Working with Geography: Los Angeles Gang Injunction Maps and Crime

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This coding exercise was from University of Pennsylvania's Criminal Justice Data Science Course taught by Dr. Gregory Ridgeway. Script has been modified from course examples to fit personal notation conventions. California city shapes, California Census tracts, and Los Angeles County Rods were acquired from the Census website. Los Angeles Safety Zones shapefiles were obtained by the Dr. Gregory K. Ridgeway from the Los Angeles City Attorney's Office. The 2014 crime data was taken from the Los Angeles Open Data website.

Key skills: Managing Spatial Data, Manipulating Spatial Object, Accessing Data Through JSON, Merging ACS/LAPD/Gang Injunction Data/Census TIGER files

Exploring Los Angeles Gang Injunction/Safety Zone Maps

Data Wrangling

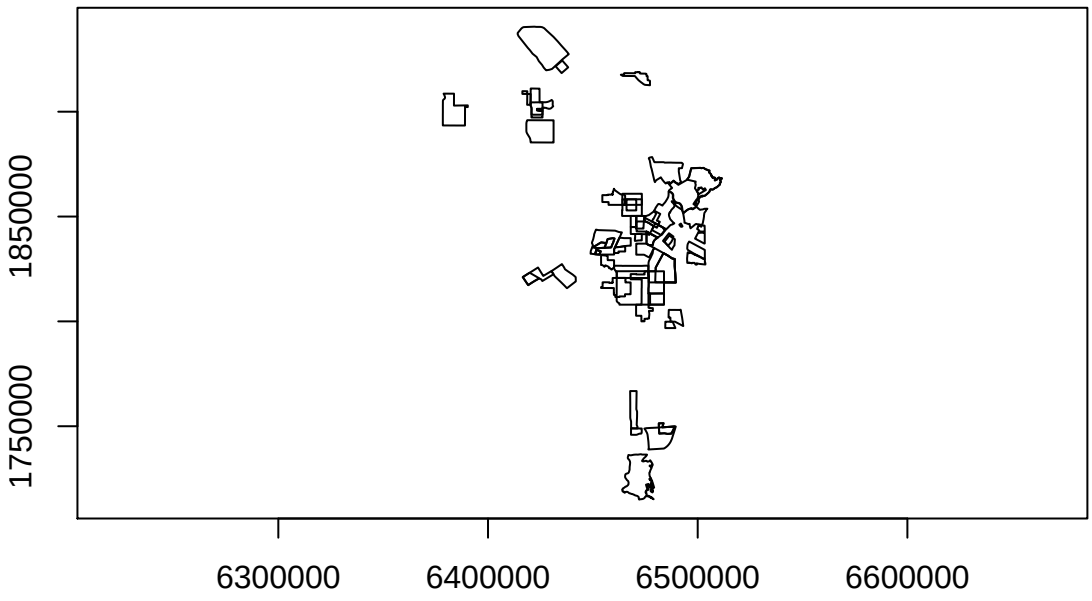
Load map and packages

```
# Load packages
  library(sf)
  library(lubridate)

# Load Map
  map_sz <- st_read("allinjunctions/allinjunctions.shp")
```

```
## Reading layer `allinjunctions' from data source `/Users/leng/Dropbox (Personal)/Programming/OG Github
## Simple feature collection with 65 features and 13 fields
## geometry type:  POLYGON
## dimension:      XY
## bbox:           xmin: 6378443 ymin: 1715015 xmax: 6511590 ymax: 1940541
## epsg (SRID):    2229
## proj4string:    +proj=lcc +lat_1=35.46666666666667 +lat_2=34.03333333333333 +lat_0=33.5 +lon_0=-118
```

Plot the geometry of the shapefile

```
plot(st_geometry(map_sz))
axis(1); axis(2); box() #add x and y axis for scale
```



View the map projection of the shapefile

```
st_crs(map_sz)
```

```
## Coordinate Reference System:
##   EPSG: 2229
##   proj4string: "+proj=lcc +lat_1=35.46666666666667 +lat_2=34.03333333333333 +lat_0=33.5 +lon_0=-118 +
```

