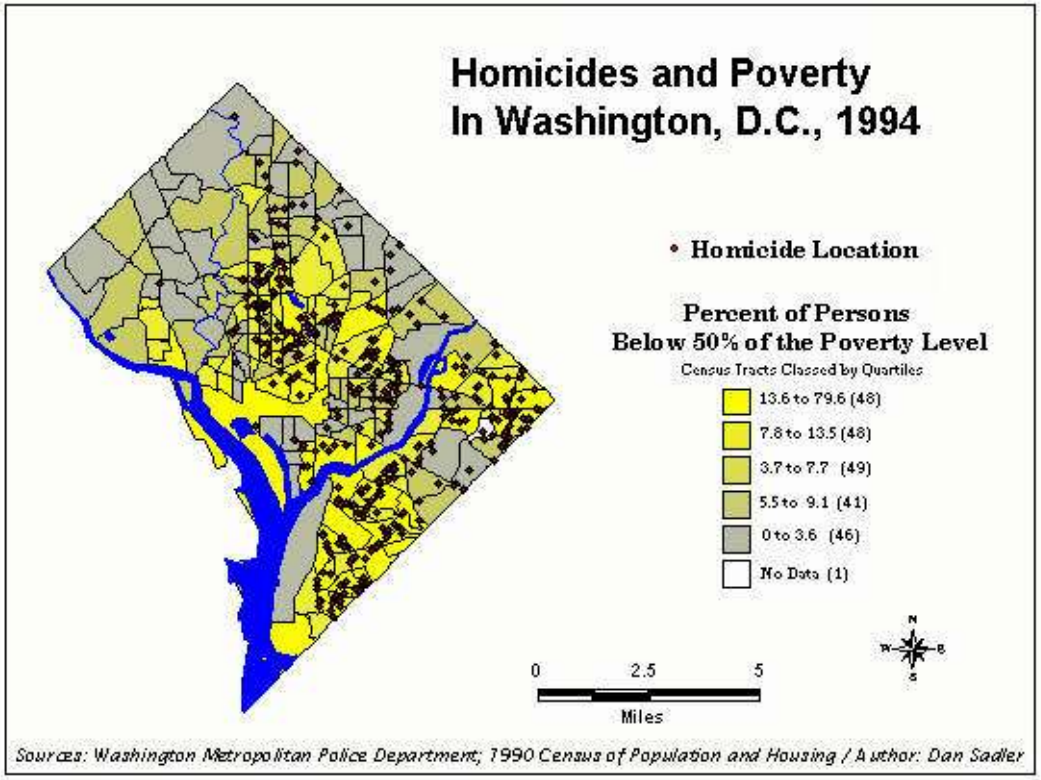
Choropleth mapping



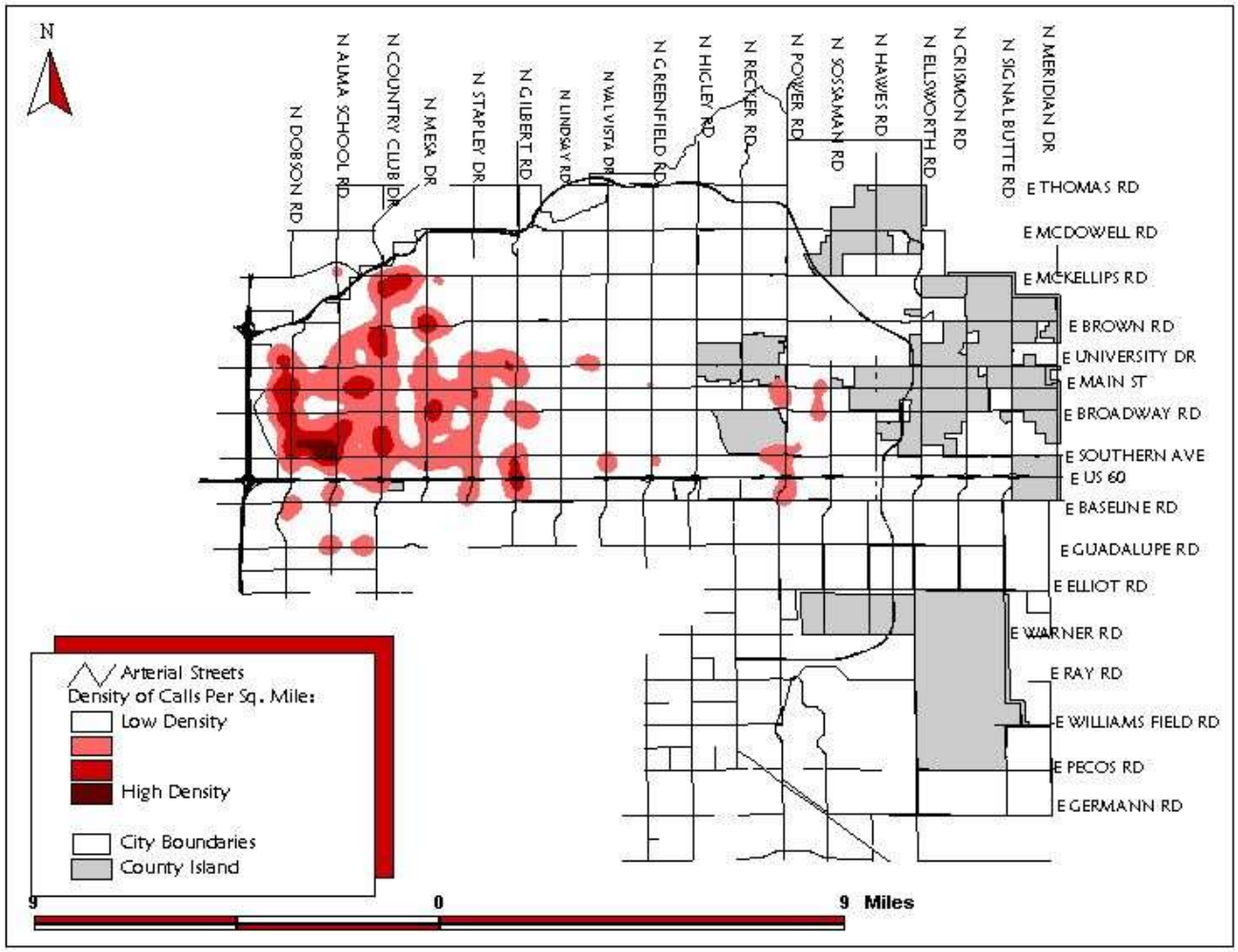
Choropleth mapping



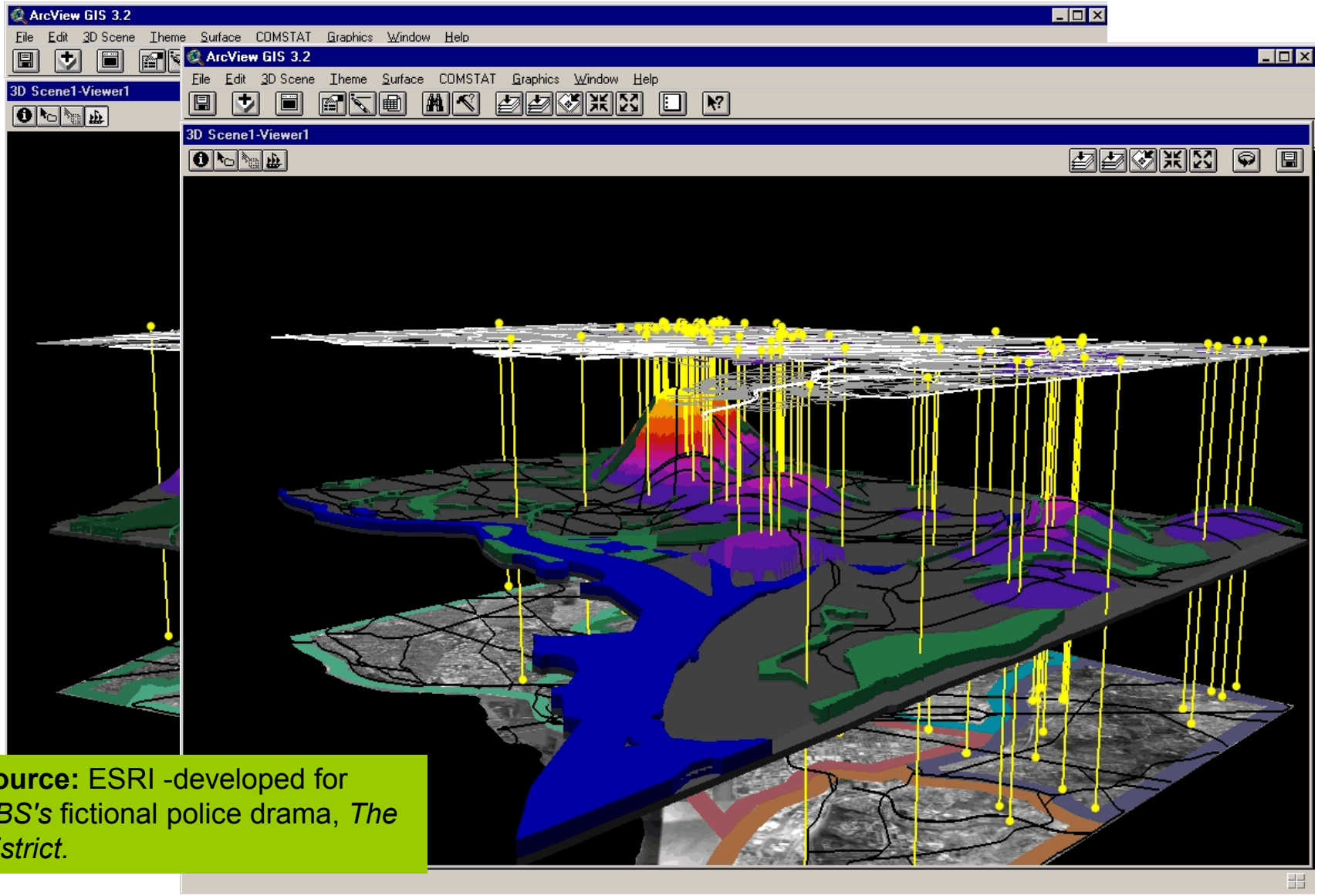
Choropleth mapping



Hotspot mapping

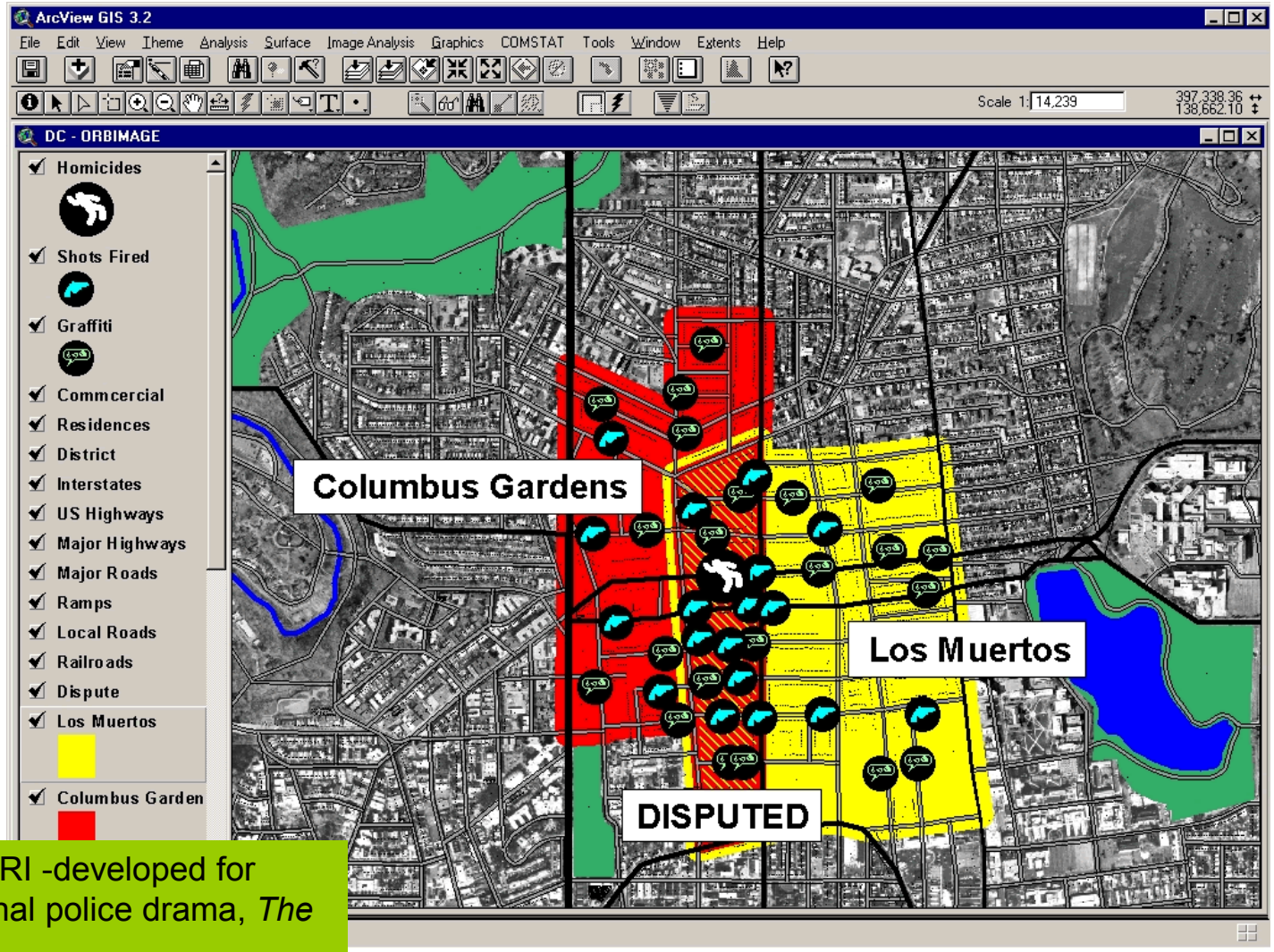


3-Dimensional



Source: ESRI -developed for *CBS's* fictional police drama, *The District.*

Aerial Photography



Source: ESRI -developed for *CBS's* fictional police drama, *The District.*

Classifying map information

- Many factors but major factors:
  - Algorithm and number of classes
  - Detail and scale of the map
  - How data are symbolised

Choices for interval determination

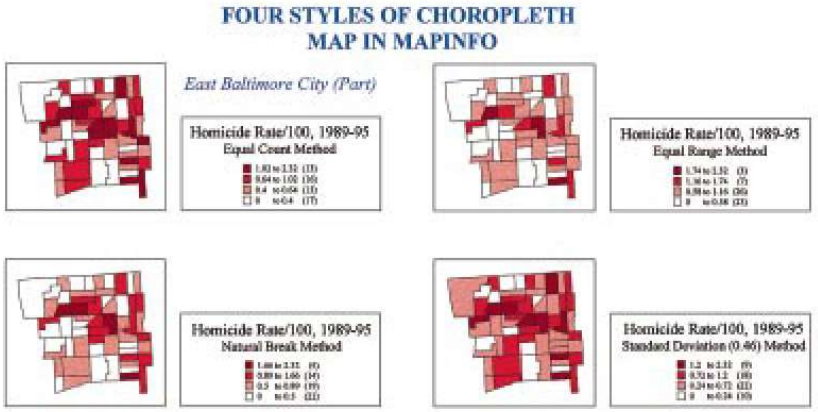
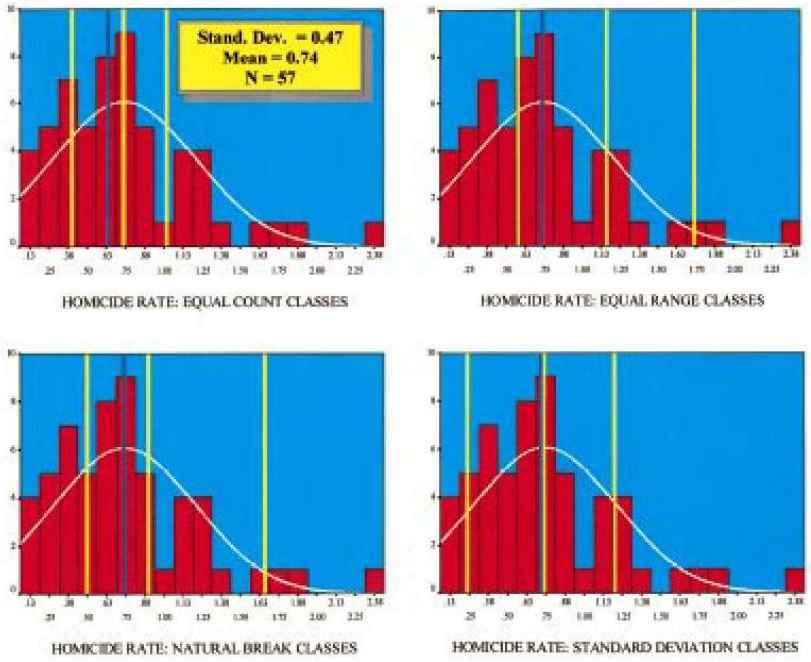


Figure 2.15

