Crime Hotspot Mapping Case Study

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1. **Scenario for the Crime Mapping Case Study**

"Community policing" is a philosophy of law enforcement that includes problem solving based on crime data analysis. This problem-solving approach is a methodical process for reducing the impact of crime and disorder in a community. In most U.S. cities, concentrations of crime occur in predictable patterns and locations which change over time. Geographic Information Systems (GIS) can be utilized to help provide insights into these spatial patterns. Once these patterns are defined, law enforcement and others in the local community can use them to develop community education programs that are specifically targeted for maximum effect in the groups that could benefit most. In addition, law enforcement agencies can use the data to allocate their resources where they will be most effective.

**Learning Objectives for This Chapter**

- Gathering information on client needs for a GIS project
- Analyzing requirements for data for a GIS project
- Planning a GIS project

**Understanding Client’s Needs**

"What we have is a lot of data. What we don't have is the ability to turn it into useful information."
--Police Chief Leonard Supenski

What has led to the desire on the part of the Police Chief and others in our case study city to turn crime data into useful information for problem solving? The first step in working with a client organization is to learn the background events leading to the requirement for a GIS project. Then we ask questions about the ways in which the information will be used and what questions the client will need to ask of the information we put together in the project.

**Background of the Study**

For several years, our city has directed its police officers to document all the information they received from field interrogations (questioning someone as a result of a call or due to suspicious circumstances). The officers completed forms, containing a host of information about the call, including the name, sex, age, and address of the victim, description of the suspect, where the crime occurred, the time and date, etc., and then submitted them to the detective bureau to investigate the crimes. Unfortunately, the detectives in their investigations rarely used these forms because there was no reasonable way to sort through the reams of paper. The data collection (paperwork) completed by the officers thus had little value, if any.

In an effort to implement a pilot GIS crime stopping effort in their city, police officers sifted through the reams of data from a prescribed period of time, looking for crime trends in the data sheets. The city’s police department discovered that a certain neighborhood was plagued with high crime. What the officers had
suspected all along was substantiated by the data—that the area was a haven for illegal drug use and sales. In addition, a wide variety of crimes such as robbery, assault, murder, rape, and domestic violence occurred in this area.

Armed with the data sheets, the police department determined that this would be a suitable area to pilot the effectiveness of the proposed GIS crime stopping effort. In order to implement this effort, the police department hired a GIS consultant to prove how effective GIS is at helping officers and detectives alike to visualize these crime trends. For these exercises, you and your students will be that GIS consultant. Once the police department has fully realized the value of this proposed GIS, they intend to share the data with the department of social services so that an education campaign can be implemented in the neighborhood.

Ultimately, the city plans for the police officers on patrol to be outfitted with electronic devices in their patrol cars so they can complete their data as they respond to a call. The automated data sheets will be standardized so that the officers simply fill in codes for the variables, and the database management software will handle the file organization. These data sets will then be live-linked to GIS software. The end result will be that the officers will be able to show the location of occurring crimes in the city.

**Asking Questions About Client Requirements**

Often you can find a similar project or application from another locality that will give you ideas to use in questioning your client. For example, in one city (not our case study city), a Problem Solving Partnership Task Force wanted to examine patterns of drug use in a target area. They asked the following questions.

- How has the number of drug incidents changed from one year to the next?
- Has the location of drug related incidents changed over the recent years?
- Are there certain neighborhoods, blocks, or buildings that need special attention because of drug incidents?
- How are drug incidents related to domestic violence incidents or other assaults?

There are lots of questions you need to ask of your clients and your team, such as:

- How do we help the police department to understand the power of GIS as an analysis tool well enough that they can give us a concrete idea of what their desired outcome is?
- Who are the people in the police department and other agencies who have the expert knowledge to identify what questions need to be asked of the GIS application to be developed?
- How can we design the system so that it’s flexible enough to handle the analysis needs of the police department and of the department of social services?
There are also all of the usual GIS questions, such as:
- What is the projection of their base map?
- What is the format of their data tables?
- How much conversion will have to be done in order to present a final product?
- What is the desired final product?
- Do they want the product deliverable on a CD? Magnetic tape? FTP Site?
- Will they require training to use the GIS we will deliver?

