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GIS Application Summary

City of Chicago West Nile Virus Tracking Project

The West Nile Virus is a potentially dangerous seasonal epidemic that is becoming ever more common in North America during the summer and fall months. The disease is spread to humans through infected mosquitoes. In most cases (approximately 80%) an infected person will not even know they have the virus. In twenty percent of cases the virus will cause severe flu-like symptoms lasting anywhere from a few days to several weeks. In the most severe cases, which occur approximately one time in every 150 cases, the virus will cause encephalitis (a swelling of the brain) or meningitis (an inflammation of the brain's lining) which may lead to coma or paralysis. People over the age of fifty are at the highest risk of developing severe complications from the virus.

The Center for Disease Control reported 86 human cases of the disease in Cook County, Illinois in 2006. Due to the potential severity of the virus, the City of Chicago's Department of Public Health has engaged in a program to track episodes of the virus. It is known that certain species of birds, such as crows and blue jays, are also susceptible to the virus. Chicago residents who find dead crows or blue jays are encouraged to dial the city's 311 non-emergency number. The city collects the birds and sends them out for testing. The locations of birds that have contracted the virus are recorded to analyze the spread of the virus in the city.

Prior to the 2006 virus season, the City of Chicago Department of Public Health contacted the city's GIS Department for assistance in tracking the spread of the virus. I spoke with Mr. Mehul Shah of the GIS Department. Mr. Shah designed and implemented the resulting GIS application.

According to Mr. Shah, the Health Department had only a vague notion regarding the capabilities of GIS at the beginning of the project. A process of educating the Health Department on GIS was needed before the actual project planning could begin. As the Health Department grew familiar with GIS, it was decided that the project needed to perform the following tasks:

- Translate database entries directly into map form
- Contain several different layers of information
- Allow for the creation of professional looking map output
- Allow for easy operation with a very minimal amount of GIS knowledge

Six months after the Health Department first contacted Mr. Shah, the West Nile Tracking System was in use. The resulting project was a desktop tool using ArcMap that the Health Department could access from their own computers. The Health Department enters information into a database which includes locations of dead birds that are picked up for testing, the results of the testing of those birds (positive or negative for the West Nile virus), the locations of mosquito traps, cases of human infection by address, and locations of catch basins which were tested for mosquito larvae. Using a combination of DLL, MS Access, and ArcMap commands the West Nile Tracking desktop tool automatically updates the ArcMap

layers with new information added to the database. In this manner, the same data is available to everyone at the same time and in as close to real time as is possible based on the time of data entry.
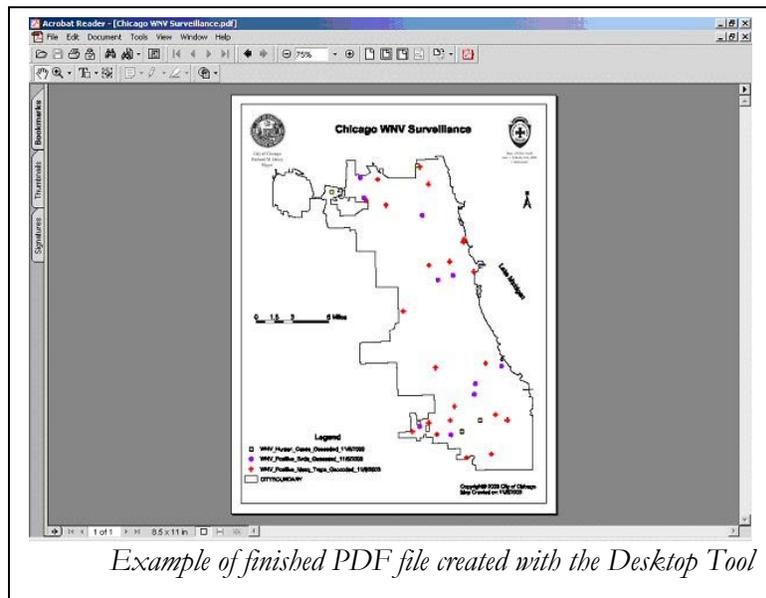
The tool contains four base maps displaying various aspects of the City of Chicago including the city boundary, city streets, city wards, and city neighborhoods. In addition to the four city base layers, the tool contains eight layers specific to West Nile virus tracking, including the following:

- Bird Test Results – displays positive and negative test results by address
- Trap Location – displays locations of mosquito traps
- WNV Surveillance – displays positive mosquito traps, positive bird test locations, and positive human cases by address
- Daily Significance – displays daily hot spots using geographic cluster analysis
- Weekly Significance – displays weekly hot spots
- CSR Call – displays 311 calls regarding dead birds by caller address
- Catch Basins – displays catch basins tested in a given year and result of test
- Positive Cases by Ward – displays city wards that have positive bird, mosquito, or human cases

Health Department officials are able to manipulate the clearly defined layers to produce maps showing exactly the information they need. Another component of the tool allows the workers to easily print the map to a PDF file. This tool automatically formats the maps with a scale, north arrow, legend, borders, and the official seals of the Health Department and the City of Chicago. The worker need only enter a name for the map and click print to produce a very professional and official looking document to share with city or elected officials or the media.

During the first month or so of the application's use some fine-tuning of the process occurred. Overall, the Health Department has been very happy with the tool. In fact, they have initiated work on expanding the tool to account for a wide variety of other animal-

Example of finished PDF file created with the Desktop Tool

bourn diseases. In addition, the GIS Department is engaged in a one and a half year project to create a web based version of the tracking tool so Health Department officials would no longer need to rely on a desktop ArcMap tool on their own computers to use to the tracking tools. At this time the Health Department does not have access to other layers of demographic data. In the future it may be of benefit to cross reference West Nile data with data showing densities of people over the age of 50 in a given location as this population is more susceptible to extreme complications from the virus.