East Baltimore City homicide rate in choropleth maps using different methods.

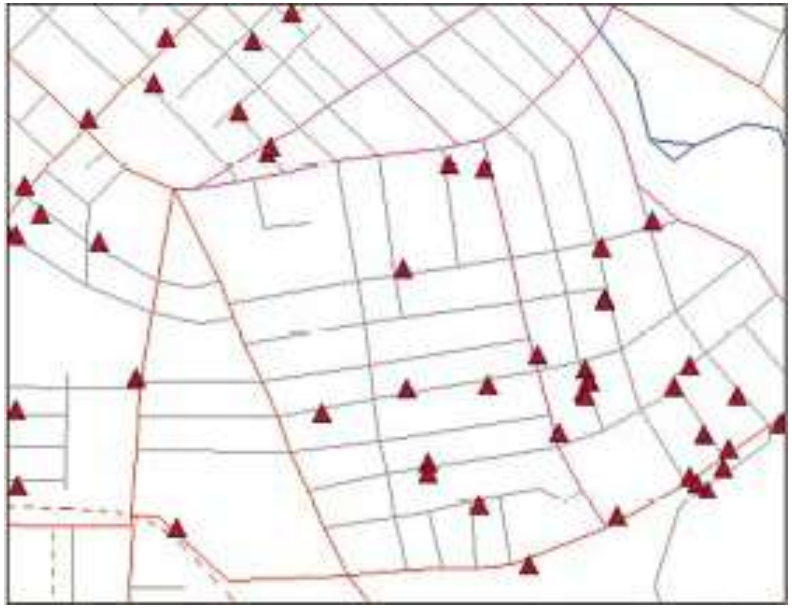
Source: Keith Harries.

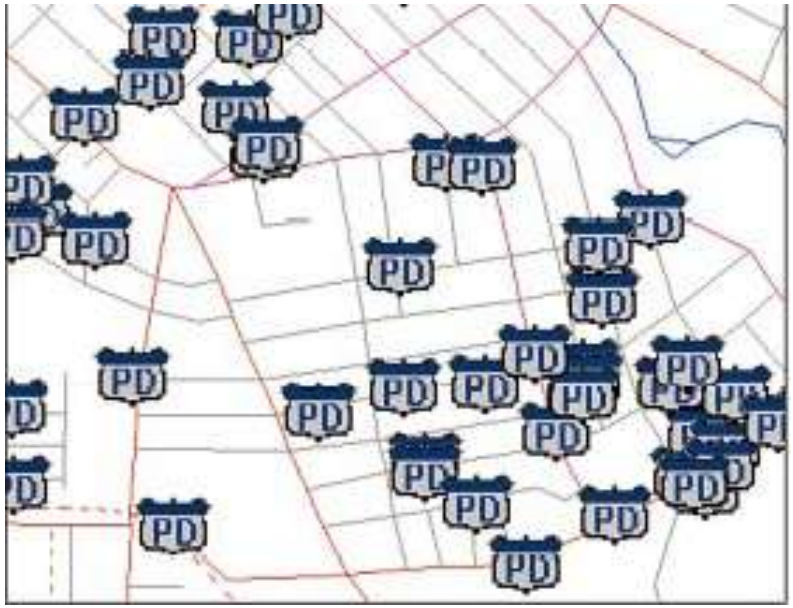


Best Choice?

- Crime tends not to be evenly distributed
  - i.e the data is skewed
- Generally *Natural Break* or *Equal Intervals* will be the best choice for creating shaded area maps.

Choice of symbology?





Source: Mapping Crime: Principle and Practice. Keith Harris

Map Design, abstraction and legibility

- The meaning of the map
  - (title, legend, scale, colour, geographic content, graticule, boarders and neatlines, symbology, labels)
- Targeting the intended audience
  - Police Officers
  - Managers

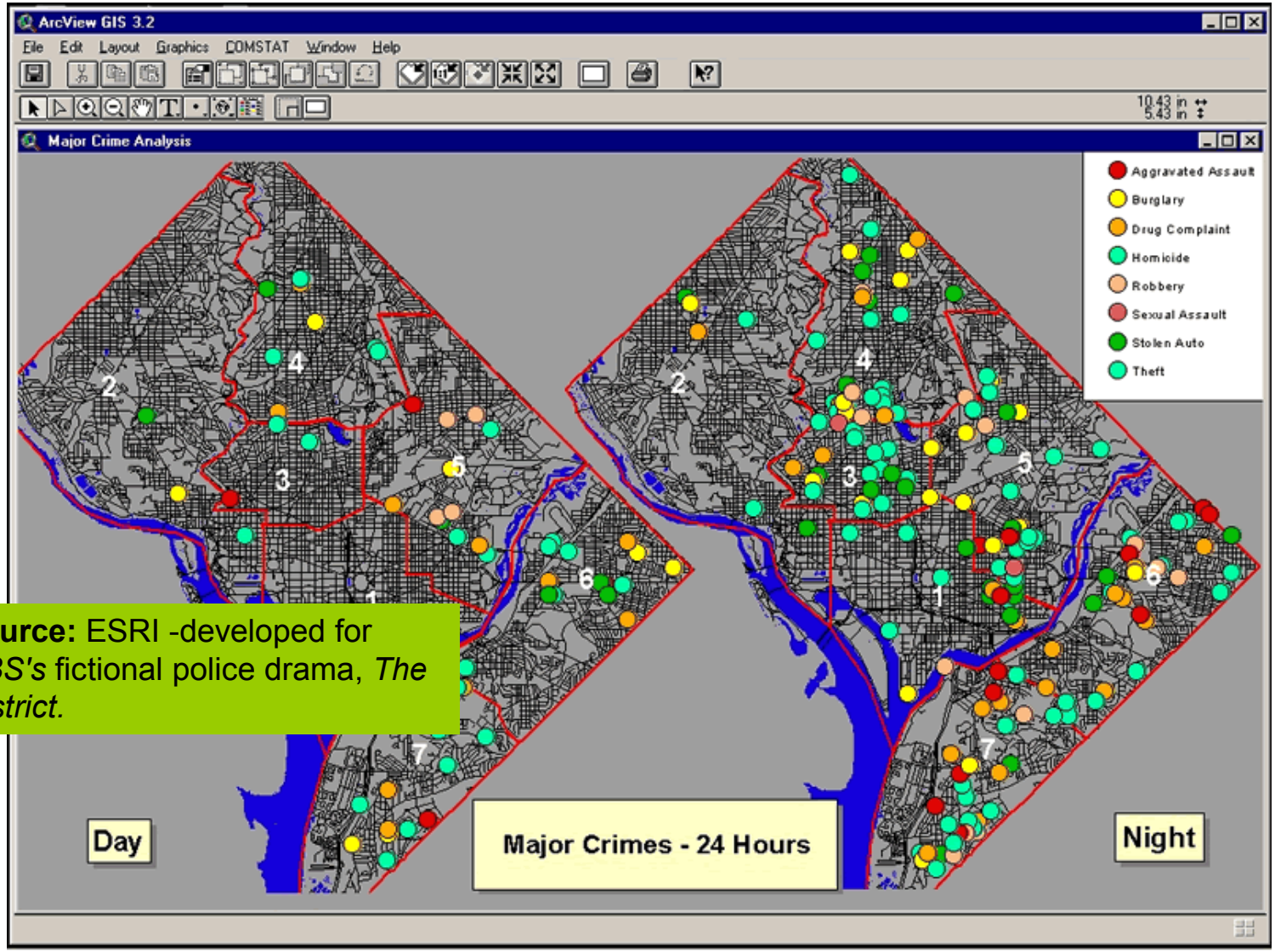
How can maps are used to address specific issues and audiences?