Some of these questions need to be answered before you start to plan the
project. Some can wait until the contract is negotiated.

**Exercises**

1.1 Visualizing the Product and Its Uses

The first step in planning a project is to visualize the end result and how the clients will
use the products you develop. You are effectively reverse engineering the project. You
start by determining what the desired product should be, and then work backward
through the process defining the necessary steps to reach the desired product set. The
objective for this exercise is to examine one of the maps produced in our case study
community in southeastern Michigan, and imagine the kinds of questions the clients ask
on the basis of this output. Figure 1.1 provides an example of a map produced in our
case study crime project.
The crime incidents are shown on the map according to their locations. It is easy to see which part of the area has a higher crime rate and which is a safer section.

**Identifying Requirements for Data**

What kinds of data will be needed in this project? Here are several main questions we may ask about the data requirements at this preliminary stage in our analysis.

- **Geographical Scope** – What is the geographical area or political jurisdiction for which the crime analysis is to be performed (and therefore, for which the data will be needed)?
- **Types of Information** – What types of information need to be analyzed and related to one other?
- **Time Frame** – For what period of time are the data needed? Will the analysis be repeated on a regular basis? Are we looking for trends over time?
- **Potential Sources** – What are the possible sources for each type of information?
- **Privacy and Confidentiality of the Data** – What are the privacy considerations and policies concerning the data?
• **Projection** – What kind of projection and coordinate system (geographic, UTM, or SPCS) will all of the data need to be in for conducting a GIS analysis in this situation?

**Scope of the Study**

What will be the scope of your GIS crime study? Will you include the entire city, one neighborhood, or several selected neighborhoods? In our case study city, the police were concerned with a particular neighborhood where there is a pattern of high crime levels. They wanted to study this particular neighborhood in depth, at the building level. This detailed analysis will enable community-based organizations such as the recreation department, human services, and citizens working with the police to identify specific buildings that will be targeted for special social service efforts, upgrading of subsidized housing, and other improvements.

Several different factors might affect the decision about the scope of the study. Some of these include the following.

- What prior analysis has been made of crime data in this city? In this case study city, no prior GIS analyses have been done with crime data.
- What are the problem-solving priorities of the police department and the other agencies they are working with? In this case study city, a particular neighborhood has been known to be a high-crime center. Police are particularly concerned about drug sales, domestic violence, and prostitution in this area.
- What is the overall size of the city? This case study city has an area of approximately 40 square miles. The neighborhood to be studied is approximately one square mile.
- How much funding is available for conducting this study? The funding for this case study crime mapping project was part of a Federal grant from the Department of Justice. The grant program that funded the study was specifically looking for community-oriented policing programs that would look in depth at the needs of a neighborhood.
- What data are available for this study? In our case study, data are available for the entire city, so that is not a factor in determining the scope of the study.

**Types of Information Needed**

In a simple case, the types of information needed for a crime mapping study would include an electronic basemap of streets in the area to be studied and crime incident data for the study period for that area. The crime incident data must include street addresses if you are to show the incidents on the street map.

To get more specific about the information needed, you will need to talk with the community task forces who are studying crime in the area. Are there particular types of crimes they wish to examine? If so, what crime data would be needed in order to examine those crime types? In one crime mapping study the community problem-solving task force wanted to look at drug use incidents, but the crime
incident databases available did not have specific crime type codes for drug use, only for drug sales and distribution.

The community problem-solving task force may already have hypotheses about the nature of the crimes in the area being studied and some of the factors that might be contributing to those crimes. In one community, a high incidence of burglaries was taking place in an area where young college students were renting apartments. By looking at information about apartment buildings, the task force was able to design and target an educational program to teach the young renters some techniques for reducing the amount of crime in their neighborhood. These included cleaning up trash, locking their doors, replacing broken windows and light bulbs, and getting to know their neighbors. The problem-solving task force may want to consider some approaches to crime prevention that will require additional information to become a part of the GIS study. For example, they may want to analyze where the crime is taking place in relation to certain community assets such as churches, parks, schools and health clinics. In this case such assets would need to be a part of the database for the GIS study.

