Project Purpose: The purpose of this project was to analyze the crime activity within one mile of the Willis Tower for one year.

Steps Taken

Project Organization- My initial step was to create folders to organize my project. I created an all-encompassing electronic project folder. I created three sub folders to contain data, MXDs and Outputs. I created a geodatabase and a scratch geodatabase in my data folder. I created sub folders in each of the folders to organize my data, as I progressed through this project.

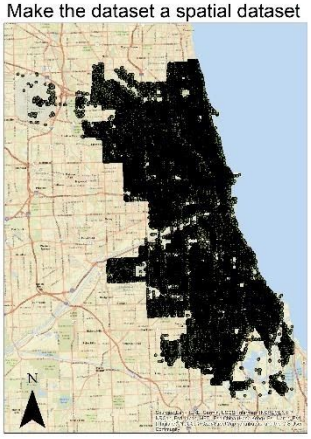
Data Collection- I next searched for and downloaded Chicago Crime data. The City of Chicago publishes its crime data on their public online data portal. I used the crime dashboard to select and download Chicago Crime for the period of February 1, 2018-January 31, 2019.

Clean Data in Excel- I cleaned the data in Excel to make the downloaded data formatted for my research purpose. I used Excel formulas to determine whether each crime was considered violent or nonviolent based on the IUCR (Illinois Uniform Crime Reporting) code. The Chicago Police department denotes several types of crime as violent on its website. I also ranked the crimes by severity. Cleaning the data in Excel allowed me to later set the severity level for the Kernel Density. I saved the file as Chicago_Crime_Jan18_Feb19withViolent.csv and added it to ArcMap.

Create an MXD and Set Projections- I created an MXD to display and manipulate my data in ArcMap. I set the coordinate systems to projected coordinate system>NAD 1983 (CORS96) State Plane Illinois East FIPS 1201 (US Feet). I chose this projection because Chicago is located in eastern Illinois.

Make the dataset a spatial dataset- I added the .csv file to a new MXD, using the "Add Data" option. I right clicked the new layer in the Table of Contents and selected "display XY data." The original data file gave latitude and longitude as well as X and Y coordinates for each occurrence of crime in Chicago. I chose the following for the given options in the "display XY data dialog box" for the following reasons:
X-field- longitude- I chose longitude to avoid error in transposing from one projection to another.
Y-field- latitude- I chose latitude to avoid error in transposing from one projection to another.
Coordinate System- WGS84 (DD)- I selected this coordinate system because that was the coordinate system of the downloaded data. I determined the coordinate system of the downloaded data because I added a
I received a message after running this process that informed me that my created GIS table does not have object ID-field. Therefore, I could not select, query, or edit the features in the resulting layer. The message led me to export the layer as a shapefile or feature class by right-clicking the layer in the Table of Contents and selecting Data>Export Data.

Make the dataset a spatial dataset



Other way to do this…
In Catalog right click on csv in catalog> create feature class> from XY table,
enter same information

Data>Export Data- I exported the crime data as a feature class to edit the layer. I right-clicked the layer and chose Data>Export Data. I entered the following into the options for exporting data:
Export: All features
Use the same coordinate system as: The data frame- I wanted to change my projection to my data frame projection to match the rest of my data.
Output feature class: I saved this file in my geodatabase as XYCSV

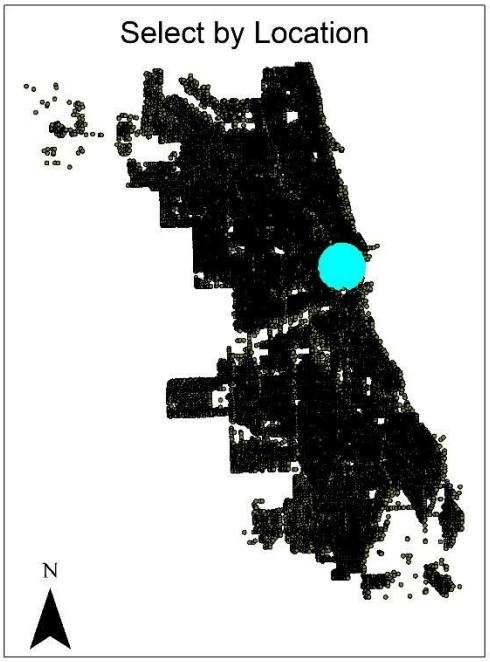
Create Willis Tower Feature Class- I created a point feature class for the Willis Tower. I added this feature class to my MXD by dragging and dropping the feature class into the Table of Contents. I then edited the feature class to create a new point at the southwest corner of the Willis Tower. I used the Imagery Basemap to locate the Willis Tower. I chose to add the point to the southwest corner to the building because the southwest corner was the easiest corner of the Willis Tower to decipher using the Imagery Basemap. I saved my edits and saved my MXD.

