GIS Technologies for Public Safety

CHRIS HARVEY

Outline

Identifying Needs

- Analysis
- Optimization of Services
- Communication and Public Outreach
- Accreditation

GIS Solutions

- Desktop techniques
- Esri platforms to meet those needs
- Third party solutions

What can the GIS Department do to help?

Police/Sheriff's Department

Crime Analysis

- Pin mapping
- Density/Hot Spot analysis
- Trends

Optimization

- POP (Problem Oriented Policing) support
- Balancing work load/Redistricting
- Predictive Analysis

Communication and Public Outreach

Accreditation

Crime Analysis

Pin mapping – the process of representing incidents as points on a map

Applicable to any location-based data: Offenses, CFS, Arrests, Field Interviews, Sex Offenders, Accidents, etc.

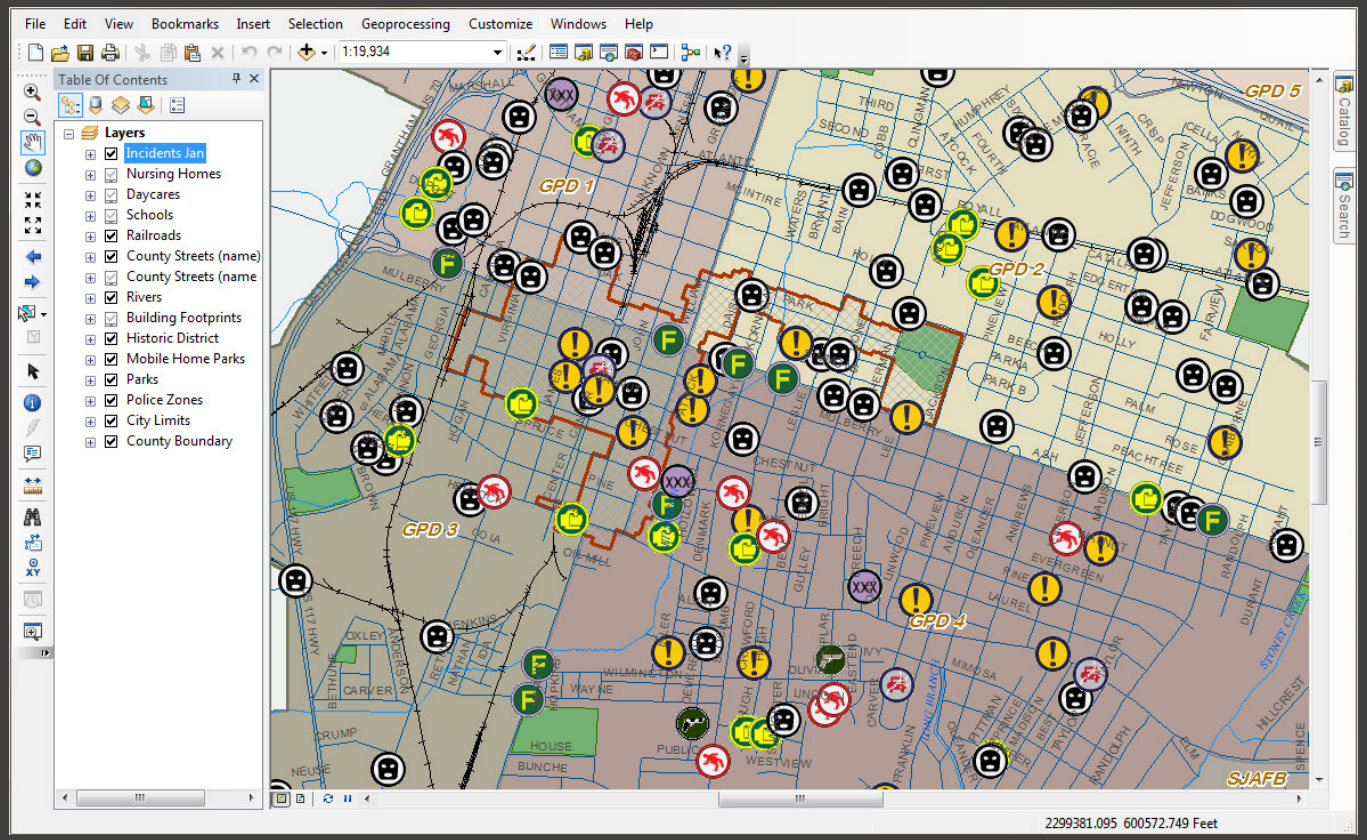
Easily achieved using ArcGIS Desktop

- Direct connect to source tables in RDBMS
- Export records from your RMS – e.g. Microsoft Excel, Access
- Add table to ArcMap
- Geocode or Display XY (if available)

Benefits

- Easier to visualize incident locations
- Serves as a starting point for further analysis
- Basis for disseminating maps and reports

Basic pin map with symbology based on incident type



Crime Analysis

Density/Hot Spot Analysis

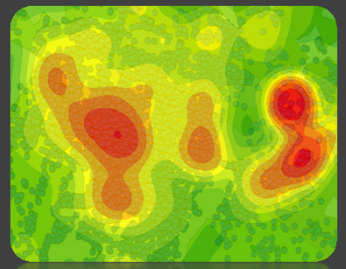
- Created using the Spatial Analyst extension for ArcGIS for Desktop
- Analyze any point layer (pin map) to determine concentration levels