**Timeframe for the Study**

Is this crime location study for just very recent crime incidents, for a year, or for a longer period of time? Is the client looking for changes in crime patterns over time? Do they want to monitor crime incidents on a daily, weekly, or other basis? The answer to these questions again depends on the purpose of the study. For instance, a GIS study of infrequent crimes such as homicides would not likely make much sense for a very short study, because there would not be many incidents to analyze. In this case study, the police department wanted to examine a fairly large sample of crime incidents for the selected area. They provided crime incident data for a three-year period, from 1995 to 1998. In another city, crime incidents are mapped on a two-week cycle so the police can track changes in the patterns on a nearly real-time basis.

**Potential Sources of Data**

One of the most challenging aspects of a GIS problem-solving study is the gathering of necessary data. Your study team may need to contact a variety of potential sources. In this crime mapping case study, we made several inquiries to the police department before we were able to identify the crime incident data available for the study area and find out which data items were in that file. In the police department we found a different group that has an electronic basemap for the study area. A different agency may have other data, such as demographic or community assets data.

**Privacy and Confidentiality of Data**

Confidentiality and privacy of crime data are ethical issues that will need to be addressed between school leaders and the police department. What information should students be able to access about crimes, particularly if the students live in the neighborhood being studied?
For this case study, the authors (many of whom actually live in the study neighborhood) changed the names of the streets before providing the data sets to the students. In addition, the names of the persons arrested for the crimes were removed from the database used in the exercises.

**Projection and Coordinate System Requirements**

What coordinate system will the client specify for the GIS application? All data sources will need to use the same coordinate system, so it is important to identify the desired projection coordinate system for the end product. In our case study city, there has been a recent policy to convert all data sets to the NAD83 projection.

1.2 Identifying Data Requirements and Potential Sources

The following is a simplified worksheet you can use to organize what your team is learning about the data requirements for this study. For this exercise, use the worksheet to organize what you have learned so far about data requirements and potential sources for this crime-mapping project (or use it to identify similar information for crime mapping in your own community).

<table>
<thead>
<tr>
<th>Study Area Scope:</th>
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<tbody>
<tr>
<td>Projection Requirements:</td>
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<table>
<thead>
<tr>
<th>Type of Data</th>
<th>Source/Contact</th>
<th>Projection/Coordinates</th>
<th>Scope/Timeframe</th>
<th>Privacy Issues</th>
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**Creating a Plan of Work for the Project**

In this chapter, we have begun the first phase of a project, which might be called "Exploration and Needs Assessment". Although the specifications for the project are not completely known at this point, we can begin creating a rough plan of work for the project. Beginning the plan of work at this early stage will enable us to conduct informed negotiations with our client concerning such matters as deadlines.

1.3 Project Planning

Begin creating a plan of work for the project. Think about the team members you have available in your class or school and what are the calendar time constraints for their work on the project. Lay out a rough estimate of possible deadlines for
the major tasks and deliverables of the project. This will be revised as you negotiate a contract with the client.

<table>
<thead>
<tr>
<th>Task</th>
<th>Deliverable</th>
<th>Start Date</th>
<th>End Date</th>
<th>Responsible</th>
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</thead>
<tbody>
<tr>
<td>1. Conduct Needs Assessment</td>
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<tr>
<td>2. Assess Available Data</td>
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<tr>
<td>3. Negotiate Contract</td>
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<td>4. Collect Data</td>
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<tr>
<td>5. Convert and Preprocess Data</td>
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<tr>
<td>6. Synthesize Data into ArcView Project</td>
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<td>7. Create Models and Analyze Data</td>
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<tr>
<td>8. Prepare Output and Presentations</td>
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<tr>
<td>9. Manage Project</td>
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2. **Assessing Sources of Data for the Crime Project**

After developing an understanding of the client's requirements and making a general plan of work for the project, the next step in planning a GIS application is to assess the available datasets for the project.

