

Crime Mapping News



A Quarterly Newsletter for Crime Mapping, GIS, Problem Analysis, and Policing

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Inside this Issue

Combating Campus Crime
with Mapping and Analysis 1

Contacting the Crime Mapping
Laboratory 5

Incident Mapping and Analysis
on the N.C. State University
Campus 6

 Crime Mapping
News Spotlight 8

Upcoming Conferences
and Training 10

Office of Community
Oriented Policing
Services (COPS)
on the Web 11

About the Police
Foundation 12

The topic of this issue of *Crime Mapping News* is how mapping and GIS can be applied in a university or college campus setting to examine and reduce crime problems. This issue begins with an article that discusses the use of mapping technology to combat crime problems at a relatively large university located in Philadelphia. The second article explains how the police department of the largest university in North Carolina has utilized their campus resources along with mapping and GIS technology in order to gain better insight and perform better analyses on their crime problems. The third article is part of a new series of this newsletter called the *Crime Mapping News Spotlight* where we highlight a particular program, crime analysis unit, or special event involving GIS, crime mapping and/or crime analysis and provide a brief snapshot of the key components, ideas, or strategies.

Combating Campus Crime with Mapping and Analysis

by George F. Rengert, PhD, Professor of Criminal Justice, Temple University and Robert Lowell, Captain, Temple University Police Department

Yale University established the first campus police force in 1894, when it hired two retired New Haven officers to quell the town-gown violence that had been raging for several years (Nichols 1987). Since then, most large colleges and universities have followed Yale's example by organizing their own police agencies. Nowadays, sophisticated police agencies that are almost as large as those of small cities patrol many campuses. Among them is Philadelphia's Temple University, which has the fifteenth largest police department in Pennsylvania, a state with over 1,000 police agencies.

One reason why Temple University, like other schools, organized its own agency was to provide officers with training in proactive policing. The traditional role of police has been to fight crime by waiting for an incident to occur and then resolving it (Bayley 1994). The mission of campus police, however, is to stop crime before it occurs (Rengert, Mattson, and Henderson 2001). Campuses are anxious to nip serious crime in the bud because the negative press arising from an incident may discourage future applicants to the school. While campus police sometimes do solve crimes, schools depend on them to prevent serious incidents and make campuses safe and attractive to potential students.

Once a crime has occurred on a college campus, it may be too late to repair the damage to the school's reputation. Therefore, campus police at Temple University and other schools rely heavily on problem-oriented policing and situational crime control. These strategies fit the bill at campuses because their goal is to identify potential problems and resolve them before they lead to actual crimes.

To view the *Crime Mapping News* in full color, visit the Police Foundation or COPS Office Web sites at www.policefoundation.org or www.cops.usdoj.gov.

Police at Temple University used this problem-solving approach to deal with a potential danger to students who commute to Temple University by rail. Amtrak's commuter rail network maintains the station about two blocks from campus, which is certainly convenient for students. The short stroll home nonetheless presented potential threats, as Temple police recognized. The problem, as the campus police understood, was that the trip to campus required students and university staff to exit the train, descend a series of steps into a secluded area under the tracks, and then proceed along a walkway that passed by a public housing project. The campus police were also aware that random patrol was unlikely to solve the problem. With no patrol officer in sight, an incident of harassment or even a mugging could easily take place in the space of a few seconds.



Figure 1. Train Station Security Kiosk

Kiosks and Public Safety

Concerned for the safety of its students and staff, the university decided to establish a permanent police presence at the Temple University train station. Since the university wanted to deter crime, it constructed a highly visible kiosk and manned it during most hours of the day (see Figure 1). A few years later, it also built a second kiosk on the campus side of the walkway that led from the station. These solicitous efforts notwithstanding, it remained unclear whether the kiosks were actually deterring crime or simply displacing it to the middle of the walkway, in a place that was less amenable to observation.

Not content with this uncertainty, crime analysts at Temple decided to use a geographic information system (GIS) to evaluate the impact of the kiosks. They found similar results for both structures, and realized that both deterred crime. We will only

discuss their evaluation of the train station kiosk, however, since it draws on more years of data.

To begin their analysis, the distance between the train station and the campus was divided in half. Next, a buffer was drawn around each kiosk using this distance as a radius. Then they divided each buffer again so that they created four buffers that were all of equal size (see Figure 2). With this framework in hand, the university police were able to determine whether the kiosk at the train station actually reduced crime.