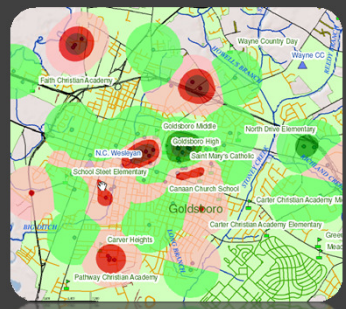
Trend Analysis

- Spatial Analyst extension
- Comparison between 2 layers of incidents of the same type but different timeframes
- Illustrates changes in concentration over time

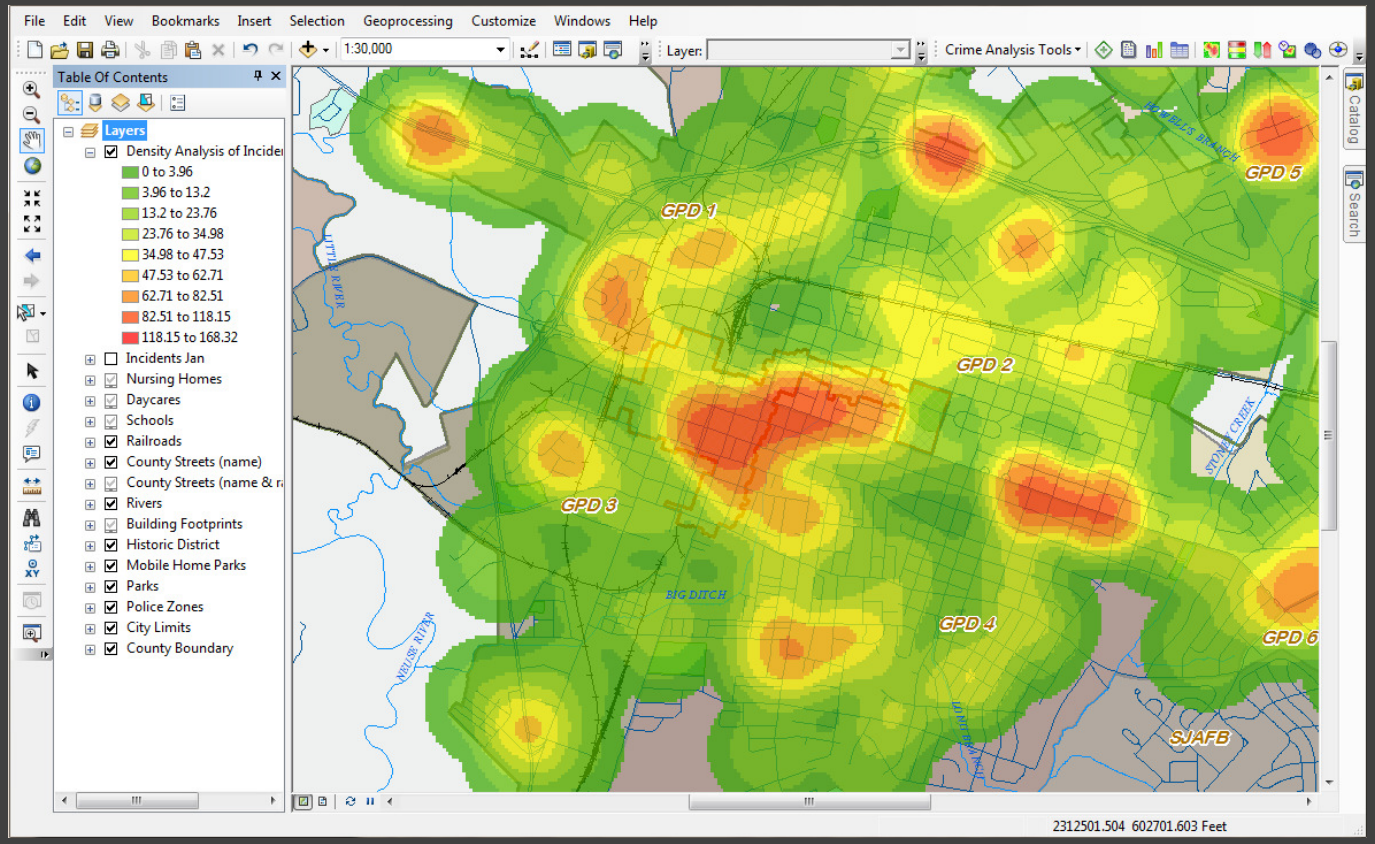
Benefits

- Highlights higher concentration areas
- Analyze the effects of particular crime reduction strategies