**Learning Objectives for This Chapter**

Determine relevance, adequacy, and timeliness of available data in relation to requirements of a study.

**Assessing Available Crime Data**

After several inquiries to the police department, they informed us that they have four comma-delimited text files. These files contain information about the reported incidents, arrests, crime codes, and the final charges in each case. We need to examine these files to determine whether the available data include the kinds of information needed for the study, based on our preliminary analysis of the client requirements. In addition, we need to identify any codes used in the files, such as crime type codes, which we will need to know how to translate. We also need to look at the available position information to see how to link the crime data to our geographical basemap. The four crime data tables are stored as text files in your wsatrans\crime\data.
Exercises

2.1 Assessing the Crime Data

Using your word processor or spreadsheet program, open each of the four crime data tables. Become familiar with the available data by answering the following questions.

• What questions do you have about these files (will require asking client for more information)?
• What is the range of dates for these crime incidents? Is this the timeframe of interest to the client?
• Approximately how many records are in each of the files?
• Which files contain information about location that enables us to georeference the data?
• What is the key field for these files?
• Which fields will be needed code translation tables (metadata) in order to understand and analyze the data?
• Will the data available in these files be adequate to address the client’s questions? What items of information are missing, if any?
• Are there some particular data items that should be considered confidential and that should be removed before the students work on the files?
• Which of these files should be used as the basis for analyzing the location of crime incidents for purposes of this study? Why?

Assessing Available Basemap Data

The police department has a basemap, which provides the spatial data for the study area. The basemap includes streets within the neighborhood to be studied. However, the data is in the Geographic Coordinate System, so we’ll have to convert it to State Plane, North American Datum 1983 (NAD83) so it will fit with the existing data sets that the department of social services already has in NAD83 coordinate system.

2.2 Assessing the Basemap Data

This is a conceptual exercise to become familiar with the basemap for this case study. You need to know if there is a match with the geographic or political boundaries required for the client’s project. You also need to know what data are contained in the basemap files.
3. Preprocessing the Data

Now that we have made an assessment of the available data sets, we can perform pre-processing steps that are necessary to get these data into our GIS Project.

Learning Objectives for This Chapter

- Importing tabular data into an ArcView Project
- Changing projection coordinates in ArcView

Preprocessing the Tabular Crime Data

As mentioned above, before we can get any crime data into our GIS, we have to do some “digital to digital” conversion. This means that we take a digital file (in this case a tab-delimited text file) and import it into ArcView, thereby converting it to a format that ArcView can use. This process only requires that field headings are added to each table prior to importing the tables. This step has already been completed in this exercise. All you have to do is add the text-delimited files to your project.

3.1 Importing Crime Data into ArcView Project

- Start ArcView 3.x
- Create a new project as a blank project.
- Add a new table to the project window.
- Navigate to your wsatraining\crime\data directory and add the table arrests.dbf.
- Add another table.
- In the New Table dialog box change the Lists Files of Type selection to Delimited Text [*.txt] and add the files incides.txt, flncha.txt, and crmcodes.txt.
- Save the project as crime_1.apr in your wsatraining\crime\data.

Preprocessing the Spatial Data Basemap

There are several preprocessing steps to be performed on the available spatial data for the basemap to be used in the crime mapping study. These steps will include: adding the spatial data to the ArcView Project, editing the display of the data to make it readable, and converting the projection of the basemap data from Geographic Coordinates to State Plane NAD83.

3.2 Adding Spatial Data Themes to the New Project

- Open the project crime_1.apr.
- Create a new View and add the following themes to it which are found in your wsatraining\crime\data directory: base_sts.shp and basemap.shp.
- Save the project as crime_1.apr.
3.3 Changing the Display of New Themes

- If necessary, start ArcView and open the project *crime_1.apr*.
- Change the order in which the two themes are drawn and their colors to reflect Figure 3.1.
- Save the project as *crime_1.apr*.

![Figure 3.1](image)

Changing the Projection of Spatial Data

The final preprocessing step is to change the projection of the themes you just added to the view. As this is an extremely important step in preprocessing, take special note of this process so you can reference it later.