Their findings showed that the university had indeed provided a safer environment for students and staff within the two buffers around the train station kiosk. There was an average of eleven crimes per year in the area during the five years before the construction of the kiosk. Afterward, there were a mere 2.6 crimes each year, a strong indication that the kiosk had reduced crime in and near the train station.

Further examination of the figures also revealed that the kiosk did not displace crime from the inner circle near the kiosk to the outer circle further away. The outer circle had an average of .6 crimes per year both before and after the construction of the kiosk. The inner circle, meanwhile, had an annual average of 10.4 crimes before the kiosk was built and only two thereafter. The construction of the kiosk therefore led to an 80 percent decrease in the significant crime problem near the station without displacing it to the surrounding vicinity.

Barriers to Criminal Spatial Movement

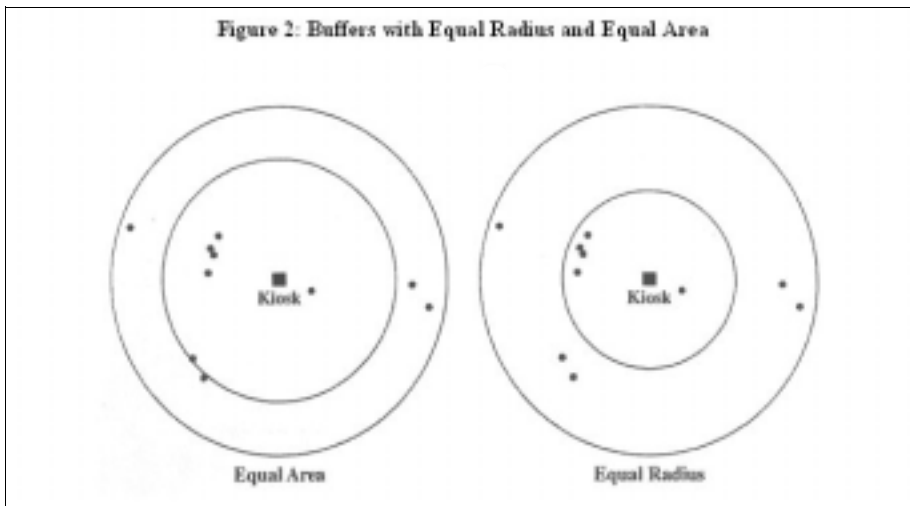
Besides building kiosks, campuses can reduce crime by erecting barriers between themselves and the surrounding community. The word barrier usually evokes physical structures, such as walls and fences, but this is not necessarily what campuses have in mind. Most public universities want to remain open to the neighboring community and make the public feel welcome. As a result, they eschew physical barriers in favor of symbolic barriers that convey a psychological message to visitors: all who enter must behave in a manner appropriate to the place.

Houses of worship have long followed this strategy by using visual symbols to encourage decorum. In fact, many churches welcome visitors when services are not taking place, but they expect people to behave as though they are indeed entering a house of God. The visual messages that churches use to enforce this behavior are usually effective since most people remain silent or speak softly when they enter a church.

Like churches, many universities construct symbolic barriers that permit access while restricting behavior. The most evident of them is immaculate

landscaping and strict enforcement of litter control. Another is that used by Temple University, which has surrounded the campus with banners that hang from utility poles and display the university's logo. These banners send a message to visitors that they are entering a separate space from that of the surrounding community.

It is possible to evaluate the effectiveness of symbolic barriers, such as these, by using the buffering feature of GIS. To do so, crime analysts at Temple University construct two or three buffers of equal size—each one as wide as a city block—on each side of the barrier, and they document the number of crimes that occur in each buffered space. Then, they create a graph that shows these crimes on the Y axis and portrays their distance from the barrier on the X axis. They draw a straight line that minimizes the variance among the points on the graph, and they make adjustments to retain its original slope. To do so, they raise or lower this line on the campus side of the barrier, so it best fits only the data on this side of the barrier. Similarly, they adjust the line on the community side of the barrier, so it best fits the data on this opposing side of the barrier. If the barrier



is actually effective, the two lines will intersect at different points. The distance separating them on the Y axis is a measure of the barrier's success in deterring crime on campus grounds (see Figure 3).