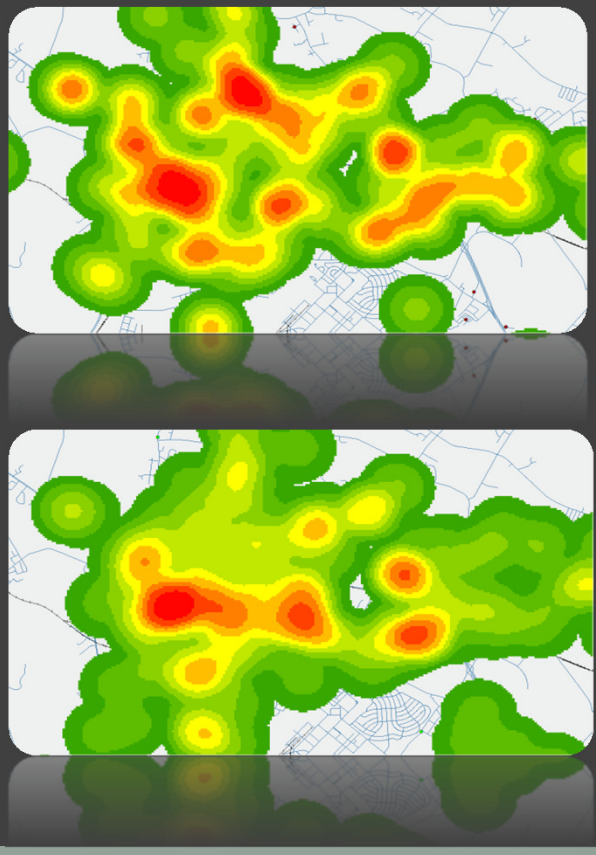
Sample density map of incidents



Trend analysis showing percent change over time

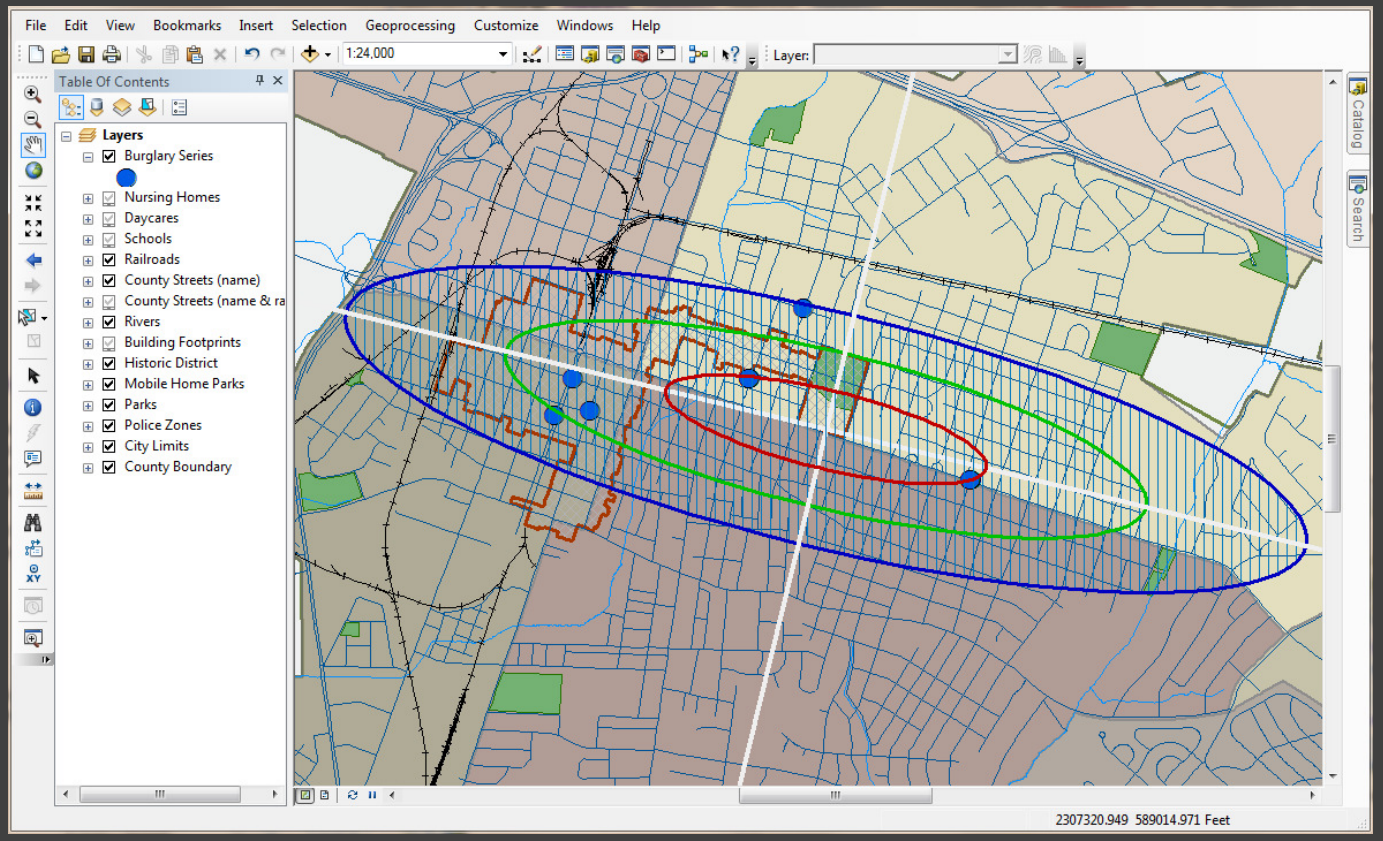
March

April



Trends can highlight emerging issues

Crime Series using Standard Deviations



Confidence Levels

1st Std Dev = 68%

2nd Std Dev = 95%

3rd Std Dev = 99%

Optimization of Services

Support for POP (Problem Oriented Policing) and

DDACTS (Data Driven Approach to Crime and Traffic Safety) initiatives

A problem is something that causes concern or harm to citizens, not just police. Addressing problems means more than just quick fixes, but rather dealing with conditions that create problems.