3.4 Setting View Properties

- Open the file *crime_1.apr*.
- Make both themes active.
- From the View menu select Properties.
- Click the Projecton button, and you will be prompted through a series of dialog boxes to re-project the themes in the view.
- Accept the default standard option, and then select State Plane 1983 from the Category dropdown menu and select Michigan South from the Type dropdown menu.
• Click OK.
• Save the project file as crime_2.apr.

4. Geocoding the Crime Data

Once the data are formatted so that they can be used in your project, you can begin the process of building the GIS application. The first step is to match the crimes to locations on the basemap. This step is necessary in order to link the crime data that have address information to the street data that have address ranges. This process is called geocoding. Geocoding is a critical step in the development of many GIS applications. The techniques used in our crime mapping case study can be applied in many different GIS application projects.

Learning Objectives for this Chapter

• Learn what geocoding is
• How to map data by geocoding
• What you should know when you employ the result of geocoding (the disadvantage of geocoding)

Geocoding Concepts and Challenges

Geocoding is the process of creating points on a map from a table of addresses. In order to geocode addresses, you need a reference theme (base_sts.shp) and an address table (arrests.dbf) that contains the points you want to map.

In general, there are three steps to geocoding addresses. First, you have to make your themes “match able”. Second, you have to run a batch match. During this step ArcView compares the table of addresses to the street information and looks for matches. Finally, you have the opportunity to go through all of the unmatched records to determine if they should have been matched, but weren’t. For example, an address with Brenda Court in the street name may not have matched with Brenda Circle. It is at this stage that you get to decide if that is close enough for a match.

Geocoding can be a very time consuming and expensive process. The three steps mentioned above sound simple enough, but in practice geocoding usually produces between 60 and 80 percent matched records the first time through the batch matching process. The user then has to determine if the other records in the database are close enough to be matched. Sometimes this requires fieldwork. You may have to visit the study area to determine if the unmatched addresses are an error in the data tables, or actually not within the study area.

Familiarity with the study area can be a critical component in this phase of the project. For example, if you know that a certain street or even an address range on that street does not exist within the study area, you can discard that record.

A more common reason for unmatched records is an error in data entry. These errors could be a misspelled street name, or an address that wasn’t entered
correctly. In addition, data erroneously entered in the query field such as block group or zip code may cause your geocoded file to be under or over represented.

For example, lets presume that the area of the city that we are working with is one U.S. Census Bureau block group. When we initially subset the crimes database, we only selected those records that were within our selected block group. If some of the crimes that occurred in our study area had data entry errors in the block group field of the original database, they would not be included in our working subset.

How can we guarantee that the results of our geocoding exercise truly represent what occurred in the field? There is no simple answer to this question. However, computer programmers have developed programs to make sure that database queries protect against this kind of error.

For your purposes, you will have to manually check the unmatched records in our data. Depending on the size of the database with which you are working, simply going through the unmatched records manually can take a very long time and be very expensive. In the arrests.dbf file, there are 1293 records. Imagine going through every one of those to determine if a respective address lies within our study area. That is exactly what you are going to do! Luckily, ArcView has automated this process somewhat through geocoding.

Preparing to Geocode Crime Records

As mentioned above, the first step is to make your data “matchable”. It is very important here to determine which theme is active in the view because changes will be made on it. During the geocoding process, ArcView models the location of the address based on the range for any given street segment. Presume that there is an address of 33 N. First Street and that the address range on the left side of the first block of N. First Street starts with 1 and ends with 99. Since that is all the information you have, ArcView models the location of 33 N. First Street by placing it one third of the way along that street segment. In reality, 33 N. First Street may be very near the corner or in the middle of the block, but without field verification you have to accept that the model provided by ArcView is reasonable. This is important because you are working with a street database. The addresses in your data have a range of addresses for each street segment, for both the left and right sides of the street.