Analysis of Crimes Within Buildings

Additional analysis is necessary to evaluate the full gamut of strategies used to deter crime on campuses. This is because campus police, unlike municipal police, are responsible for preventing crime within buildings, as well as on the street. They may find themselves assigned to college dormitories, gymnasiums, or sports arenas to ensure safety for participants at social occasions or sports events. When this occurs, campus police must use problem-oriented policing to identify potential problems and establish situational crime control.

Again, Temple police manage this by using GIS and mapping the physical features of the building using analogies to macro-scale GIS. For example, they consider elevators and stairs to be limited access highways that one can enter or exit only at specific locations. They consider hallways to

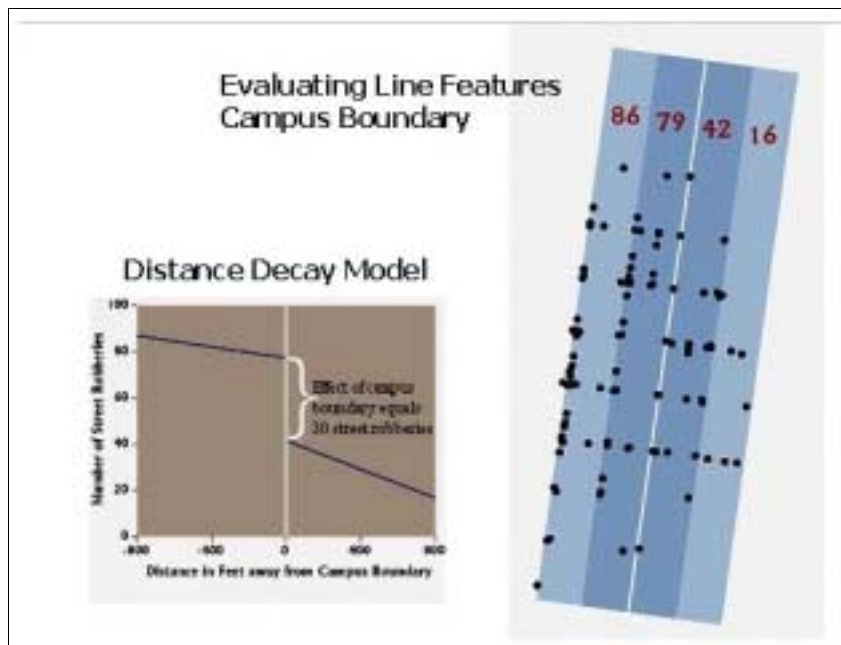


Figure 3. Measuring the Effect of a Barrier

Note from the editors: The opinions expressed in the articles of this newsletter are those of the authors and do not necessarily reflect the views of the Police Foundation or the COPS Office. In addition, only light editing has been done in order to keep each author's voice and tone.

be highways with many entry and exit points, and they look on offices as addresses, just like buildings in macro GIS. Finally, a building's different floors are akin to different communities in the larger jurisdiction of the entire building. By using this framework, crime analysts at Temple University can map the interior of buildings and identify hot spots.

Analysts, for example can divide the X and Y axes of a building into a number of equal parts and depict the number of floors in the building on the Z axis. Then they can identify and graph the number of crimes occurring within each of these slices of the building. The hot spot of crime within the building will be the place where the maximum number of crimes occurs on each of the three axes. Analysts can precisely determine this location by measuring the number of feet along the X axis that contains the slice of the building with the most crime and then taking the same measurement along the Y axis. Where the two lines cross is the hot spot on the horizontal axis (see Figure 4), and the exact floors where these hot spots are burning will lie on the Z axis.

Hot spots may not occur on a single floor, as Temple police have learned. For example, use of GIS helped university police determine that the reception area, or "fishbowl," on most floors was a crime hot spot that was most active when the building was nearly empty. Their solution was to install window blinds that could be lowered in the evening, so that a person passing the reception area could not see the equipment it contained or determine whether the room was



Figure 4. Overlay of Floors in Gladfelter Hall/The Hot Spot of Crime Identified Within a Building

occupied. By thus using GIS to determine a hot spot and employing a situational crime-control technique to extinguish it, Temple police were able to make a dent in crime within campus buildings.