- COMSTAT or similar type programs
- Use GIS to help communicate problem areas
- Measure effectiveness of program initiatives and reduction goals

Redistricting/Balancing work loads

- Analyzing incident numbers, calls for service amongst patrol zones (polygons)
- Useful tool in supporting staffing level decisions

Communication and Public Outreach

Interdepartmental Communication

- Providing tools to allow patrol officers access to incident data
- Measure the progress of specific reduction goals in real-time

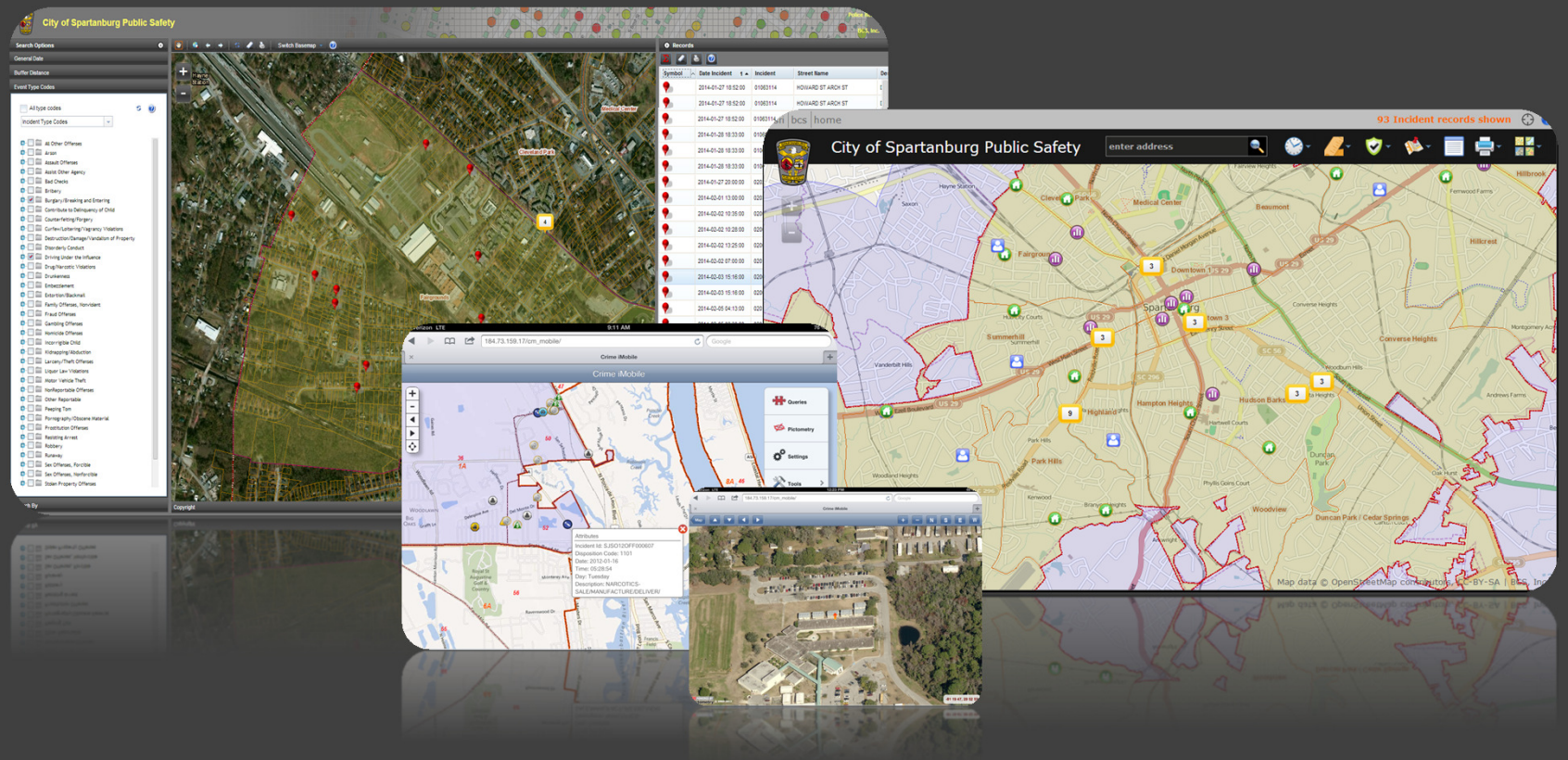
Web-based tools enable instant access

- Vendor provided online mapping (low functionality/lower cost)
- ArcGIS Online / Portal
- ArcGIS Server
  - Free local government templates provided by Esri
  - In-house applications
  - 3rd party solutions

Public Access Sites

- Provides incident information to the public
- Reduces information requests to the department
- Supports neighborhood watch programs

ArcGIS Server applications for displaying crime data



Accreditation

CALEA accreditation is focused on planning, analysis, and evaluation

Methods such as POP and DDACTS employ GIS as a primary analytical tool to meet accreditation goals

CALEA Standards

- Chpt 15 – requires crime analysis procedures, including identification of data sources, analysis and distribution of reports to operational leadership. The ultimate result is the use of analyses to deploy operational resources
- Chpt 16 – Selective traffic enforcement activities based on analyses of traffic crashes and the days, times, locations and types of violations that cause crashes. Goal being increased probability of long-term crash reductions
- Chpt 45 – Crime prevention programs should be targeted based on data and analysis. Additionally, liaison with communities, publicizing objectives and results, conveying information and developing community-based strategies