- Police patrol officers
- Crime analysts
- Managers
- Community oriented policing

Police patrol officers

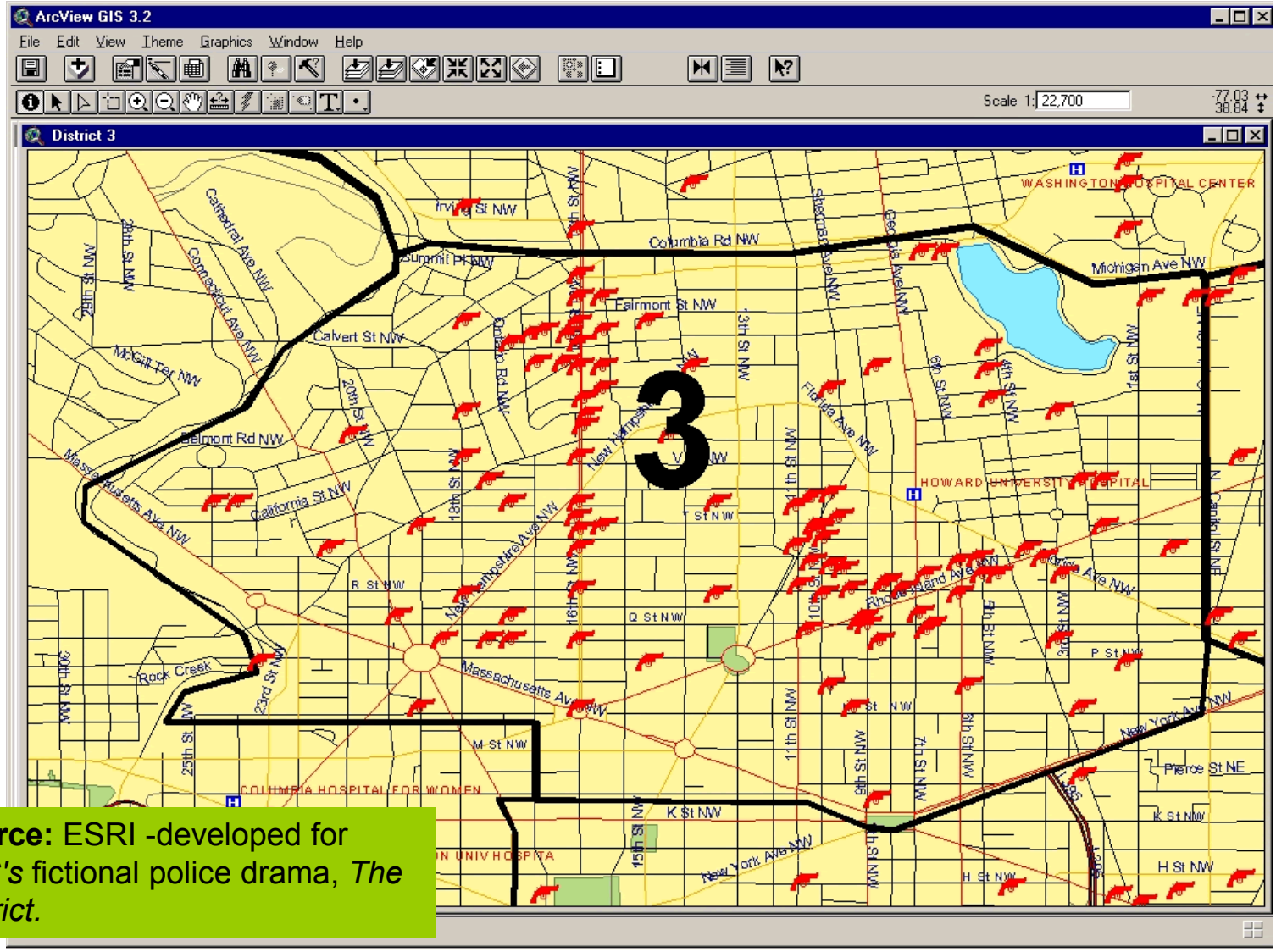
- Spend a large proportion of time on the beat
  - Data relating to their patrol areas
- Focus on recent occurrences
  - Patterns
  - Changes in patterns

Police patrol officers



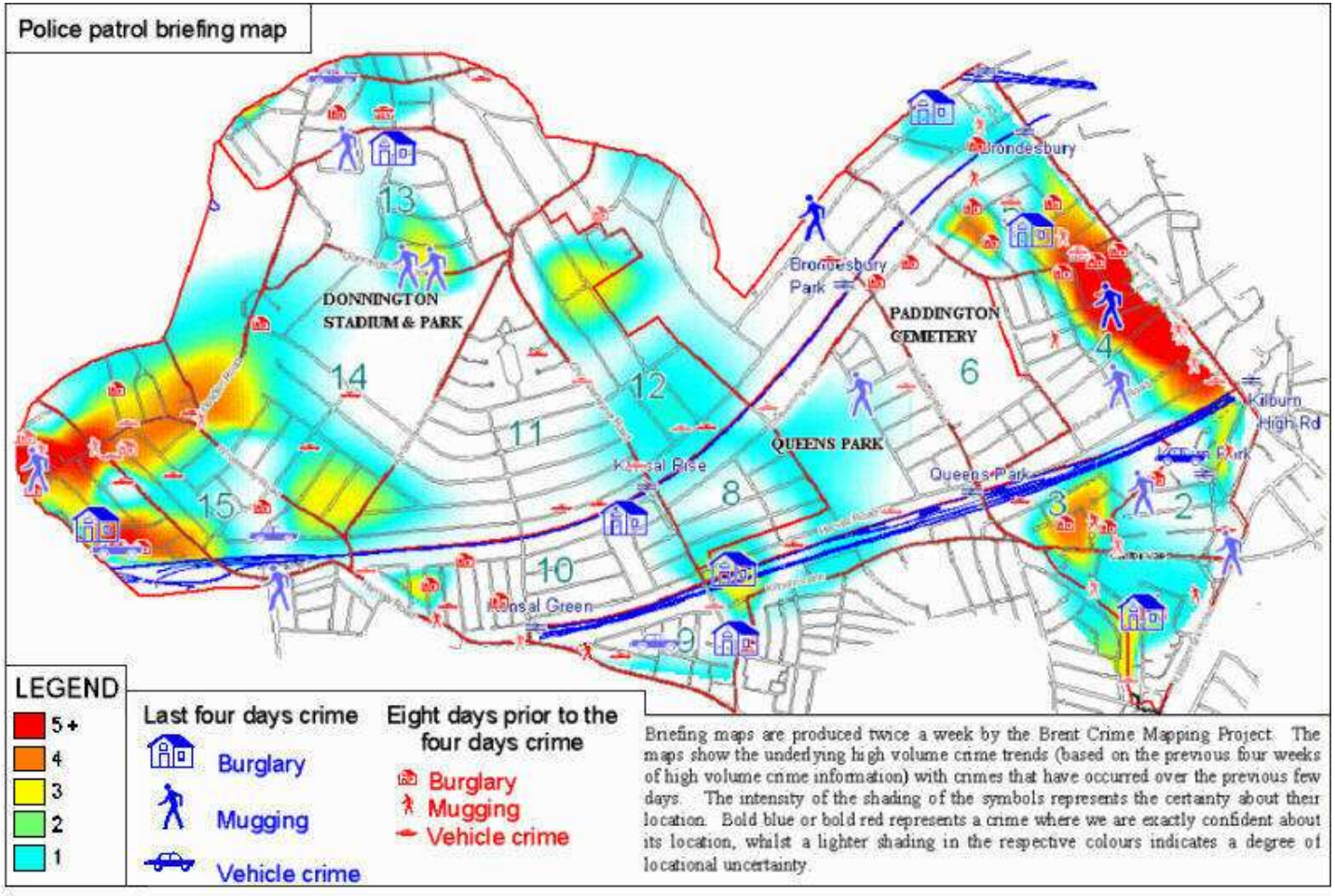
Source: ESRI -developed for *CBS's* fictional police drama, *The District.*

Police patrol officers

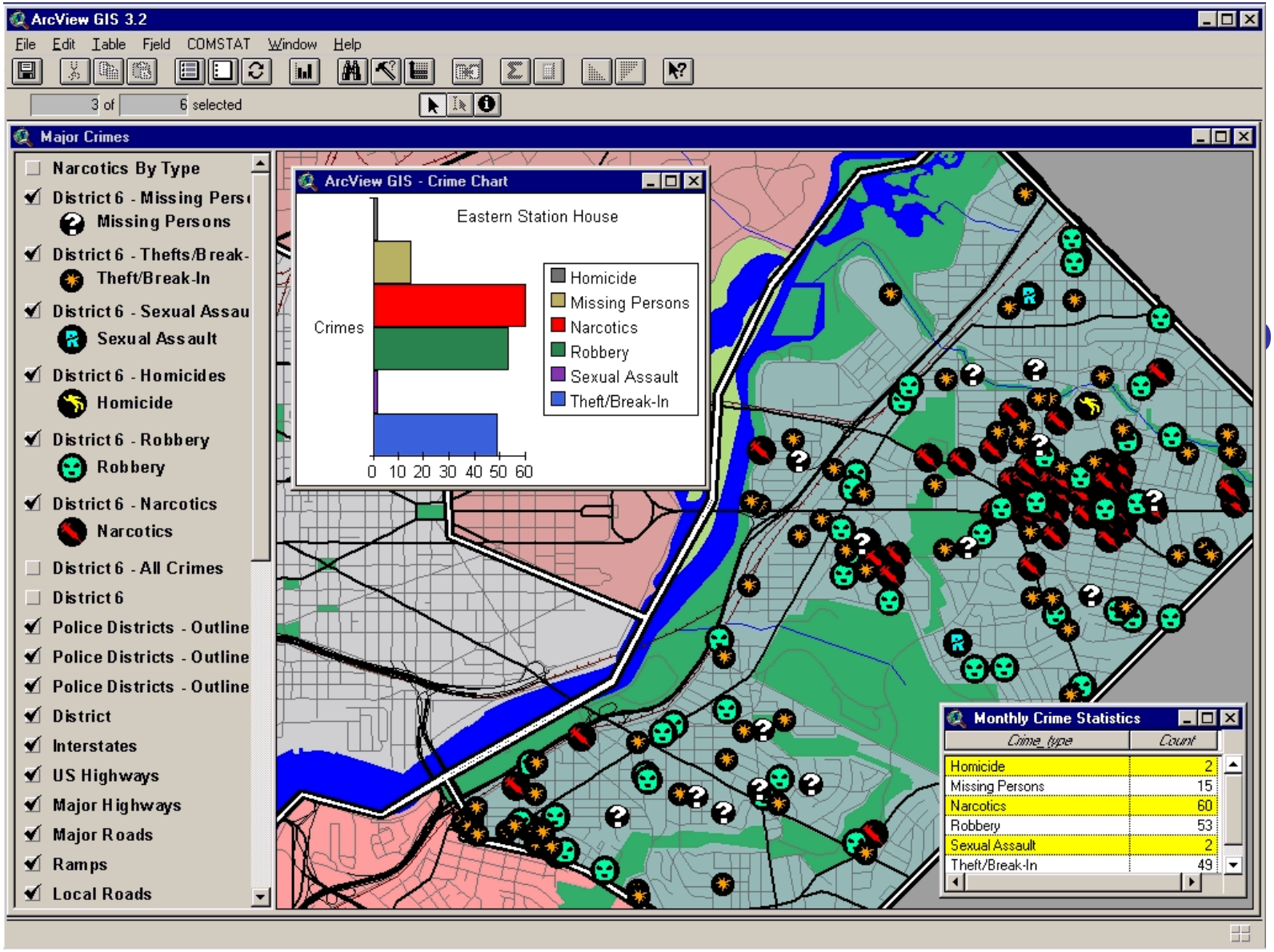


Source: ESRI -developed for *CBS's* fictional police drama, *The District.*

Police patrol officers



Source: Brent Crime Mapping Project (Chainey, 1997)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District 6 - Homicides
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District 6 - Robbery
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District 6 - Narcotics
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District 6 - All Crimes
District 6
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Major Highways
Major Roads
Ramps
Local Roads
ArcView GIS - Crime Chart
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Robbery
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Narcotics 60
Robbery 53
Sexual Assault 2
Theft/Break-In 49