Crime on Campus Grounds

GIS has also helped Temple police to determine the location, as well as the time, of crime occurring outside buildings. We have so far focused on location, but it is also very important to pay attention to the chronological aspects of an incident. This means paying attention to the time of day, since a patio area outside a residence hall, for example, may be the scene of many incidents in the evening while remaining serene during the morning. It also means paying attention to the day, month, or year, as Temple Police did when they determined that most campus crime occurred on a single day of the year—that of Spring Fling.

Analysis revealed to university police that many people used this occasion to literally fling off their inhibitions about breaking the law, and they brought this finding to the attention of campus authorities. University administrators consequently began to tone down this ebullient, yearly celebration. The university had formerly advertised Spring Fling in the local media, allowed liquor companies to advertise the availability of beer, and booked nationally recognized entertainment. Now it confined its publicity campaign to the campus community, banned advertisements for beer, and booked local entertainment. The festivities consequently became more subdued and attracted fewer outsiders. Fortunately, most students felt that Spring Fling was just as much fun without additional visitors from the region milling about and creating more problems for campus security.

Security on Campus

Temple police played a significant role in making Spring Fling a safer event, and they have used a variety of techniques to deal with other crime problems on campus. As a result, Temple University, like many other college campuses, is actually a very safe place. In fact, college campuses are generally safer than most communities, and students, rather than outsiders, usually perpetuate the relatively small number of crimes that do take place (Fisher and Sloan 1995). In other words, if you wish to keep your child safe, you should just get them out your hair and pack them off to college, where they are less likely to come to harm than they are at home. Clearly the growing use of GIS and crime analysis on college and university campuses is contributing to increased safety and better responses.

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Incident Mapping and Analysis on the North Carolina State University Campus

by Lt. Col. John Dailey, Sgt. Jon Barnwell, and Sgt. Ed Farmer
North Carolina State University Police Department

Our Vision

The North Carolina State University Police Department (NCSUPD) is introducing incident mapping to make information accessible to officers so they can conduct more problem solving. We are designing our system so that patrol plans can be more officer-driven versus middle management-driven. When patrol officers return to work after normal days off, they will be able to print a map of their assigned area and see specifically where incidents have occurred to help them determine the next appropriate action. Officers will also be able to map calls-for-service and conduct further analysis to determine specific causes for similar and/or repeat calls. Finally, we want officers to be able to run a query when they do problem solving so they can see what kind of effect their response has on a particular problem.

With 55 officers, the NCSUPD patrols the largest university in North Carolina with a community of approximately 35,000 students, staff, and visitors. Crime rates are generally low compared with other communities of our size and scope, and we are fortunate to be experiencing a downward trend in our overall crime. To better predict where incidents are going to occur, however, requires precise and accessible information on both criminal and non-criminal incidents and has driven us to conduct crime analysis using GIS mapping.

The Beginning

Prior to 2003, the extent of crime mapping at the NCSUPD consisted mainly of generating simple pin maps. When the department's patrol lieutenants and chief investigator enrolled in a crime-analysis course offered by the university, they learned to look beyond the incident and understand how analysis could help the department reduce crime, decrease calls-for-service, and solve community problems. These department supervisors started to look at crime problems proactively, using analysis to provide their officers with more comprehensive information, such as the number of similar incidents, dates, times, victims, locations, and offenders. They also acquired specific information on campus lighting, landscaping, and

building design that would aid university police in their crime prevention efforts and be helpful to victims.

Information for NIBRS Versus Information for Problem Solving

In the spring of 2004, the department became a research site for Enhancing Community Policing: Institutionalizing Problem Analysis, a grant that provided expert technical assistance and funding to assist us with problem solving. Working with these experts, we discovered early on that our incident and crime data—calls for service, citations, motor vehicle accidents, general police information, and criminal reports—were not conducive to in-depth analysis. Like most departments, we collect data electronically but data formats were designed for reporting to NIBRS, not for crime analysis. In addition, the few people in our department who had the expertise to link our databases and run meaningful queries also had other duties; thus, it was often difficult to get the information in a timely fashion or in a format that was user-friendly. We also had a problem with our old data collection methods because they did not provide enough accuracy, such as exact location, about incidents. There are, for example, 16,000 parking spaces on campus but they are identified only by the parking lot address. In order to know exactly where a car break-in occurred in a parking lot, officers needed to collect better information that would enable them to analyze environmental factors. To accomplish this, we upgraded our software capabilities.