High Performance Policing

Predictive Policing

- Using data to predetermine areas of concern
  - Crime trends
  - Problem areas
  - Weather
- Requires a paradigm shift from historical patrolling methods
  - Beats and Patrol Zones
  - Directed Patrols: time-based positioning within each zone
  - Roving/Mobile task force

Impacting incident levels by being in the right place at the right time

Fire/EMS Departments

Analysis

- Pin mapping
- Density/Hot spot analysis
- Response times

Optimization

- Load balancing
- Station coverage and planning

CFAI Accreditation

High Performance Agencies

Desktop Analysis

Pin mapping

Location-based data: Incidents, Calls For Service (CFS)

Easily achieved using ArcGIS Desktop

- Direct connect to source tables in RDBMS
- Export records from your RMS/CAD – e.g. Microsoft Excel, Access
- Add table to ArcMap
- Geocode or Display XY (if available)

Benefits

- Easier to visualize incident locations
- Serves as a starting point for further analysis

Desktop Analysis

Response Times
- Symbolize CFS points based on differences in time stamps

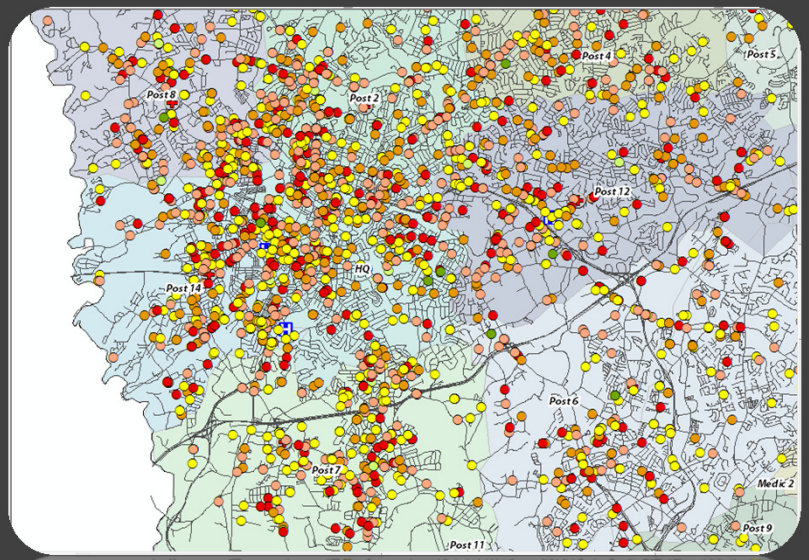
Density/Hot Spot analysis
- Created using the Spatial Analyst extension for ArcGIS for Desktop
- Analyze any point layer to determine concentration levels

Station Coverage
- Network Analyst extension
- Analyzes street network using connectivity and impedance data
- Determines theoretical range a unit at a given station can reach

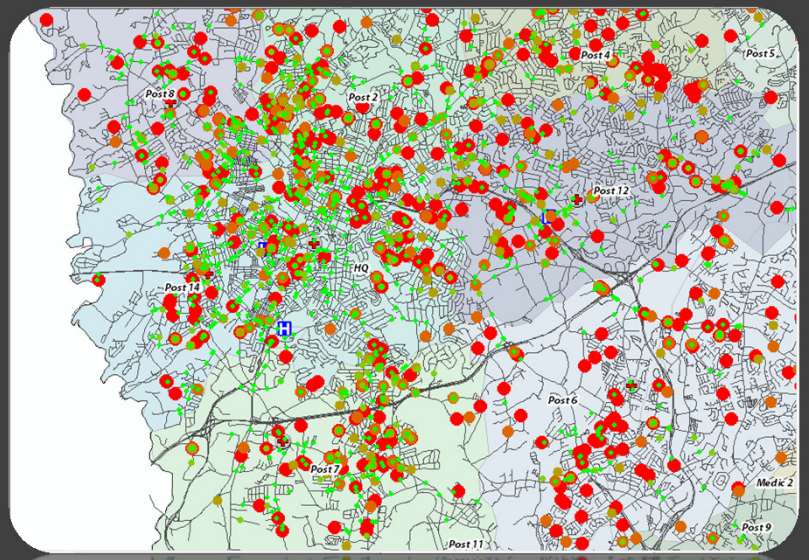
Benefits
- Determine problem areas/units with increased or out of compliance response times
- Highlights higher concentration areas
- Contributes to workload balancing/redistricting/station planning decisions