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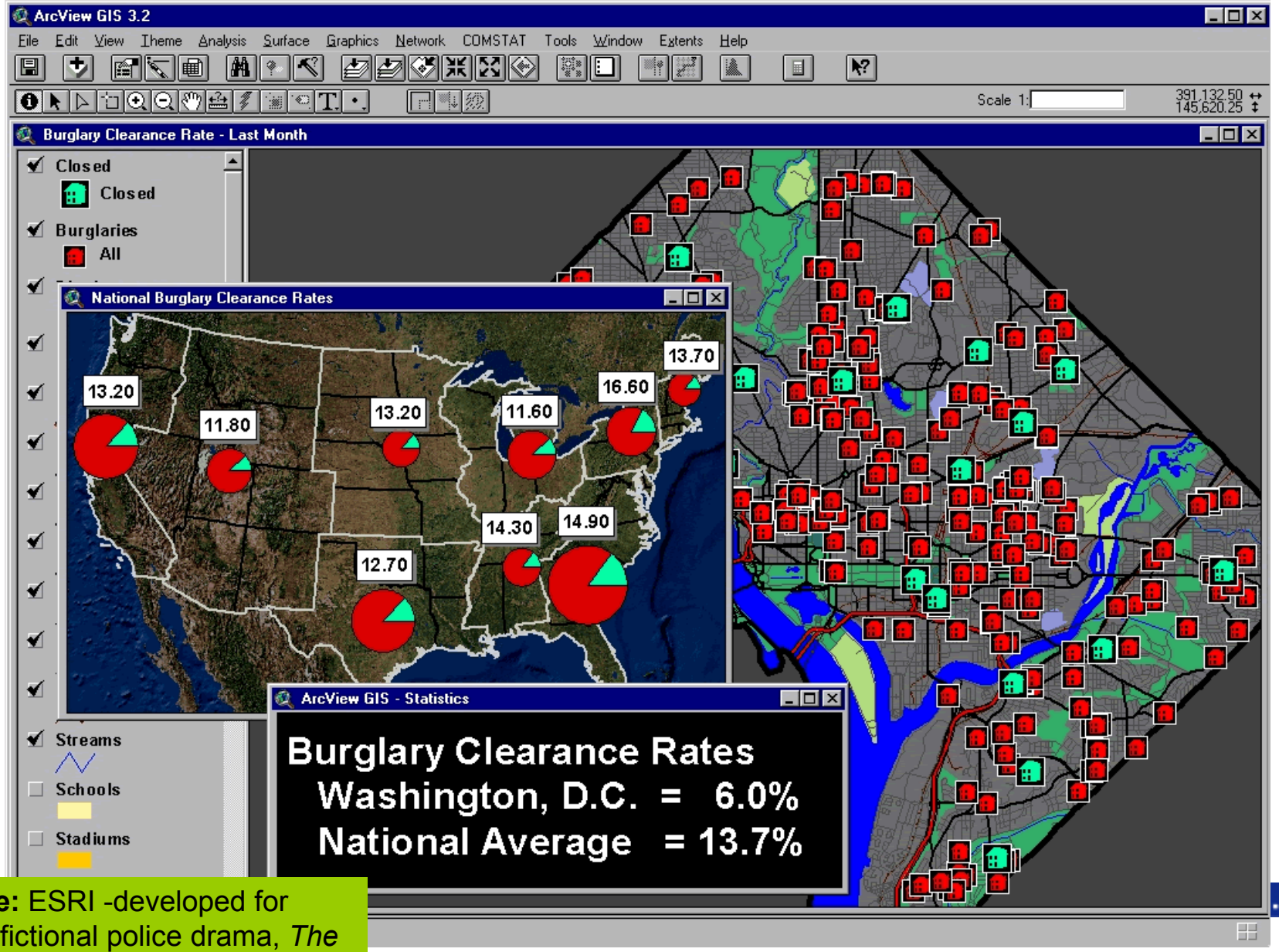
Crime analysts

- Use of mapping to answer investigative questions.
  - i.e relationships and patterns between time and locality of assault victims
- Use evidence to support managerial resource deployment decisions

Crime analysts

- A Burglary problem!
  - (Taken from *The District*)
- Focus on unsolved burglaries

Crime analysts



Source: ESRI -developed for *CBS's* fictional police drama, *The District*

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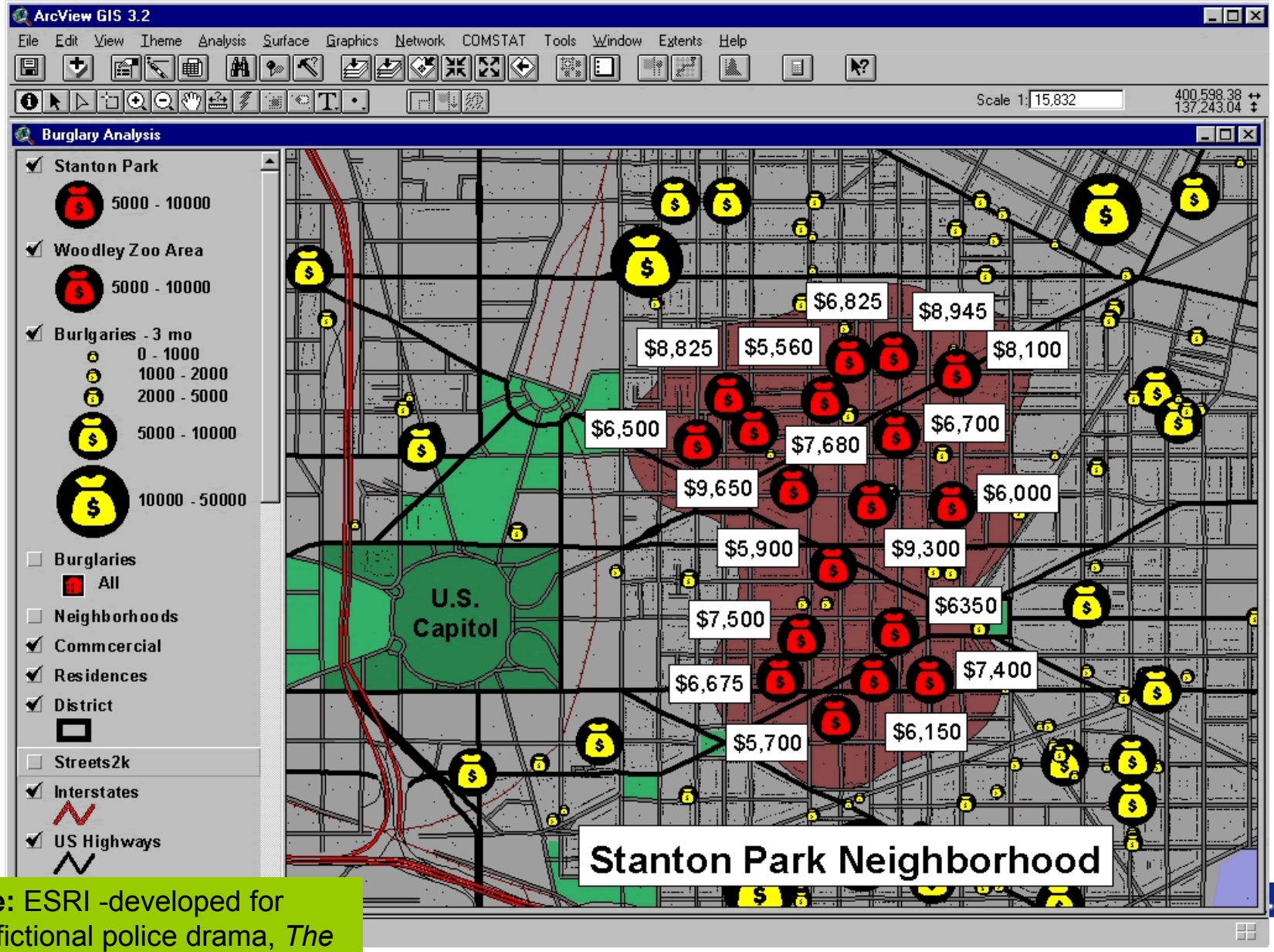
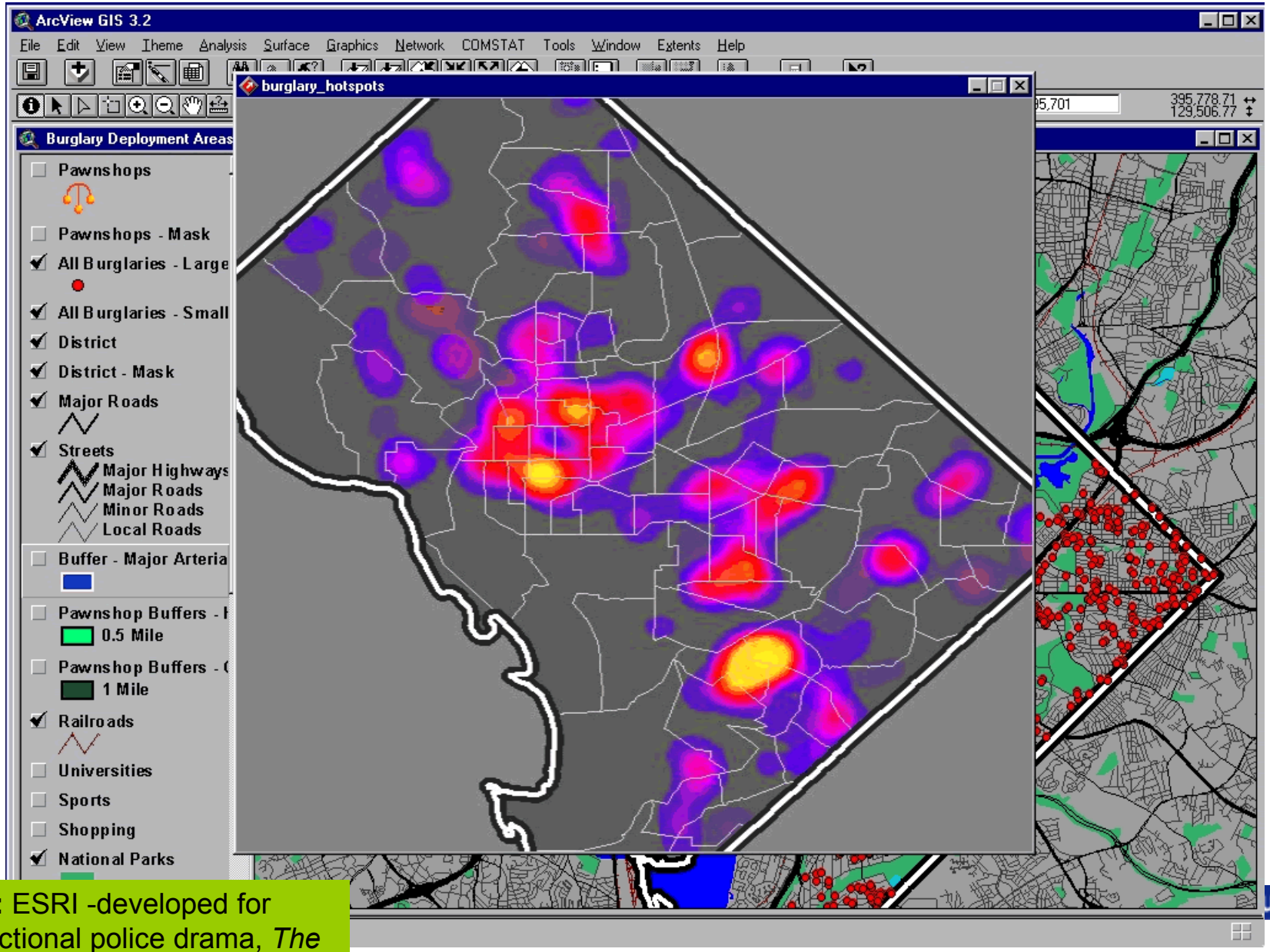
Crime analysts