Information and Access

We looked for a user-friendly, computer program that would be compatible with our current databases and decided the Crime View 2000 software program would fit our needs. The Huntersville (NC) Police Department was currently using Crime View and gave us a demonstration allowing us to observe first-hand the program's capabilities and compatibility with our needs.

The software would enable officers, supervisors, and administrators to access our criminal and incident data and assist them in compiling reports and gathering information that could be used proactively. It also gave patrol officers the ability to query data and produce a visual display of all the activities in their districts, such as crimes reported, motor vehicle stops, field interviews, and calls-for-service.

Partnerships

While cleaning up our data for better information, including an accurate geocoding service, and to facilitate implementation of the Crime View program, we discovered that much of the information we needed already existed in other campus departments. The College of Natural Resources, for example, provided us with street centerlines, building foot plans, digital orthophotos, playing fields, and water features. The Department of Transportation provided parking lot data, emergency callbox locations, bus stops, and streetlights. Facilities Operations provided building floor plans and correct addresses. Obtaining the data from these departments and making it available to patrol officers will assist them in problem-oriented policing by providing precise information. Being able to show exactly where crime occurs in large open areas will lead to information-driven solutions. Making recommendations to other departments based on information instead of hunches will be critical as they budget for crime prevention.

We also found that several university departments had some type of GIS or GPS information we could use so we set up a meeting with these different departments to review what information we were capable of sharing. As a result of this project, we were able to establish a university GIS users group, which enabled us to more precisely locate and map street addresses, trees and shrubs, future construction sites, sewers, electric services, water lines, and tunnels under the university. Both academic and support departments come together monthly to develop guidelines and protocols for data collection. The project has the support of the campus community and the university's chancellor. It has expanded to include several other campuses within the University of North Carolina system that use GIS. Finally, our partnerships with other departments have resulted in the discovery of several software site licenses that already existed on campus, reducing our implementation costs.

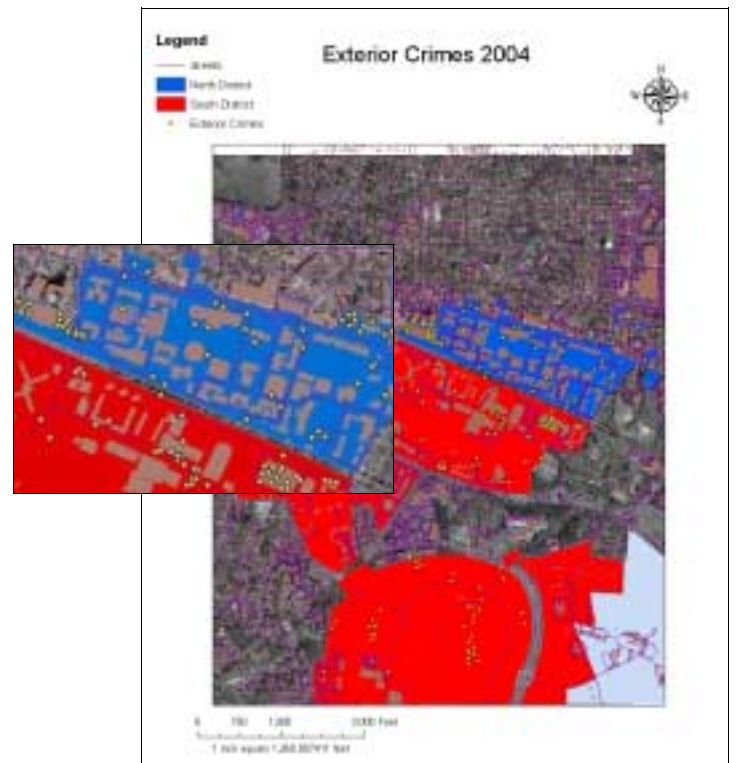
Next Steps

We were initially recording the location of incidents by building name, followed by a specific description of a more exact location. Changes in building names and occupants required us to make duplicate searches to accurately record all incidents occurring at a location. The rapid growth of the university and the implementation of mapping made us recognize the need for static locations. We now use