Symbolizing CFS by Response Time

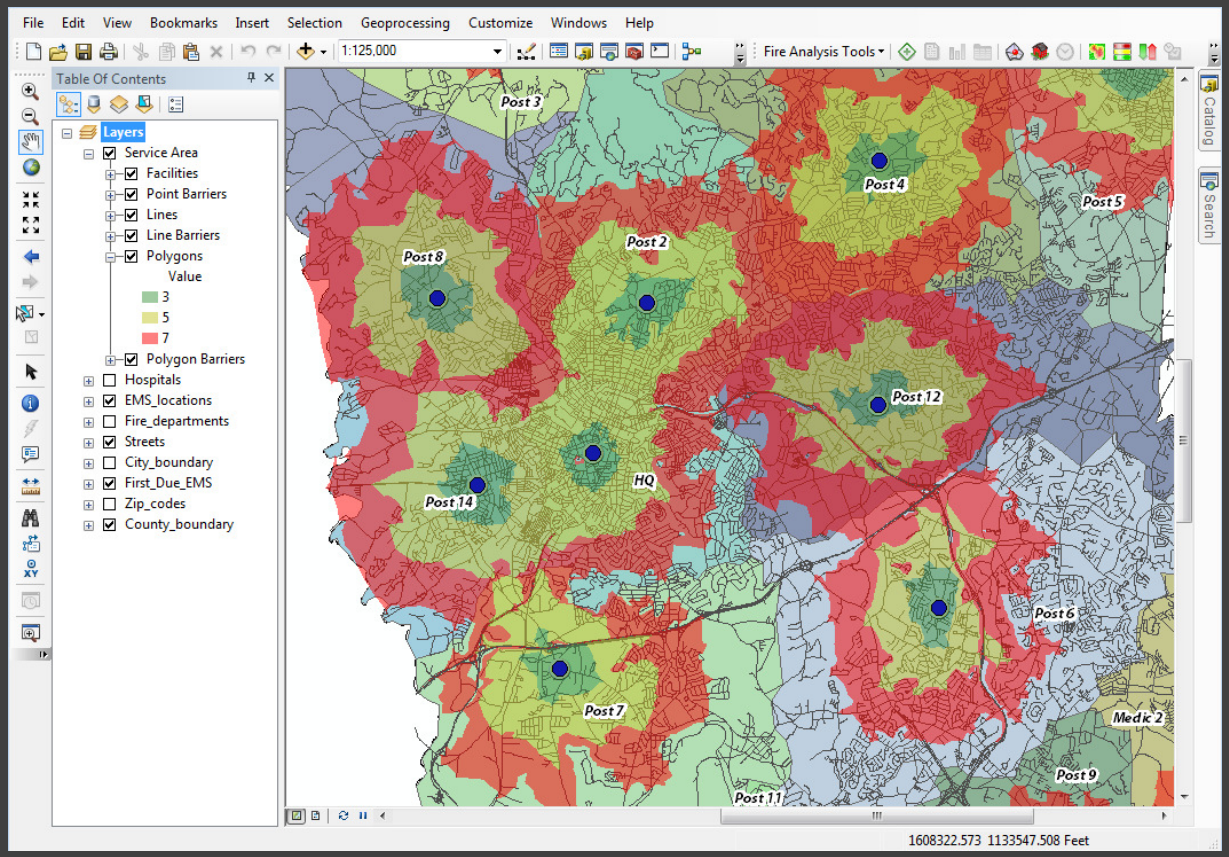
Standard pin map of CFS



Response times > 8 mins



Network Analysis showing Station Coverage



Optimization – Fire Service

Generally rely on static post locations/stations for staging

Determine staffing and posting levels based on:

- Types of vehicles/equipment at each station
- Drive time coverage of population densities
- Developed areas vs wilderness
- Economic criteria – property values

Move Ups – posting plan to fill voids in coverage when current units dispatched

Station Placement

When and where to add new stations?

Optimization - EMS

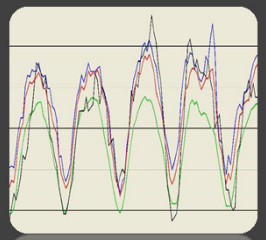
Building a SSM – System Status Management Plan

Involves the analysis of historical demand, posting locations and staffing levels to ensure compliance standards are met

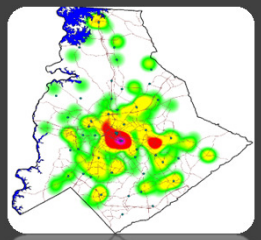
Simply stated, SSM is:

- The right resources
- The right place
- The right time

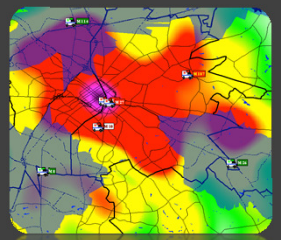
Expected call volume



Where do I need them?



What to do when they get busy?