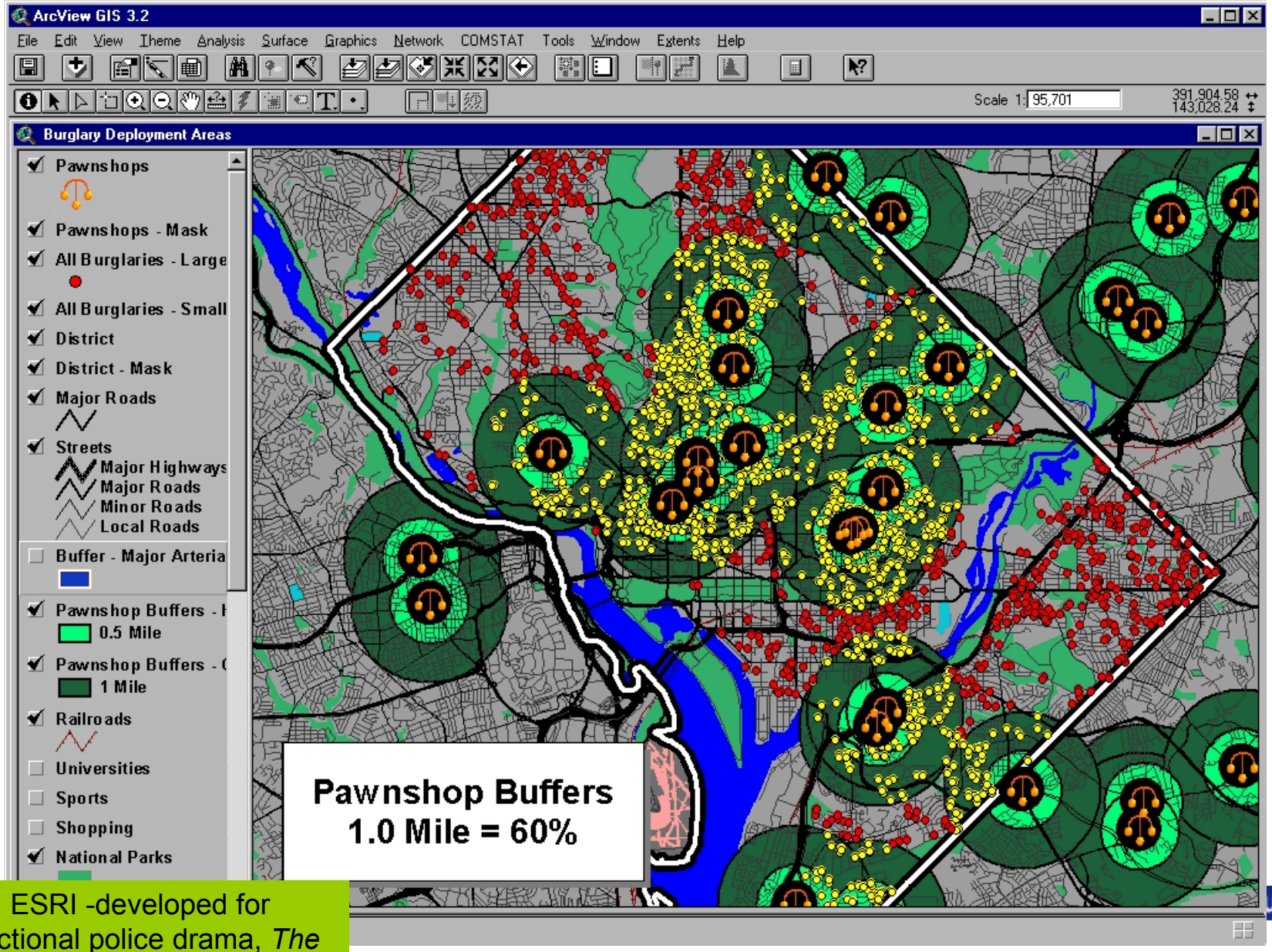
Source: ESRI -developed for *CBS's* fictional police drama, *The District*

Crime analysts



Source: ESRI -developed for *CBS's* fictional police drama, *The District*

Crime analysts



Source: ESRI -developed for *CBS's* fictional police drama, *The District*

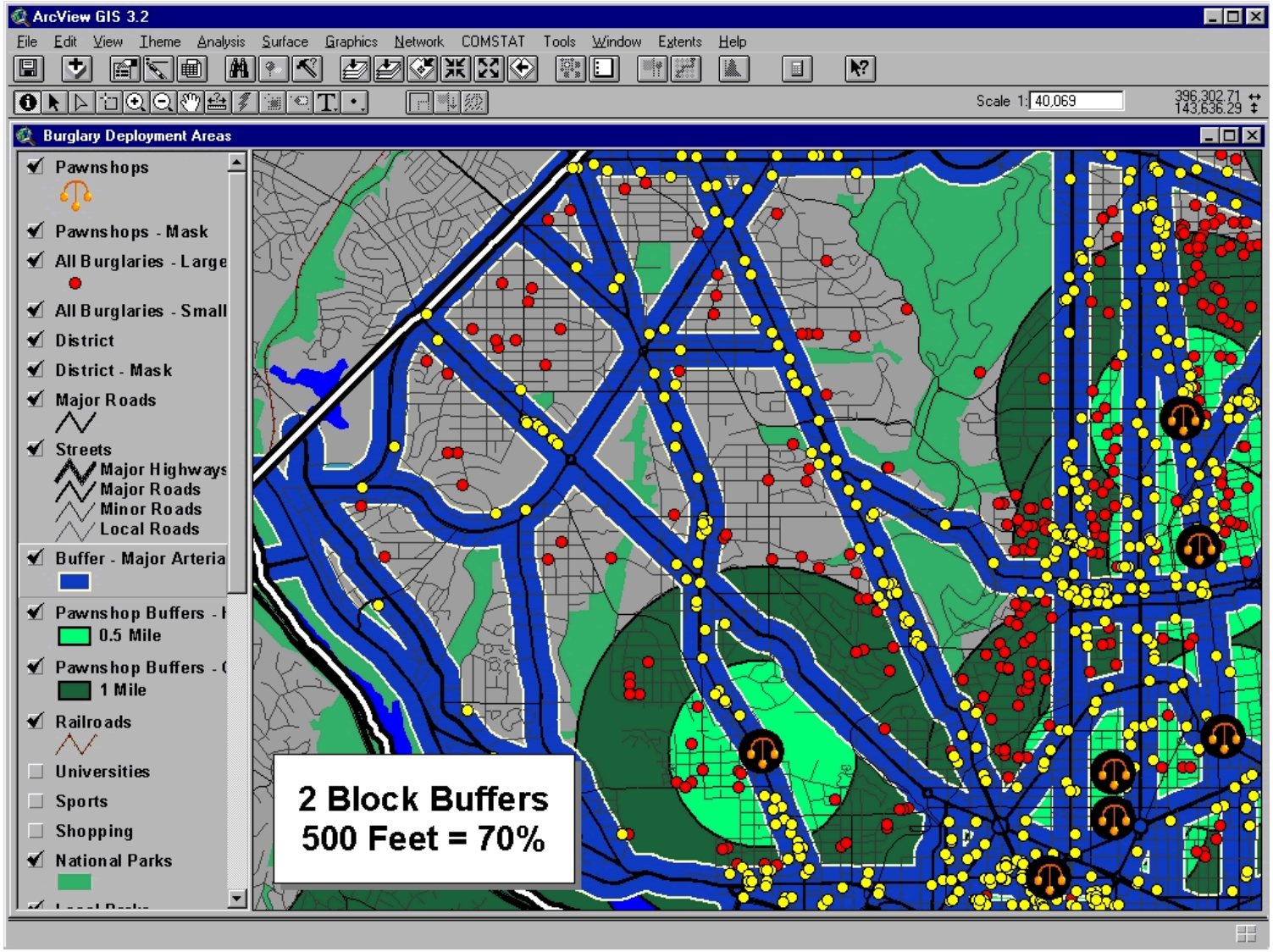
Crime analysts

- Crime analyst assess relationships and offers a potential plan to effectively deploy resources to tackle the problem
  - Deployment along specific main street networks

Managers

- Resource allocation
  - where and when to locate police officers?
  - Linking in with the outputs from the crime analysts
- Displacement of crime
  - has there been a shift or a change in pattern of criminal activity in an area?

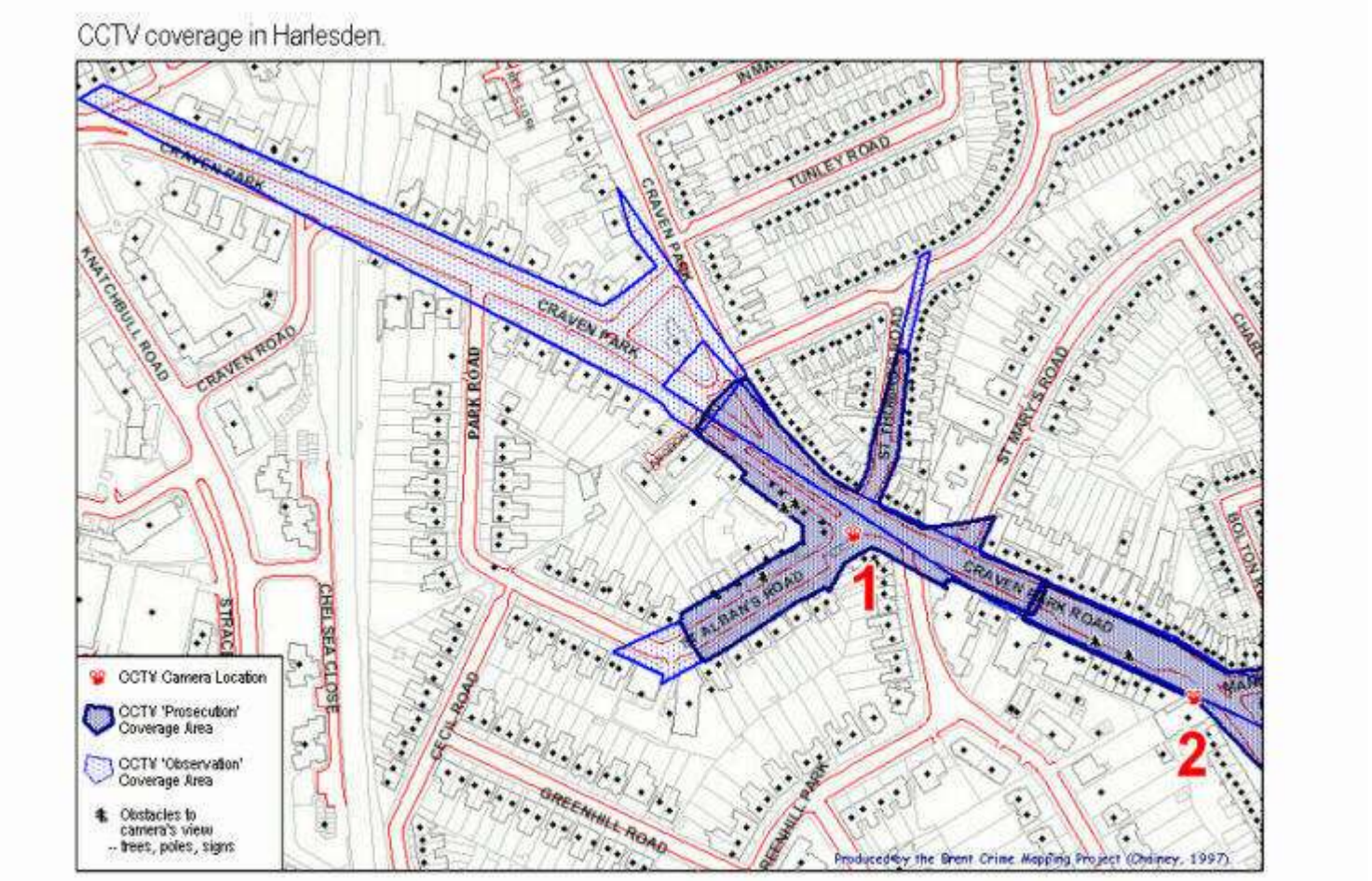
Crime analysts



Source: ESRI -developed for *CBS's* fictional police drama, *The District.*

Managers

- Displacement of crime (e.g. Mapping CCTV)