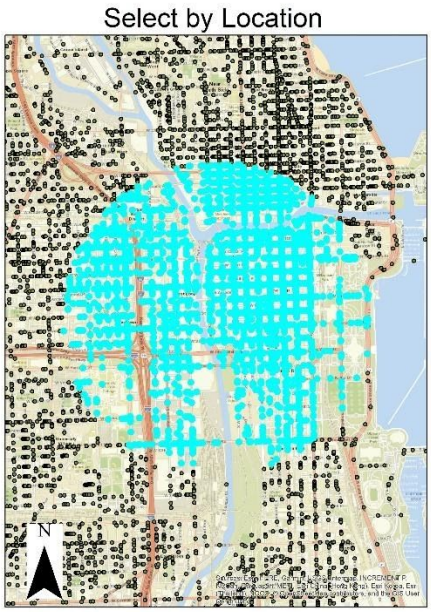
Create Willis Tower Feature Class

Create a One-mile Buffer- I then created a one-mile buffer around the Willis Tower using the "Buffer" geoprocessing tool. I entered the following into the options for the "Buffer" tool:
Input Features- Willis Tower
Output- I saved the document as Willis_Tower_one_mile_buffer
Distance-1 mile

Create a One-mile Buffer

Select by Location- I used "Select by location" to then determine which crimes took place within one-mile of the Willis Tower. I entered the following for the "Select by Location" options:
Selection method: Select features from
Target layers: XYCSV
Source layer: Willis_Tower_one_mile_buffer
Spatial Selection Method for Target Layer Feature(s): Intersect the source layer feature





Export chosen Features- I opted to export the features within the 1mile radius of the Willis Tower. I right-clicked on the XYCSV layer in the Table of Contents and selected Data>Export Data. I selected the following in the fields for Export Data.
Export: Selected features
Use the same coordinate system as:

- The data frame

Output feature class: I saved the file in my project geodatabase as "XYin1mi."

Set Environments – I next wanted to run a kernel density analysis. I chose to set my environments prior to running the kernel density to set my environments for my MXD as opposed to setting the environments specifically for the kernel density analysis. I chose the following options under Geoprocessing> Environments

Workspace:

Current: Chicago_crime

Scratch: Chicago_crime_scratch

Output Coordinate system: same as display (MXD)

Processing extend: same as layer: crime 1 mile (This will make a square)

Kernel Density Analysis

The kernel density tool calculates the density of features in a neighborhood around those features. The population field could be used to weigh some features more heavily than others, depending on their meaning, or to allow one point to represent several observations. I chose the following options in the kernel density tool for the following reasons:

Input point of polyline features: XYin1mi,

Population Field- severity, I chose the severity field as the population field because I want to rank the crimes based on severity. For example, I want a murder to be consider a more severe crime than theft.

Output cell size: 50 This cell size will automatically be rated as feet because my data frame is set to a feet projection. I chose to have my output cell size 50 feet because I am analyzing a circle with a mile radius.

Search Radius: 450

Area Units: sq_ft

Output values are: density

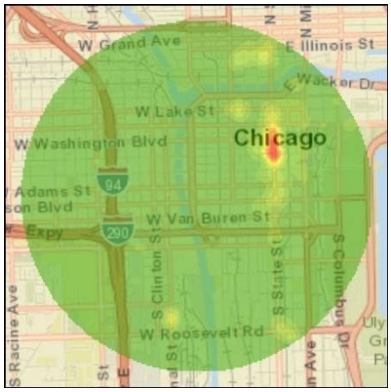
Method: planar

Raster analysis- I performed a raster analysis because my area of interest was a circle. Performing the raster analysis created a circular mask around the one-mile butter