Examine the data attached to each polygon

```
map_sz[1:3,]
```

```
## Simple feature collection with 3 features and 13 fields
## geometry type:  POLYGON
## dimension:      XY
## bbox:           xmin: 6378443 ymin: 1893403 xmax: 6438243 ymax: 1924413
## epsg (SRID):    2229
## proj4string:    +proj=lcc +lat_1=35.46666666666667 +lat_2=34.03333333333333 +lat_0=33.5 +lon_0=-118 +
##        AREA PERIMETER GANG_INJ11 GANG_INJ_1 SHADESYM           NAME Inj_
## 1  18152790  17048.67          2          9        8       Foothill   09
## 2  11423653  20863.36          3          1      760 Langdon Street   04
## 3 129459650  54419.87          4         11      140    Canoga Park   11
##    case_no      Safety_Zn    LAPD_Div      Pre_Date      Perm_Date
## 1 PC027254       Foothill    Foothill          <NA>  Aug. 22, 2001
## 2 LC048292 Langdon Street  Devonshire  May 20, 1999  Feb. 17, 2000
## 3 BC267153    Canoga Park West Valley Feb. 25, 2002 April 24, 2002
##              gang_name                       geometry
## 1 Pacoima Project Boys POLYGON ((6435396 1924413, ...
## 2       Langdon Street POLYGON ((6418722 1908442, ...
## 3  Canoga Park Alabama POLYGON ((6379791 1908614, ...
```

Extract coordinates of the first injunction

```
  st_coordinates(map_sz[1,])
```

```
##             X       Y L1 L2
##  [1,] 6435396 1924413  1  1
##  [2,] 6435607 1924174  1  1
##  [3,] 6435792 1923960  1  1
##  [4,] 6435872 1923867  1  1
##  [5,] 6436158 1923545  1  1
##  [6,] 6436349 1923325  1  1
##  [7,] 6437295 1922239  1  1
##  [8,] 6438231 1921163  1  1
##  [9,] 6438243 1921150  1  1
## [10,] 6437992 1920931  1  1
## [11,] 6437743 1920714  1  1
## [12,] 6437495 1920498  1  1
## [13,] 6437246 1920282  1  1
## [14,] 6436874 1919958  1  1
## [15,] 6436472 1919608  1  1
## [16,] 6435940 1919144  1  1
## [17,] 6435771 1918998  1  1
## [18,] 6435633 1918878  1  1
## [19,] 6435311 1918597  1  1
## [20,] 6435143 1918451  1  1
## [21,] 6435086 1918401  1  1
## [22,] 6434689 1918857  1  1
## [23,] 6434139 1919485  1  1
## [24,] 6433857 1919808  1  1
## [25,] 6433742 1919938  1  1
## [26,] 6433189 1920572  1  1
## [27,] 6433040 1920743  1  1
## [28,] 6432908 1920894  1  1
## [29,] 6432706 1921120  1  1
## [30,] 6432500 1921348  1  1
## [31,] 6432467 1921385  1  1
## [32,] 6432279 1921596  1  1
## [33,] 6432227 1921658  1  1
## [34,] 6432296 1921718  1  1
## [35,] 6432466 1921866  1  1
## [36,] 6433399 1922679  1  1
## [37,] 6433404 1922683  1  1
## [38,] 6433857 1923073  1  1
## [39,] 6434399 1923545  1  1
## [40,] 6434790 1923885  1  1
## [41,] 6434822 1923914  1  1
## [42,] 6435396 1924413  1  1
```

Clean up dates

```
map_sz$Pre_Date <- as.character(map_sz$Pre_Date)
map_sz$Pre_Date <- gsub("Jne", "June", map_sz$Pre_Date)
map_sz$Pre_Date <- gsub("Sept\\.", "September", map_sz$Pre_Date)
map_sz$Pre_Date <- mdy(map_sz$Pre_Date)
map_sz$Perm_Date <- as.character(map_sz$Perm_Date)
map_sz$Perm_Date <- gsub("Sept\\.", "September ", map_sz$Perm_Date)
map_sz$Perm_Date <- mdy(map_sz$Perm_Date)
map_sz$startDate <- pmin(map_sz$Pre_Date, map_sz$Perm_Date, na.rm = TRUE)
```

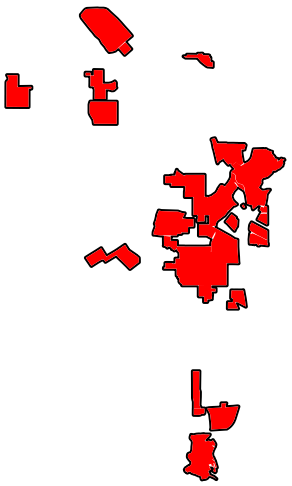
Combine overlapping injuctions into one polygon

```
# Combine polygons
  map_sz_union <- st_union(map_sz)

# Check map units
  st_crs(map_sz_union)$units
```

```
## [1] "us-ft"
```