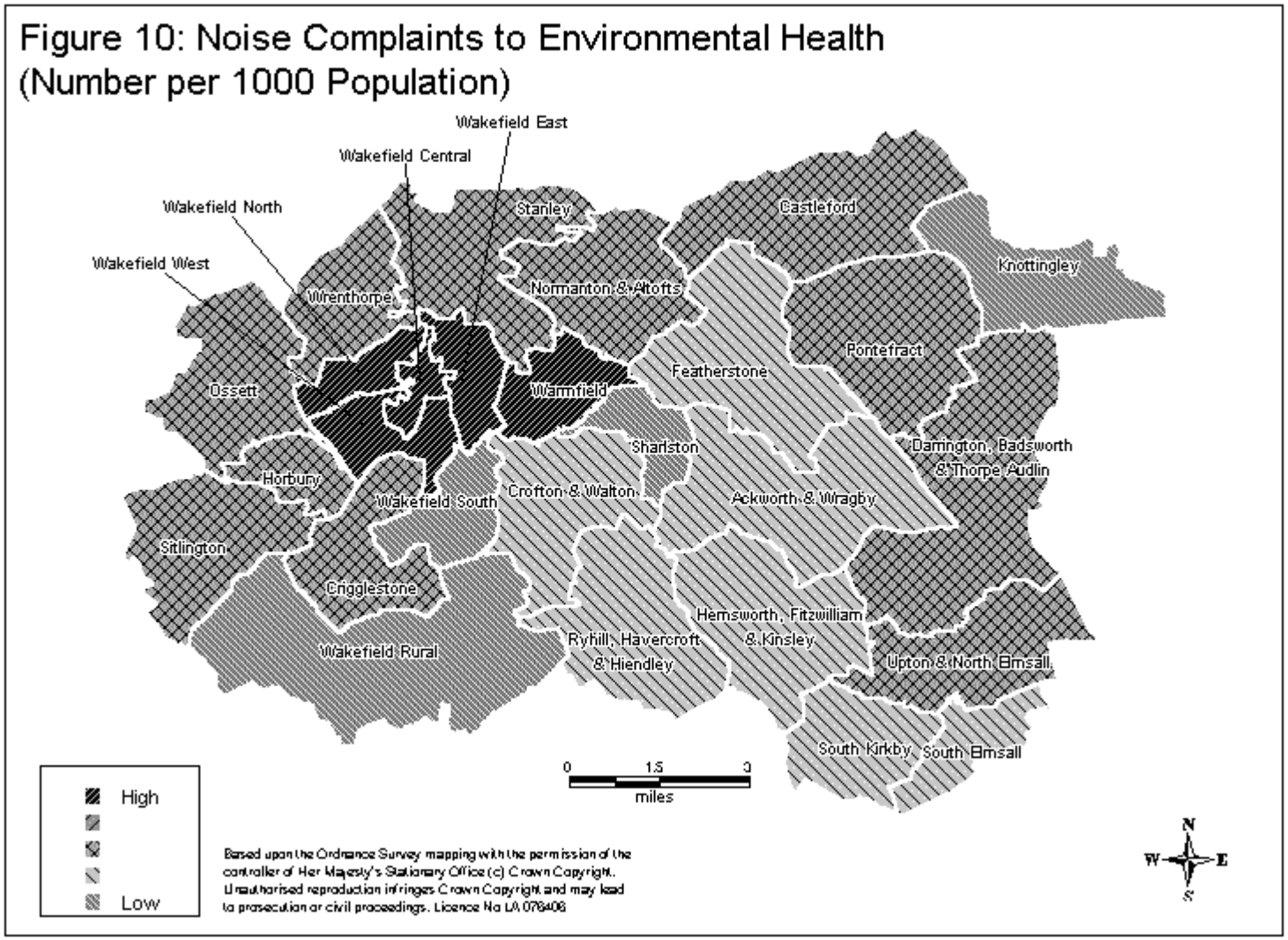


Source: Brent Crime Mapping Project (Chainey, 1997)

Community oriented policing

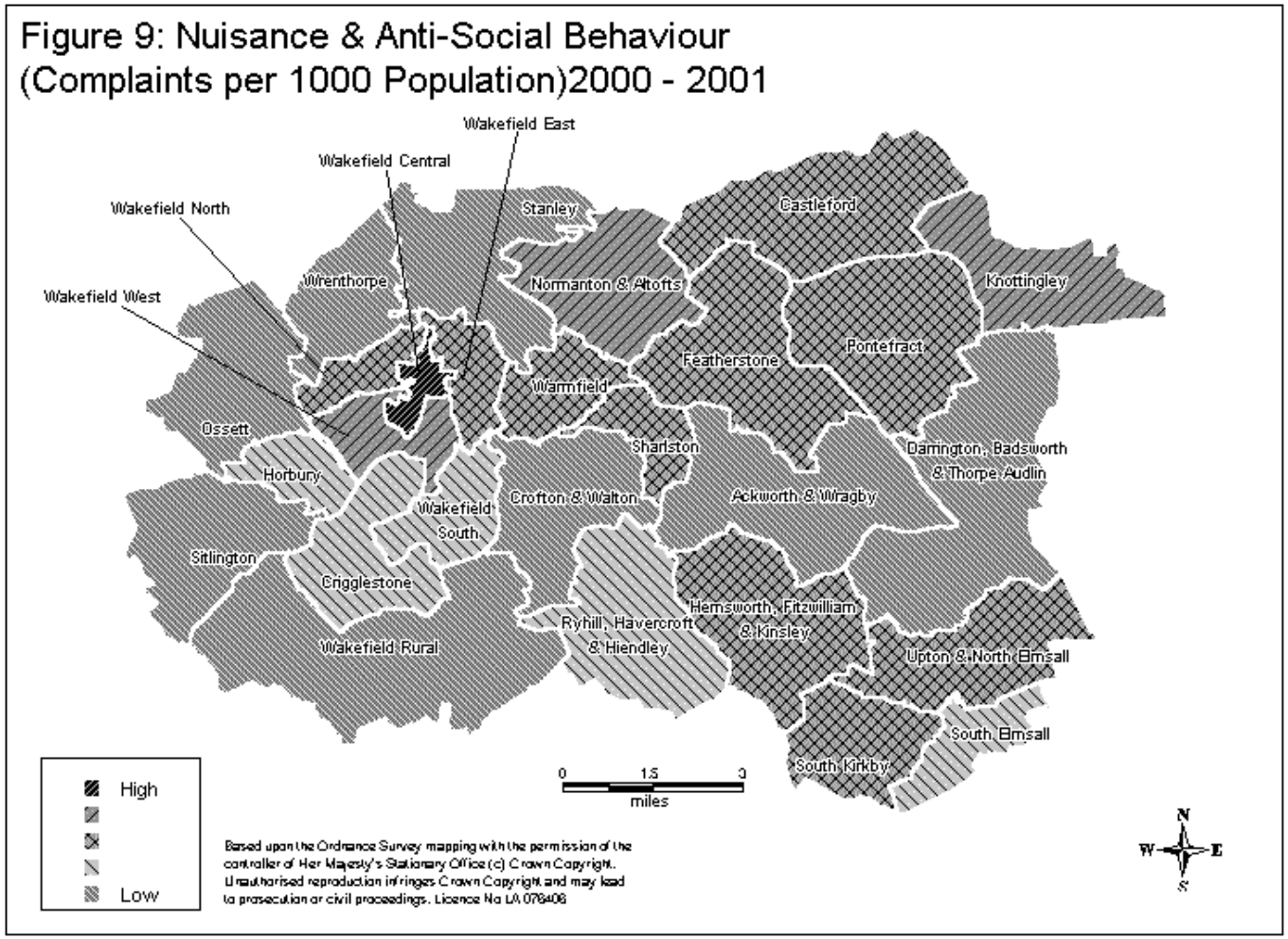
- Mapping in association with other agencies to build a fuller picture of crime and disorder issues.
  - i.e. Neighbourhood watch information alongside police data on disorder and disturbance
  - i.e. Fire service and deliberate fires mapped alongside police data of similar type

Community oriented policing



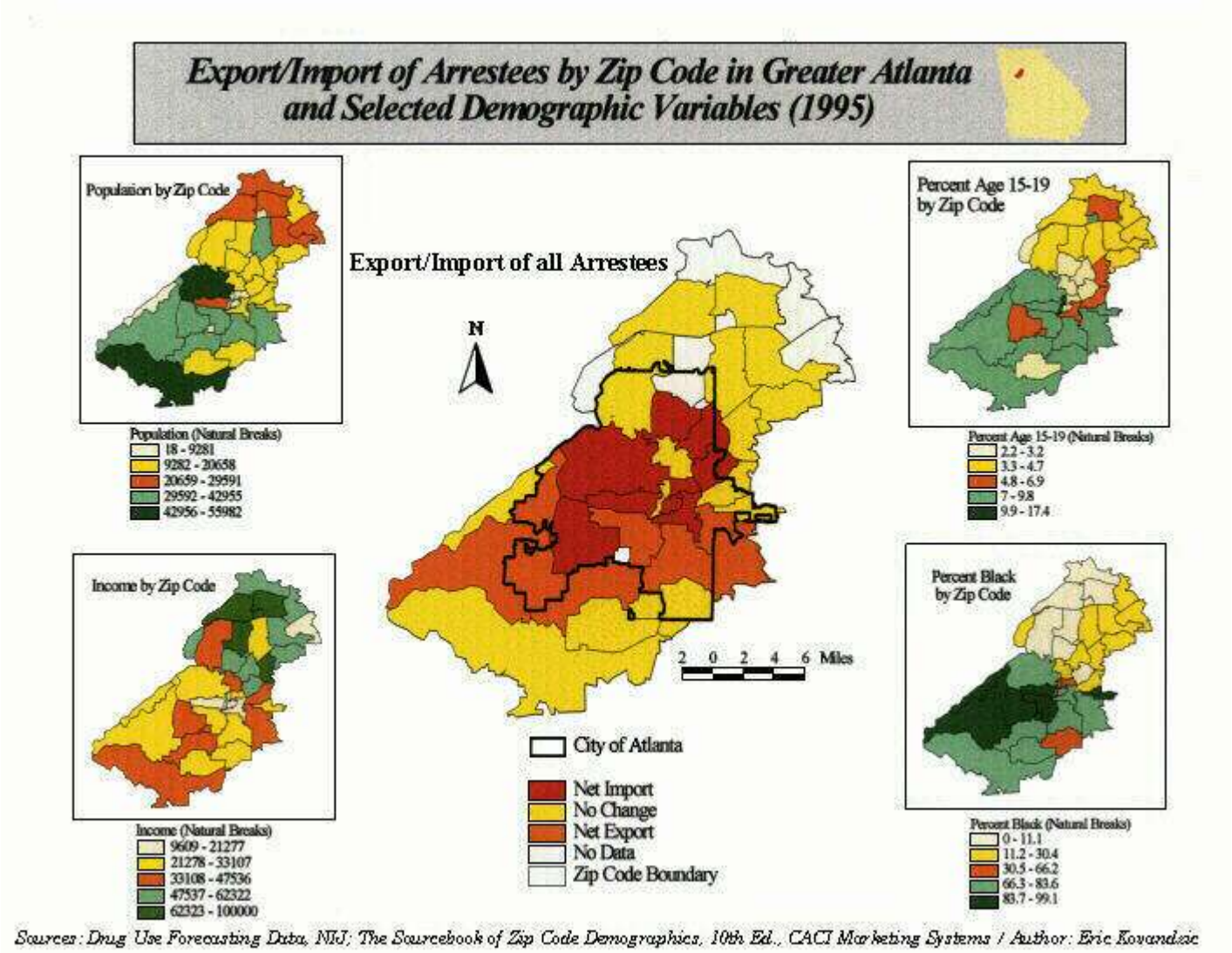
Source: Wakefield District Community Safety Partnership