Paper Map Before Partnership w/Campus Departments

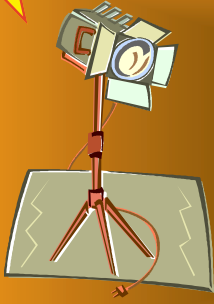


Computerized Maps Using GIS After Partnerships



street names and addresses for locations and add symbols to the location field that marry up to the mapping system to produce exact locations. This allows accurate mapping to pinpoint problem areas to address. Report data entry now provides more useful information. Police officers have been assigned to geographic areas, and graduate students have loaded
(Continued on page 9)

NEW



CRIME MAPPING NEWS SPOTLIGHT: St. Cloud State University

This newsletter spotlight focuses on St. Cloud State University's course on Spatio-Temporal Crime Analysis, developed and taught by D. Lee Gilbertson, PhD. *Spatio-Temporal Crime Analysis* is offered as a 400-level course in the School of Sociology's Department of Criminal Justice. While some students may use this course as a foundation for a career in crime analysis, others are learning exactly what crime analysis is and its importance in the daily operations of law enforcement agencies. Students gain an understanding of crime analysis principles using three separate textbooks and develop the practical crime-analysis skills from hands-on projects in the university's state-of-the-art Spatial Analysis Research Center (SARC). Located in the geography department, the SARC offers a complete package of geographic information system hardware and software and employs nine students who work on projects for the Minnesota Department of Transportation and the Minnesota Department of Military Affairs.

For the Spring 2005 semester, Professor Gilbertson had a full class of twenty-five undergraduate and five graduate students. One graduate student worked with the St. Cloud Police Department to obtain real-world data from 2000 to 2004 on motor vehicle theft, burglary, robbery, and public disorder. Undergraduate students worked in groups of five on these data, while the graduate students used data from the Becker Police Department to conduct in-depth crime analysis. Finally, the students produced maps depicting the distribution of crime relative to space and time, tables of offender and victim characteristics, and other analyses, mainly using ESRI's ArcView 3.3.

Bridging the Gap Between Academia and Law Enforcement

On the day when the students presented their final analyses, Professor Gilbertson invited the chiefs and their staffs from the St. Cloud and Becker Police Departments. They asked questions that the students answered based on the gathered data and analyses. Following the presentations, both the chiefs and their crime analysis personnel asked for copies of the findings, and the Becker Police Department chief plans to present the graduate students' work to the city council as part of his request for another full-time officer position.

Carolyn Ruth Williams, PhD, Associate Dean of the College of Social Sciences, was a big supporter in both the development and implementation of the course. Recognizing the need for spatio-temporal crime analysis, she and Professor Gilbertson



Fall 2004 Spatio-Temporal Crime Analysis Class Picture

developed a curriculum to be taught by Professor Gilbertson drawing on his vast experience with both civilian and military crime and intelligence analysis and his interest in the use of spatial analysis for criminal justice applications. First offered in the fall of 2004 as *Crime Analysis*, the course will be offered again in the fall of 2005 and is already full. In the future, Professor Gilbertson would like to introduce a course entitled Homeland Security & GIS that will use many of the concepts associated with intelligence analysis.

As crime analysis and intelligence analysis continue to gain acceptance as a critical part of police

operations, the need for more educated and skilled recruits will continue to grow. *Spatio-Temporal Crime Analysis* and courses like it are helping to prepare the next generation of crime analysts and law enforcement professionals by combining criminal justice education with practical hands-on training.

For specific questions about this course, you can email Professor Gilbertson at dlgilbertson@stcloudstate.edu. For questions about other St. Cloud State University course offerings or programs, please see <http://www.stcloudstate.edu/>.

CRIME MAPPING NEWS CALL FOR AUTHORS

UPCOMING TOPICS INCLUDE:

- Crime Mapping in Smaller Agencies
 - Mapping for Major Events
- Crime Mapping in Public Transportation
 - Crime Mapping in State Agencies
 - Mapping in Courts and Corrections
 - Multi-Jurisdictional Mapping Efforts
- Mapping Intelligence Data for Homeland Security

Please contact Joe Ryan at jryan@policefoundation.org

or

Greg Jones at gjones@policefoundation.org

(Continued from page 7)

PDA's with floor plans so that officers can map exact locations in both internal and external open areas to include with their reports. The Crime View mapping software is projected to come online in July 2005. We will provide problem-solving training to the officers and are depending on our supervisors to teach them how to conduct the appropriate kinds of analyses using more robust information and geographic references. It has taken the NCSUPD, technical experts, and other members of the university community over one year to develop our mapping program and we believe that the long-term benefits of

improved information for problem solving are worth it.