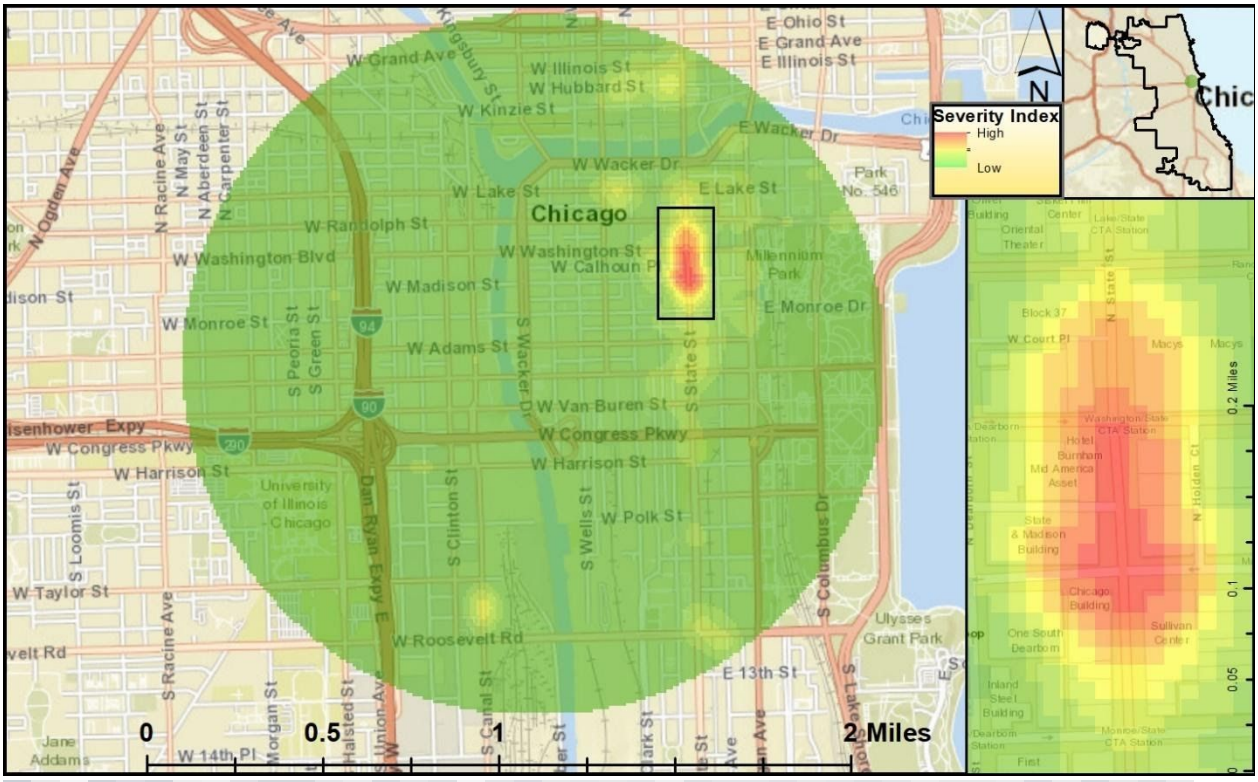
Cell size: 50 feet

Mask: Willis_Tower_one_mile_buffer

This map depicts the results of the kernel density analysis.



Geospatial Analysis- Figure 1 displays a map of the crimes within one-mile of the Willis Tower, an outset map that shows where in Chicago the Willis Tower lies and an inset mat that zooms in on an area of interest in the kernel density analysis. This inset map shows an area that shines bright on the kernel density map. This indicates that a high concentration of crimes occur in this location. I zoomed in on this area to display in more clearly. The inset map displays State Street, along the Magnificent Mile. The Magnificent Mile is a well-known and high-profile shopping district in The Loop neighborhood in Chicago.



within One Mile of the Willis Tower

Table Analysis- The inset crime piqued my interest about the types of crime that occurred within the inset map. I questioned which types of crimes occurred in this location and where did these crimes occur. I returned to the excel document Chicago_Crime_Jan18_Feb19withViolent

to further analyze the data using tables and charts. I created pivot tables in excel to perform this data analysis using the following steps.

Filter for chosen coordinates- I only was interested in the crimes that occurred in my inset maps. I determined the coordinates for the corners of the inset map. I then used those x, y coordinates as filters in excel. I chose to filter for x and y coordinates between the x and y coordinates of the inset map.

Create Pivot Table to determine what crimes happened where- I next created pivot tables using the inset map coordinate filter. I wanted to identify what types of crimes occurred at different locations. I put the following data in the following fields for pivot tables:

Columns- location
Rows- primary
Values- primary

I looked at the resulting pivot table and was interested in displaying only types of crimes and crime locations that occurred ten or more times. I looked at the results and put on another filter for primary type and crime locations to result in those primary type and crime locations that had ten or more occurrences. Table 1 depicts the resulting table. I highlighted cross sections of primary type and crime locations in yellow. The table shows that most crimes within the inset map occurred in department stores. Thefts occurred more often than other crimes. Figure 2 displays the same data graphically.