Community oriented policing



Source: Wakefield District Community Safety Partnership

Offenders commuting



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Time Critical Systems

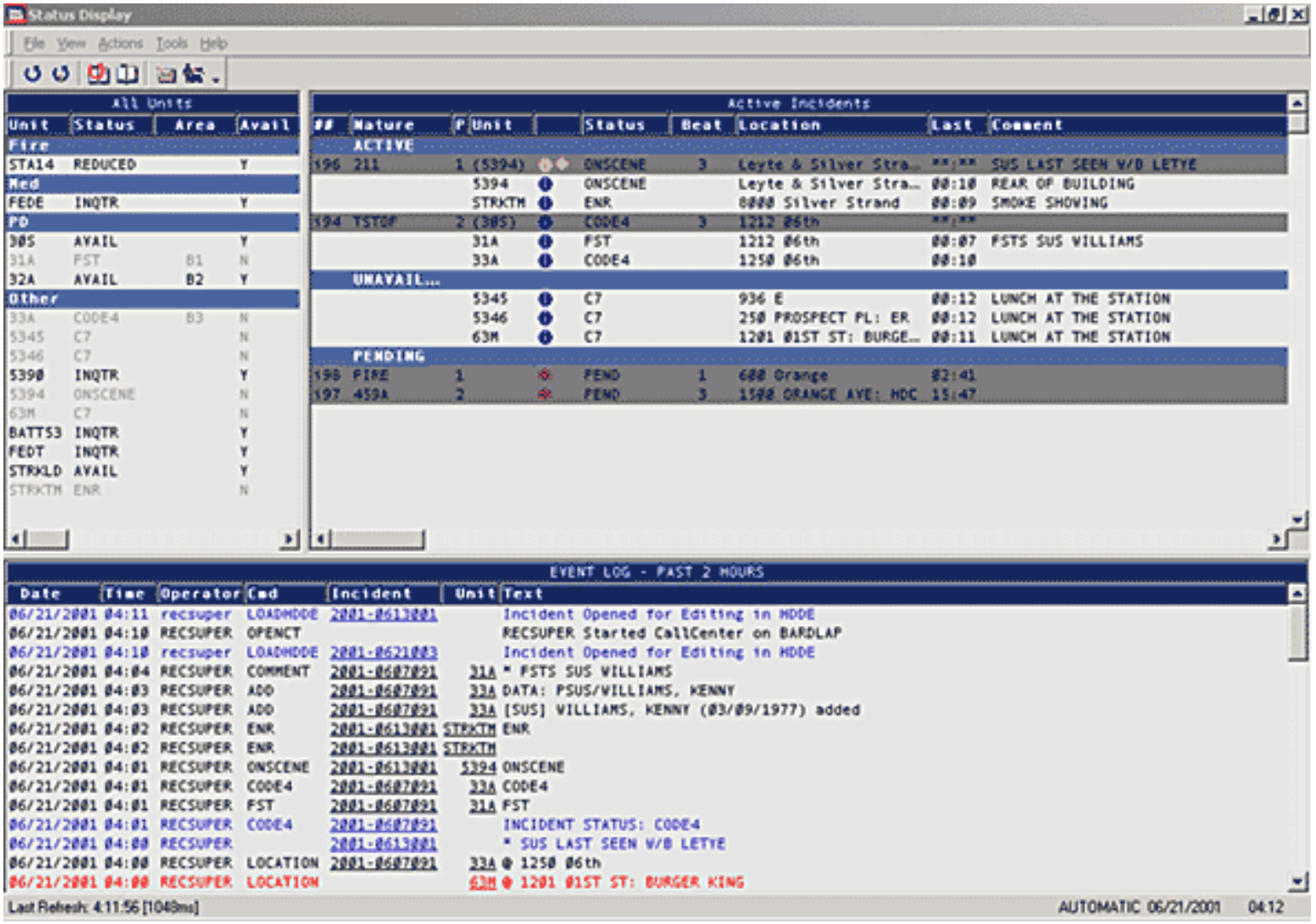
- What are time critical systems?
- How are they used
- A typical real time mapping installation

Time Critical Systems

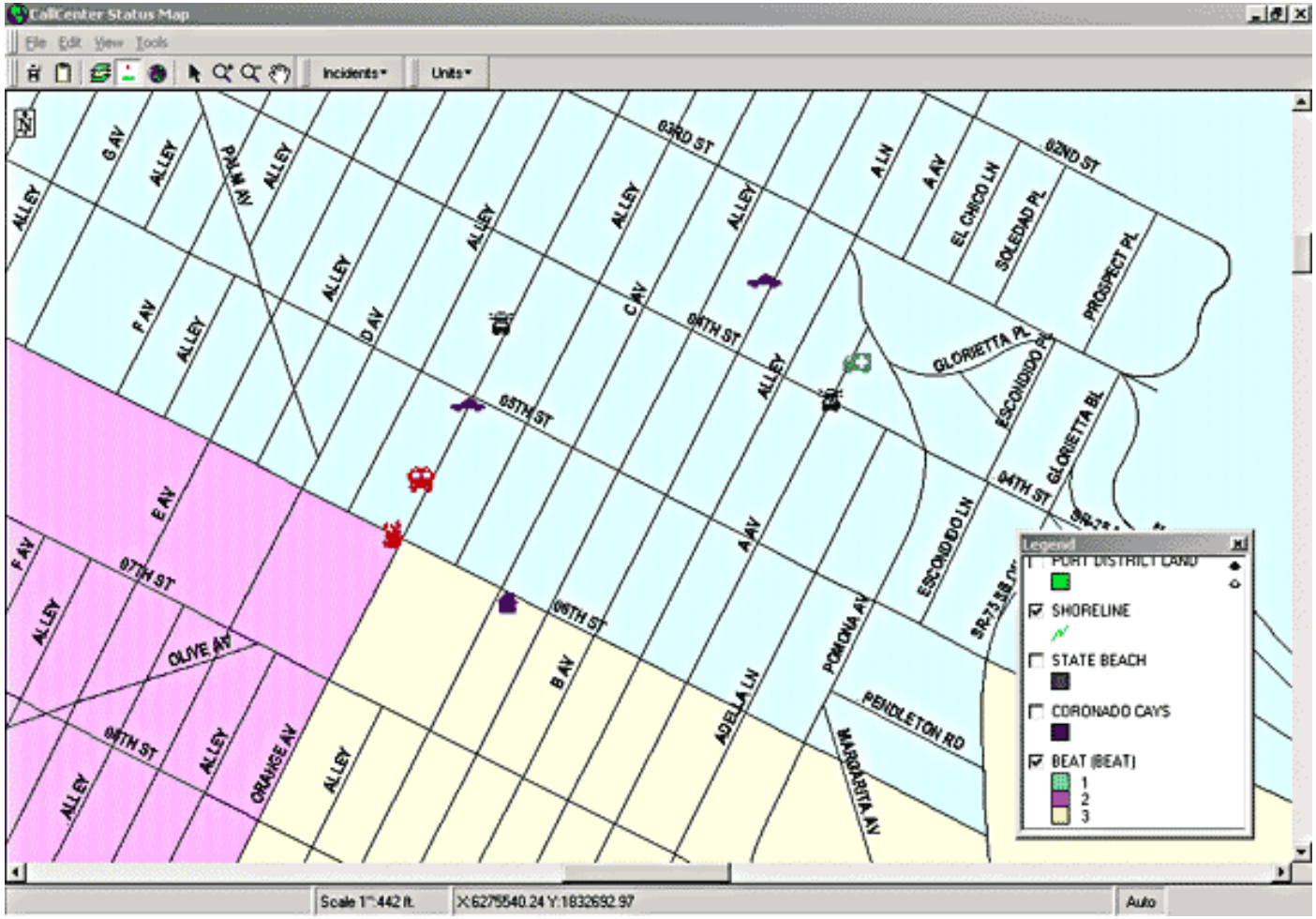
- Operate in real time providing locational (X Y) and attribute information on resources
  - i.e. GPS to locate vehicles and transmit locality back to control room
- Central control of resources through mapping location and availability status.
- Provision such real time spatial information is a relatively new technology

Time Critical Systems

Time Critical Systems



Time Critical Systems



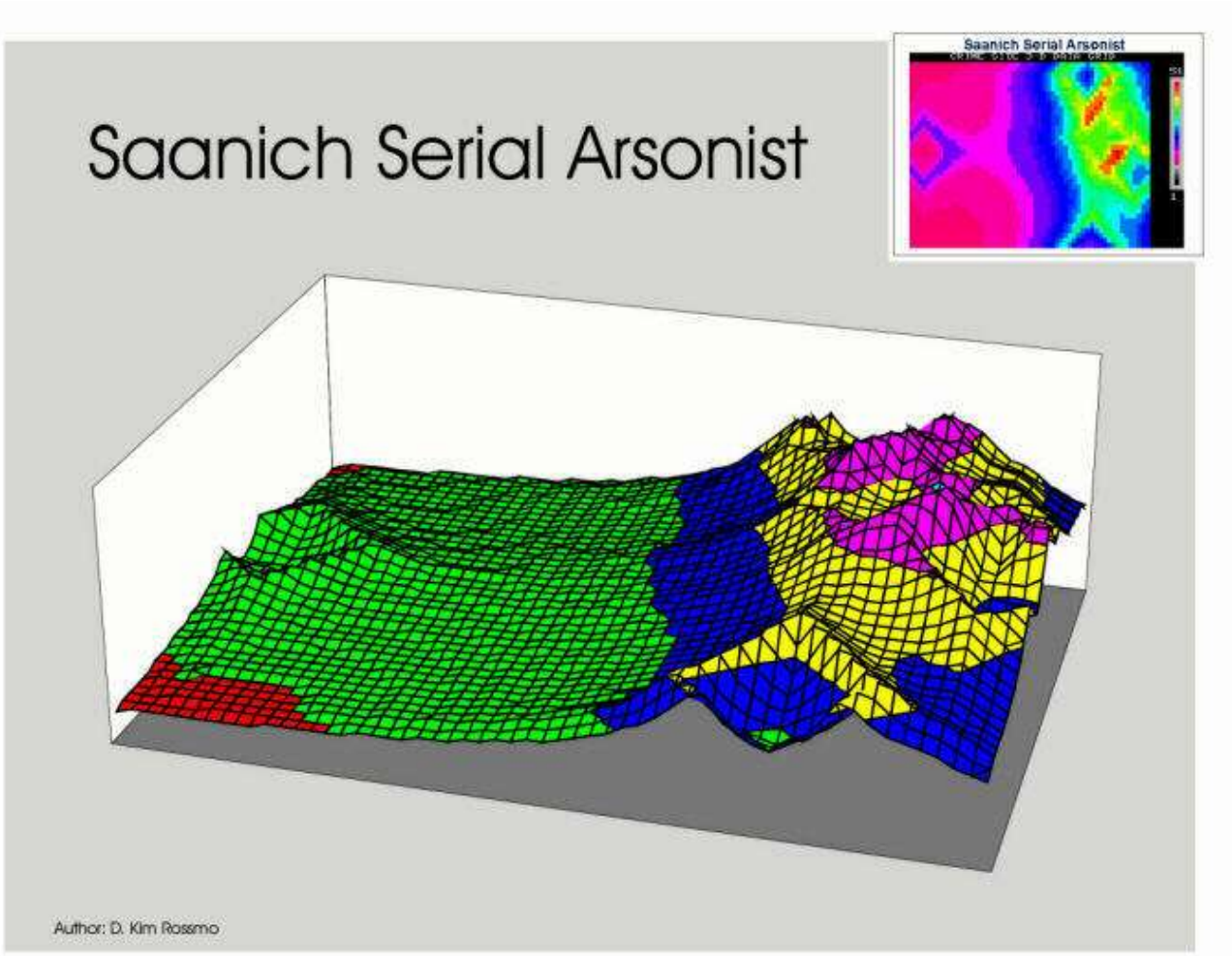
Time Critical Systems

Source: New Jersey State Police

The Future

- Geographic Profiling
- High Resolution GIS
- Visualisation techniques
- Forecasting the geo-temporal distributions
- GIS and GPS
- Multimedia incorporation
- Disparate data aggregation