This article was co-authored by Lt. Col. John Dailey, Assistant Chief; Sgt. Jon Barnwell, Crime Prevention Division; and Ed Farmer, Special Events/Crime Stats, North Carolina State University Police Department.

Special thanks to Lt. Richard Potts for his assistance in providing this information and these images to us. For more information about this project please contact Lt. Potts via e-mail at rwpotts@gw.fis.ncsu.edu.

Upcoming Conferences and Training

AUGUST

World Congress of Criminology Conference (Includes Crime Mapping/GIS Workshops)

August 7 - 11, 2005

University of Pennsylvania

Philadelphia, PA

www.worldcriminology2005.org

National Gang and Crime Research Center Conference (Includes Sessions on Gang Mapping)

August 10 - 12, 2005

Chicago, IL

<http://www.ngerc.com/2002/2002.html>

GeoDecisions/ESRI: ArcGIS Solutions for Effective Crime Analysis and Mapping Seminar

August 23, 2005

Columbus, OH

www.geodecisions.com/seminars.htm

Crime Mapping and Analysis Program: Introductory ArcGIS 8.x Training

August 22 - 26, 2005

Denver, CO

<http://www.crimeanalysts.net/>

GENERAL WEB RESOURCES FOR TRAINING SEMINARS AND CONFERENCES

<http://giscenter.isu.edu/training/training.htm>

<http://msdisweb.missouri.edu>

www.actnowinc.org

www.alphagroupcenter.com

http://www.cicp.org/course_sched.html

www.cops.usdoj.gov

www.esri.com/events

<http://www.iaca.net/Training.asp>

www.ialeia.org

www.ialep.org

www.mapinfo.com/events

www.nijpcs.org/upcoming.htm

www.nlectc.org/nlectcrm

www.nsgic.org

www.urisa.org/meetings.htm

http://ocpe.gmu.edu/certificate_programs/gis.html

<http://www.worldcampus.psu.edu/wc/GISCertificate.shtml>

Looking Ahead in 2005!!

8th Annual Crime Mapping Research Conference

September 7 - 10, 2005

Savannah, GA

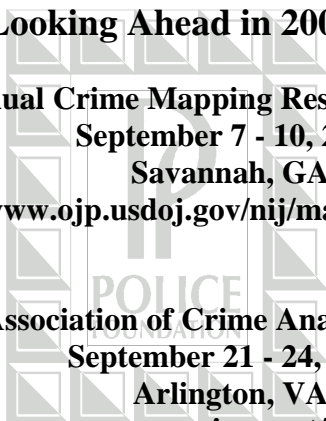
<http://www.ojp.usdoj.gov/nij/maps/savannah2005/>

International Association of Crime Analysts (IACA) Conference

September 21 - 24, 2005

Arlington, VA

www.iaca.net/



The mission of the U.S. Department of Justice, Office of Community Oriented Policing Services (COPS) is to advance community policing in jurisdictions of all sizes across the country.

COPS provides grants to tribal, state, and local law enforcement agencies to hire and train community policing professionals, acquire and deploy cutting-edge crime-fighting technologies, and develop and test innovative policing strategies. COPS also provides a wide range of original publications, tools, and products designed specifically for law enforcement and community members who wish to enhance their community policing capabilities.

This broad range of programs and products helps COPS offer agencies support in virtually every aspect of law enforcement, and it's making America safer, one neighborhood at a time.

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COPS

COMMUNITY ORIENTED POLICING SERVICES
U.S. DEPARTMENT OF JUSTICE

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The Police Foundation is a national, nonpartisan, not-for-profit organization dedicated to supporting innovation and improvement in policing through its research, technical assistance, communication, and professional services programs. Established in 1970, the foundation has conducted seminal research in police behavior, policy, and procedure, and works to transfer to local agencies the best new information about practices for dealing effectively with a range of important police operational and administrative concerns. Motivating all of the foundation's efforts is the goal of efficient, humane policing that operates within the framework of democratic principles and the highest ideals of the nation.

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