What Crimes happened where?	Crime Location							
Type of Crime	BANK	COMMERCIAL / BUSINESS OFFICE	CTA PLATFORM	CTA STATION	CTA TRAIN	DEPARTMENT STORE	HOTEL/MOTEL	OTHE
ASSAULT	2	3	2			19		
BATTERY	1	2	8	3	6	22	8	
CRIMINAL TRESPASS			1			11	14	
DECEPTIVE PRACTICE	20	9	8	16	24	121	10	
ROBBERY	3	1	3	3	5	19		
THEFT	1	14	51	24	120	875	35	
Grand Total	27	29	73	46	155	1067	67	

Table 1. What crimes happened where?

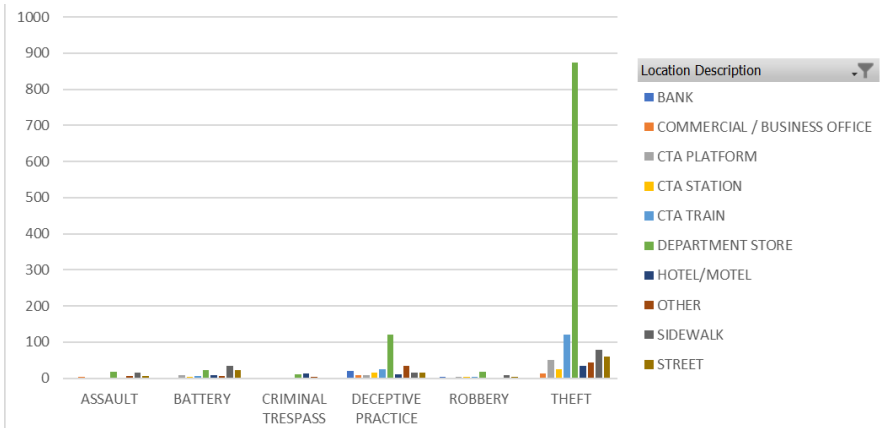


Figure 2. What crimes happened where?

Create Pivot Table to analyze further crimes located in department stores- I determined that the majority of crimes that occurred within the inset map occurred in department stores. I thus chose to analyze further department store crimes. I further filtered my data to display only crimes that occurred in department stores. I added the crime description to the pivot table rows to display the crime description under the crime type. Table 2 displays the resulting pivot table. Table 2 indicates that most thefts were retail thefts. The table also indicates a high occurrence of credit card fraud. I concluded from this analysis that many crimes may occur in the high-end retail stores located along State Street in The Loop.

Crime Types	DEPARTMENT STORE
ASSAULT	**19**
AGG PRO.EMP: HANDGUN	1
AGG PRO.EMP:KNIFE/CUTTING INST	1
AGGRAVATED:KNIFE/CUTTING INSTR	4
SIMPLE	13
BATTERY	**22**
AGG PRO.EMP: OTHER DANG WEAPON	1
AGGRAVATED: OTHER DANG WEAPON	1
DOMESTIC BATTERY SIMPLE	1
PRO EMP HANDS NO/MIN INJURY	1
SIMPLE	18
CRIMINAL TRESPASS	**11**
TO LAND	11
DECEPTIVE PRACTICE	**121**
ATTEMPT - FINANCIAL IDENTITY THEFT	2
COUNTERFEITING DOCUMENT	2
CREDIT CARD FRAUD	96
FINANCIAL IDENTITY THEFT OVER $ 300	2
FRAUD OR CONFIDENCE GAME	1
ILLEGAL USE CASH CARD	18
ROBBERY	**19**
AGGRAVATED	1
ARMED: HANDGUN	2
ARMED: OTHER DANGEROUS WEAPON	4
ARMED:KNIFE/CUTTING INSTRUMENT	1
STRONGARM - NO WEAPON	11
THEFT	**875**
$500 AND UNDER	22
ATTEMPT THEFT	4
FROM BUILDING	42
OVER $500	15
POCKET-PICKING	11
PURSE-SNATCHING	1
RETAIL THEFT	780
Grand Total	**1067**

Table 2. Department Store Crime types and descriptions