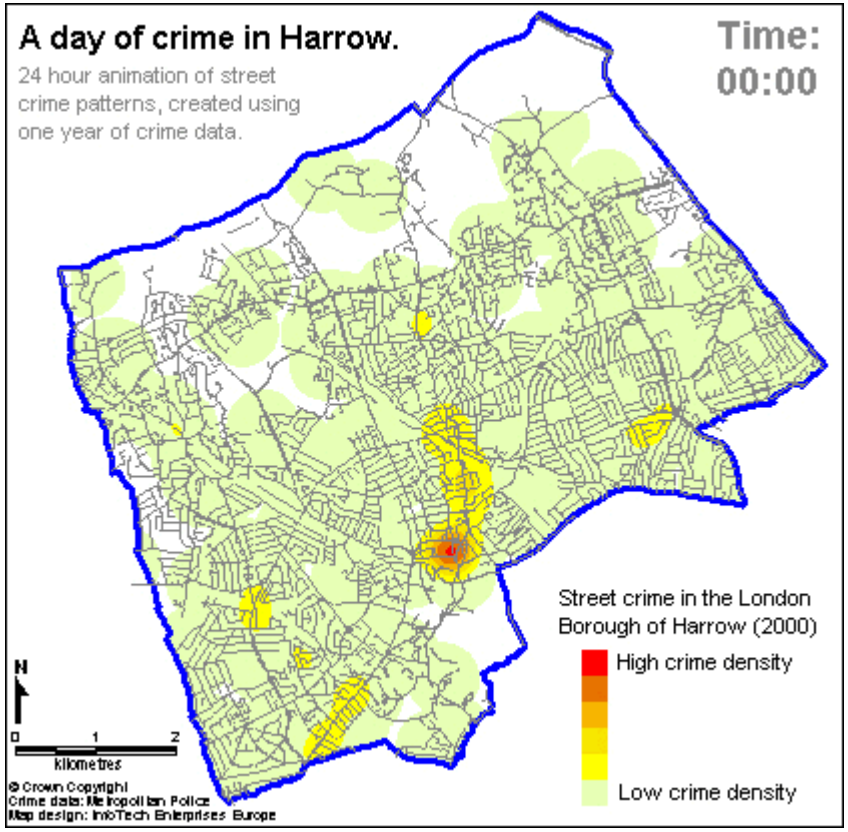
Geographic Profiling



High resolution GIS

Source: ESRI -developed for *CBS's* fictional police drama, *The District*

Visualisation through Animation



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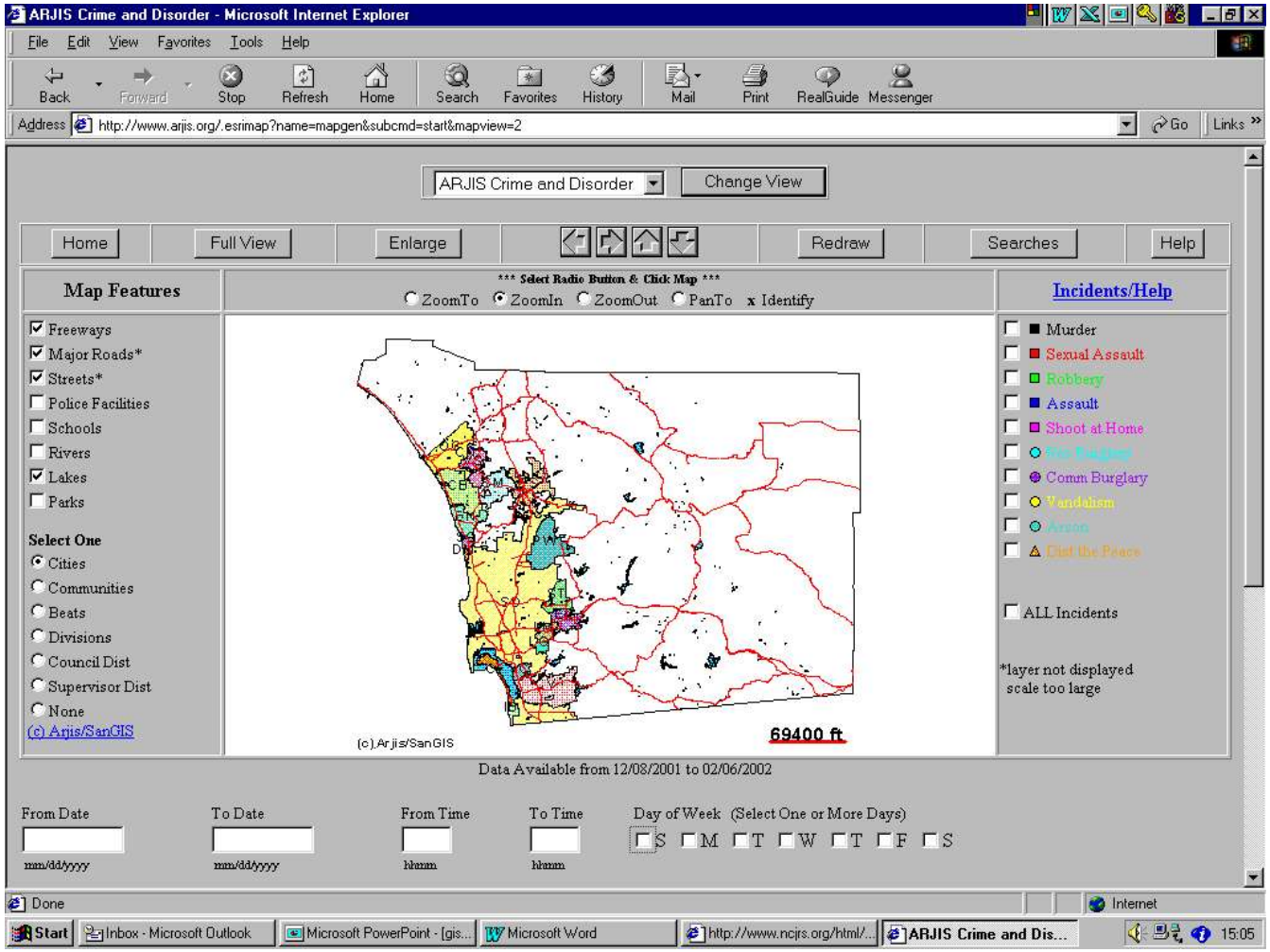
Source: Crime Reduction Toolkits - Home Office

Web mapping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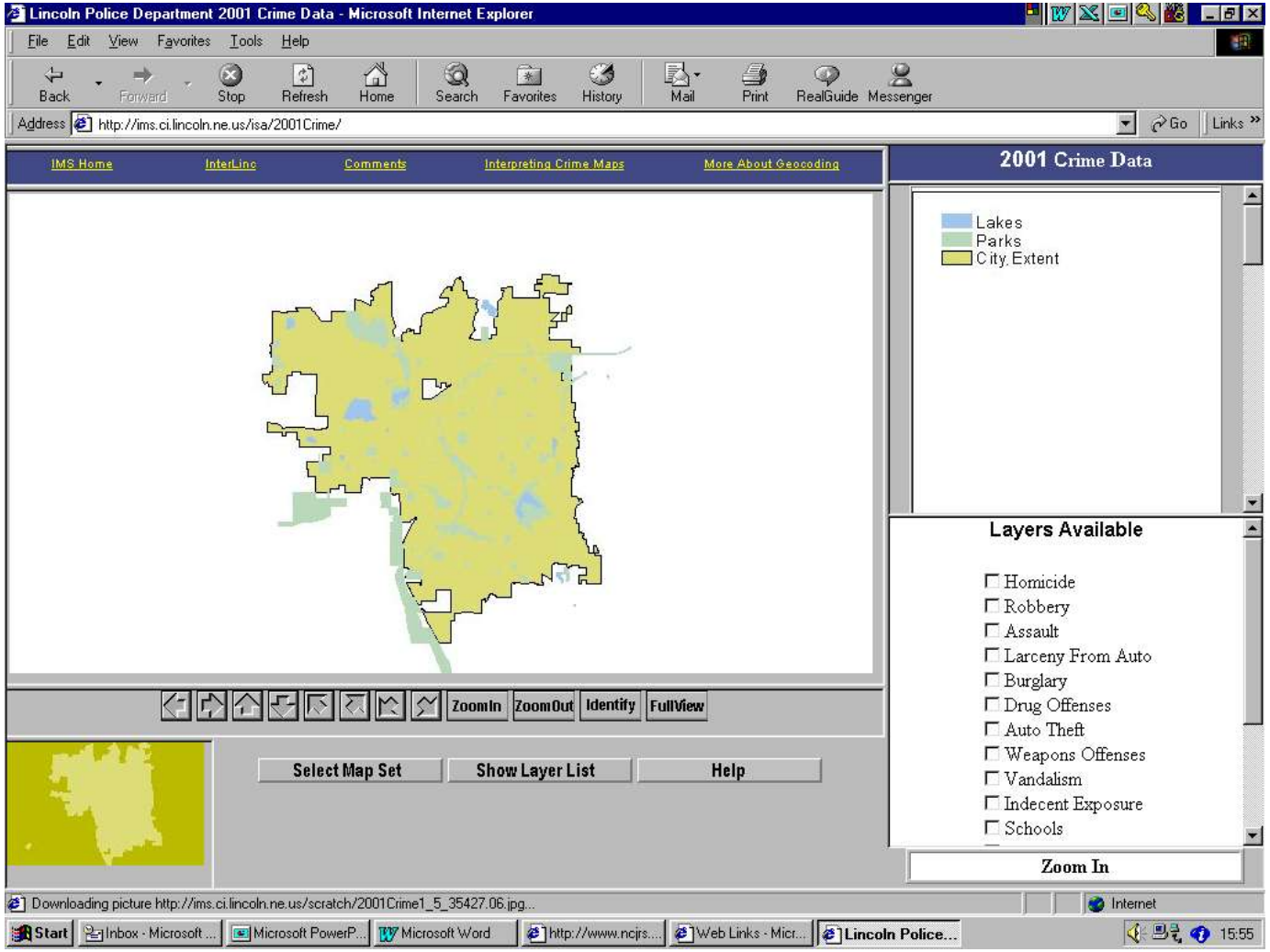
Web mapping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Larceny From Auto
Burglary
Drug Offenses
Auto Theft
Weapons Offenses
Vandalism
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Crime and Disorder Information Systems (CANDDIS)

- Developed by Geo-Bureau for Safer Neath Port Talbot Community Safety Partnership
- Domestic Violence
- Anti-Social Behaviour
- Monthly Crime Statistics
- CCTV Reporting
- Community Referrals

In summary...

- Crime as an application of GIS
- Mapping and GIS have an important role to play in both time and non-time critical police systems
- Growing number of techniques and applications