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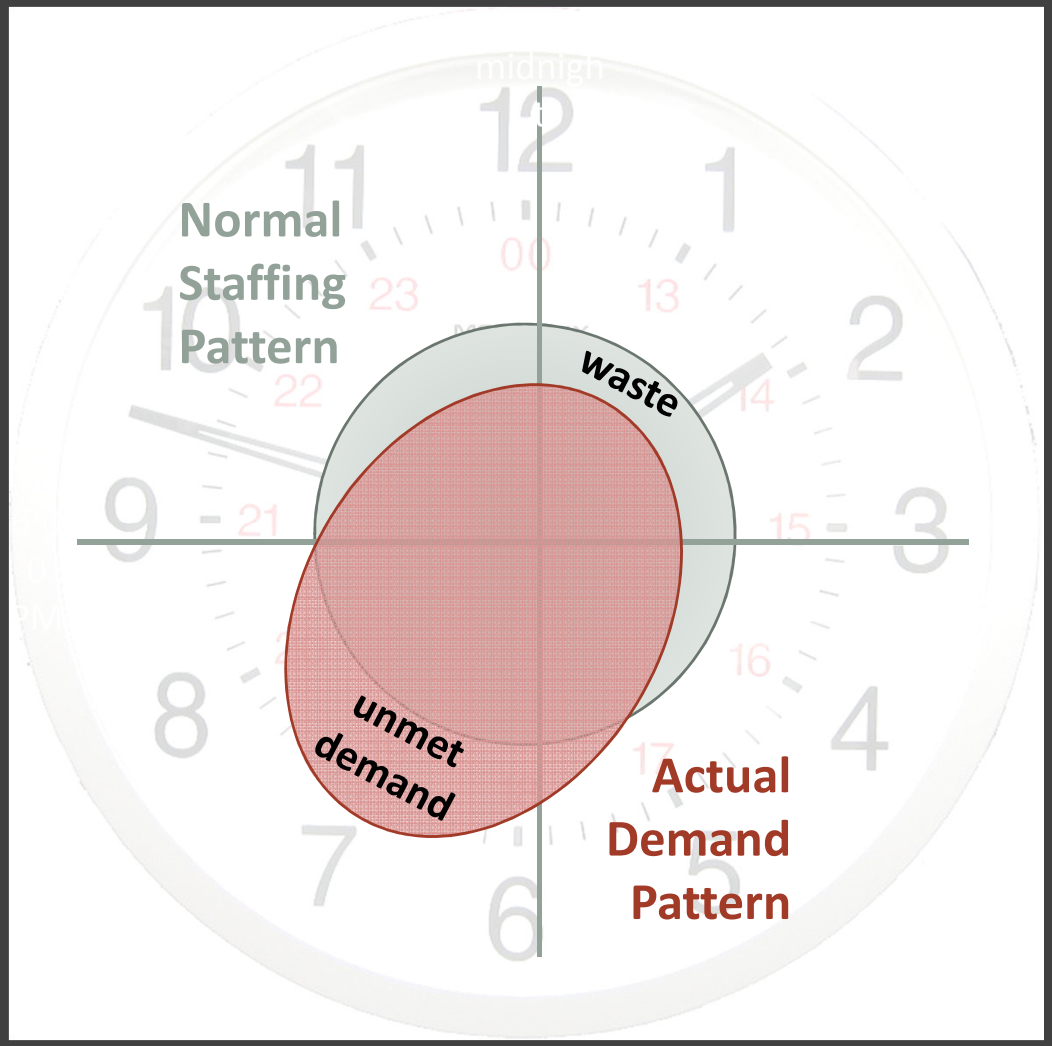
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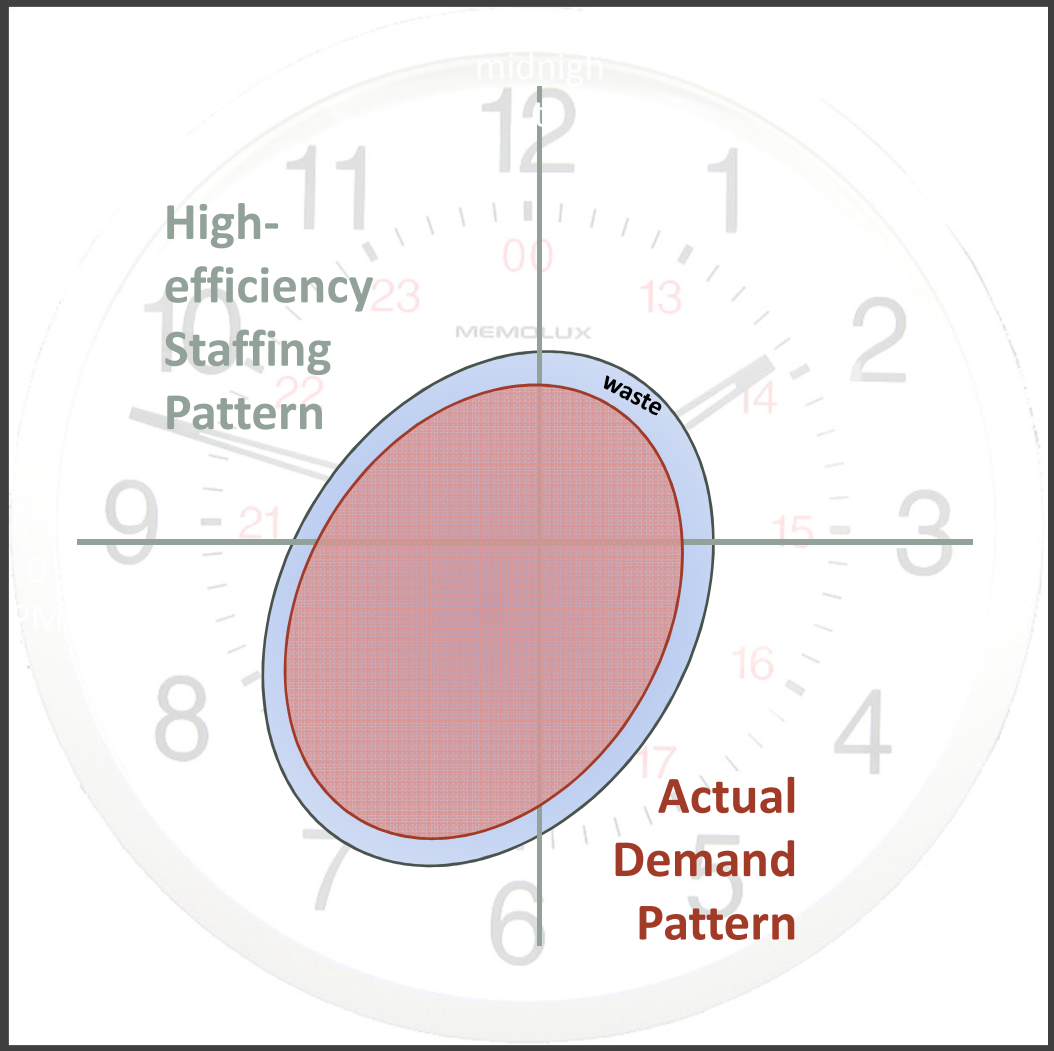
High-
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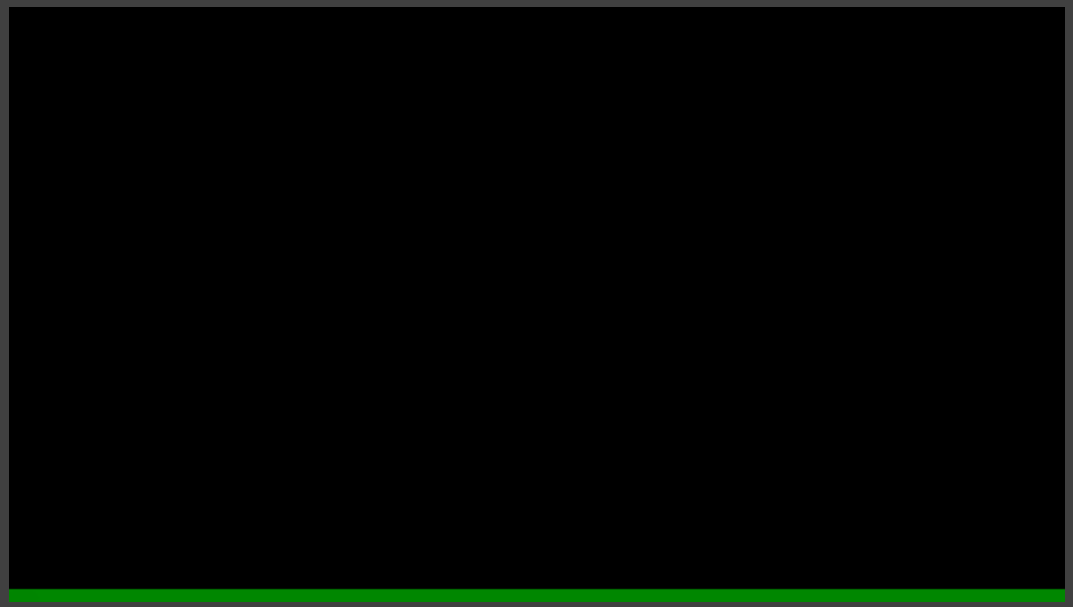
High Performance Agencies