Exercises

4.1 Defining the Properties of the Geocoding Theme

- Open the project crime_2.apr.
- Make the base_sts theme active and select the Geocoding icon from the Theme Properties dialog box.
- Set the options to match those selected in Figure 4.1.
- Select Yes to the question offered by ArcView.
• Your theme will then be ready for geocoding.
• Save the project as crime_2.apr.

![Geocoding screenshot](image)

**Figure 4.1**

### 4.2 Setting up the Batch Matching Parameters

Open the project crime_2.apr. From the View menu select Geocode Addresses. This brings up a dialog box that allows you to set specific geocoding parameters. Set the options to match those in Figure 4.2, saving your geocoded theme as crimes.shp in your wsatrainin\crime\data directory.
4.3 Setting Geocoding Preferences

In some instances, you may want to change the specificity with which ArcView searches the database. This is done through the Geocoding Preferences dialog box (Figure 4.3).

Set your options to match those in Figure 4.3 and click OK.
4.4 Starting the Geocoding Batch Match

Click on the Batch Match button. This will start the geocoding process. Depending on the speed of your computer, this could take several minutes because of the size of your database. When the process has finished a new dialog box will pop up that reveals the success of the geocoding process (Figure 4.4). In this case, 79% of our records matched.

![Figure 4.4](image)

4.5 Performing an Interactive Re-Match

The third and final stage of the geocoding process is to interactively rematch those addresses for which ArcView could not find a match. Before you select Interactive Re-match however, you may want to change the geocoding preferences to allow for more matches as the software runs through the Batch Matching process. Experiment with the Geocoding Preferences to see if you can improve your geocoding success. Regardless of the Batch Match settings, you will have to perform an Interactive Re-match to successfully match the crime addresses during the geocoding process.

As mentioned earlier, it is at this stage that you can change the information about a respective address in order to try to improve the chances of a match. For example, lets presume that you are familiar with the area, and you know that 11358 Glenmore Circle exists. You would simply type Circle behind the word Glenmore to match it to the database. If you still did not get a match, you might try typing in Cir, Ct, or some other derivation in an effort to get a match. Once a good candidate for the match pops up, select it and select the Match button. To progress through the unmatched records, simply click the Next button until you have gone through the entire list. Click Done when finished.

You will then see the Re-Match Addresses dialog box.

- If you are happy with the way your geocoding has turned out, click Done.
• If you want to try to improve your accuracy, try changing the Geocoding Preferences, and re-matching until you are satisfied that you have matched as many addresses as possible and then click on Done.

Make the new theme active and adjust its color accordingly. It should look similar to Figure 4.5.

Save the project as crime_3.apr.

**Assessing the Geocoding Result**

You should not be discouraged if you have addresses that are not matchable. That is the nature of geocoding. Unless your data tables are perfect, you should expect to have a certain percentage that does not match. In addition, do not be surprised if your matching rate is well below 60% when you try geocoding different data sets. As mentioned before, the success of a geocoding operation is a function of the original data.

Recall that in Chapter 3 you added four crime-related tables to your project. However, at this point, only one of the tables has been geocoded – the arrests.dbf table that become the crime.shp file. Now you are going to incorporate the other crime data tables into your project to create a meaningful product – a map of crime types and locations. You will join these tables to your geocoded theme table to increase the amount of information associated with each point on the map.
4.6 Joining Crime Tables

Make the `crime.shp` theme active and click on the open theme table button to open the attribute table. Join the three text tables to the `crime.shp` theme table using the `Incident_n` (Incident no.) field. Your newly created table should resemble Figure 4.6.

![Figure 4.6](image)

Once the tables are joined, you can perform some meaningful analyses with regard to the information stored in the data tables collected by your city’s police officers.

Save your work as `crime_4.apr`. 
5. **Spatial Modeling and Interpreting Crime Hotspots**

As previously mentioned, you will need to present these data products to the police department and the department of social services. You need to design your queries with that in mind. In addition, you will use the *Legend Editor* to perform advanced classifications of your crime data. You can now “mine” your GIS for answers to some of the questions that were asked in the beginning of this case study.

Imagine that your city’s police department is interested in mapping the drug-related crimes in your study area. In addition, they are interested in finding the locations of prostitution arrests. Your city’s police department believes that these crimes, in particular, occur in predictable patterns. Based on that assumption, the police believe mapping the past locations of these crimes and arrests can provide information that can be used to prevent these crimes in the future.

**Exercises**

5.1 **Querying Drug-Related Crimes**

The first thing you have to do in order to perform the queries mentioned above is to define the codes in the *Crime_code* field of the *crimes* theme table. For the purposes of this exercise the charges in the designated field that begin with “1” will represent drug related crimes, and the charges that begin with “2” will represent prostitution/solicitation related crimes.

Once you have the metadata (1 = drug related, 2 = prostitution), you can build your queries to map the crime patterns in your city.

- Open the project *crime_4.apr*.
- Make sure the *crimes* theme is active and open its theme attribute table.
- Click on the *Query Builder* button to bring up the *Query Builder* dialog box.
- Build a query that matches Figure 5.1.
• Click the New Set button.
• 404 records should be selected out of the 1293 records in the entire database. Thus, more than 30% of the crimes in this study fall under the “drug related” category.

5.2 Converting a Theme to a Shapefile

• From the Theme menu select Convert to Shapefile.
• Navigate to your wsatraining\crime\data directory and name the new theme drug_crimes.shp.
• A Convert dialog box will pop up asking if you want the shapefile to be shown in projected units. Click No.
• Click Yes in the Convert to Shapefile dialog box to add the shapefile to View1.
• With some minor adjustments, your view should now appear similar to Figure 5.2.
5.3 Querying Prostitution-Related Crimes and Creating a Shapefile

Repeat the entire process for all the prostitution related crimes. When finished, your results should look similar to Figure 5.3.

Save the project as crime_5.apr.
Crime Analysis in the View of Socio-Economics

Socio-economics conditions are significantly related to crime patterns. Crime is most frequent in low-income apartment areas. Analyzing the economic situation of a district makes it easier to for the police to focus on potential crime areas. This economic analysis can be easily performed in GIS.

In this case study you will analyze the relation between crime and the average household income using a spatial join. It will be a point-to-polygon spatial join.

5.4 Relating Drug-Related Crimes to Average Household Income

- Open the project crime_5.apr
- Add the theme comp.shp from your wsatraining\crime\data directory.
- Use the Legend Editor as shown in Figure 5.4 to edit the comp theme.
- When finished, apply the new settings, make the comp theme active, and place it at the bottom of the legend table of contents.
• Open the *Attributes of Comp.shp* table and click the *Shape* field to select it for the join.
• Open the *Attributes of Crimes.shp* table and click the *Shape* field to select it for the join.
• Join the two tables (Figure 5.5).
• Make the Id field active in the crimes theme table and menu select: Field | Summarize.
• Create the definitions: First_Comp_id, First_Name, and Ave_Av_hshldin (Figure 5.6).
• Save the new table as sumbycomp.dbf in your wsatraining\crime\data directory.

Figure 5.6

• Click OK.
• Your new table should look like Figure 5.7.

Figure 5.7

You will notice that the most crimes occur in the lower income areas. In addition, crimes occur less frequently when fewer families live together. (Residence_3 is characterized as multi-family, Residence_2 is characterized as duplex, and Residence_1 is characterized as single-family.) There is more crime in the multi-family housing than in the single or double family housing.

Save the project as crime_6.apr.
Further Exercise
You can do a similar analysis on the relationship between prostitution and average household income.

6. Presenting Results to the Client
You must now present the result to clients – in this case, the police department – using a layout in ArcView.

Exercises

6.1 Creating a Layout
To create a layout, make the view that you want to present active. You will create the drug crime layout now.
- Menu select: View | Layout.
- Choose Landscape.
- Click OK. The Layout window will show up.

You may edit the layout as you see necessary. Eventually, it should resemble Figure 6.1.

Figure 6.1
Save your project as `crime_7.apr`.

You can follow the same procedure to create a separate layout of the prostitution and the crimes (all) map. Just remember to select that you want to create a “new” layout.