Incorporate multiple technologies

- AVL
- Wireless communications: Cellular, Radio, WiFi
- In-vehicle routing
- Nearest vehicle dispatch
- Real-time analysis of historical demand
- Real-time active service areas for resources
- Timeframe-based impedance for better modeling traffic patterns
- Dynamic posting based on expected demand and coverage requirements

Jersey City Medical Center - EMS



Lexington County Case Study

Call volume increasing 6-7.5% annually

Estimated $3M expenses annually just to keep compliance

- For ambulance, crew, station and other equipment

Current AVL system was unreliable

GIS routing data quality was poor

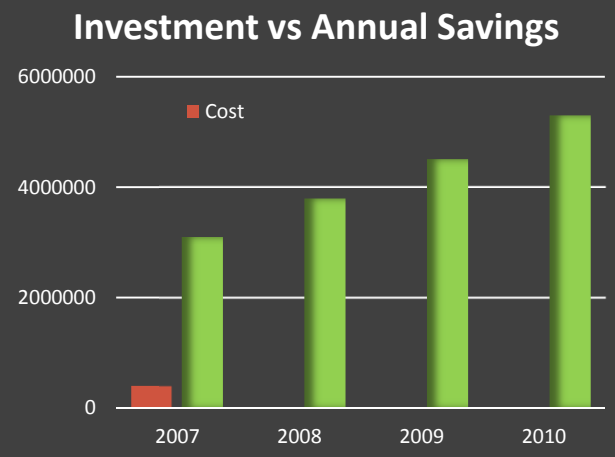
Lexington County ROI

EMS department was able to leverage and improve quality of existing GIS street data

Improved reliability and response times even without additional resources

Cost avoidance of $16M over 4 years

ROI of 3,900%



Options

DIY

- Achievable with standard GIS software
  - Desktop
  - Spatial Analyst and Network Analyst extension
  - ArcGIS for Server
  - ArcGIS Online
- Proper training and planning

Vendor Solutions

- Expedite or automate many tasks
- Generally easier to get running quicker

What Can You Do?

Ways to support your various Public Safety departments

- Establish a relationship – Be a resource!
  - Software licensing
  - Training
  - Support
- Provide accurate base map data
  - Zones, establishments, infrastructure, etc.
- Maintain accurate street and addressing data for geocoding and routing
  - Street Centerlines
    - Accurate ranges
    - Connectivity
    - Impedance
  - Address Points (if available)
    - No missing addresses

Be Patient!

Next Gen 911 Initiative – Be Prepared!

Communicate with your Public Safety Communications Officer for your county

Become aware of the coming federally mandated standards for E911 addressing

Thank you

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