Plot combined polygon with a buffer zone that is within 500 feet of an injunction

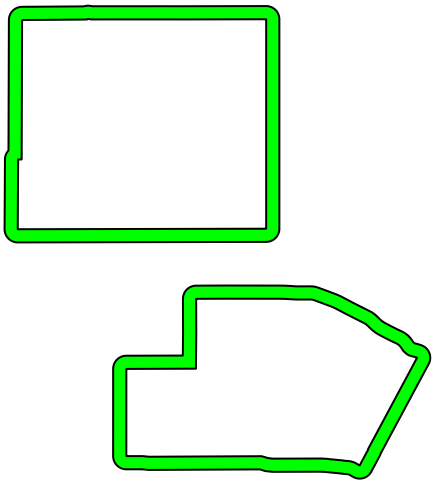
```
# Create buffer zone
  map_sz_500 <- st_buffer(map_sz_union, dist=500)

# Plot buffer zone
  plot(st_geometry(map_sz_500))

# "Fill in" the combined injunction polygon in red
  plot(st_geometry(map_sz_union), col="red", border=NA, add=TRUE)
```



Create MS-13 Injunction Shapefiles

Double-check the LA City Attorney's Office website with the correct injunction posted on its website.

```r
# Subset MS-13 data
  map_ms13 <- subset(map_sz, case_no=="BC311766")

# Combine polygons
  a <- st_union(map_ms13)

# Add back data
  map_ms13 <- st_sf(map_ms13[1,c("NAME","case_no","Safety_Zn","gang_name","startDate")],
                    geometry=a)

# Plot MS-13 gang injunction safety zone and add 500ft buffer
  map_ms13_buff <- st_difference(st_geometry(st_buffer(map_ms13, dist=500)),
                                 st_geometry(map_ms13))
  plot(st_geometry(map_ms13_buff), col="green")
```



Merge LA City Gang Injunction and US Census Tract (TIGER) Shapefiles

Extract outline of the city of Los Angeles from California Shapefile

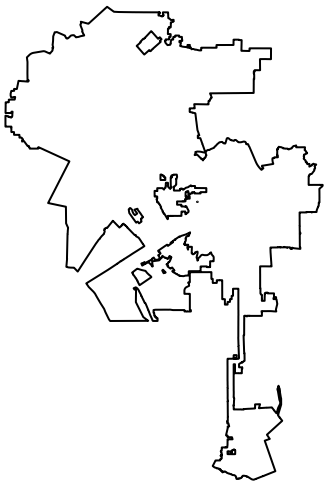
```r
# Load TIGER shapefiles
  map_ca <- st_read("tl_2014_06_place/tl_2014_06_place.shp") # california state polygon
```

```
## Reading layer `tl_2014_06_place' from data source `/Users/leng/Dropbox (Personal)/Programming/OG Gith
## Simple feature collection with 1516 features and 16 fields
## geometry type:  MULTIPOLYGON
## dimension:      XY
## bbox:           xmin: -124.2695 ymin: 32.53417 xmax: -114.229 ymax: 41.99323
## epsg (SRID):    4269
## proj4string:    +proj=longlat +ellps=GRS80 +towgs84=0,0,0,0,0,0,0 +no_defs
```

```r
  map_tract <- st_read("tl_2014_06_tract/tl_2014_06_tract.shp") # california census tracts polygon
```

```
## Reading layer `tl_2014_06_tract' from data source `/Users/leng/Dropbox (Personal)/Programming/OG Gitl
## Simple feature collection with 8057 features and 12 fields
## geometry type:  MULTIPOLYGON
## dimension:      XY
## bbox:           xmin: -124.482 ymin: 32.52883 xmax: -114.1312 ymax: 42.00952
## epsg (SRID):    4269
## proj4string:    +proj=longlat +ellps=GRS80 +towgs84=0,0,0,0,0,0,0 +no_defs
```

```
  # Extract LA city outline from CA shapefile
    map_la <- subset(map_ca, NAMELSAD=="Los Angeles city")

  # Plot LA city polygon
    plot(st_geometry(map_la))
```



Coordinate map projections for each shapefile

```
  # Check projections
    st_crs(map_la) # longitude/latitude
```

```
## Coordinate Reference System:
##   EPSG: 4269
##   proj4string: "+proj=longlat +ellps=GRS80 +towgs84=0,0,0,0,0,0,0 +no_defs"
```

```
    st_crs(map_tract) # longitude/latitude
```

```
## Coordinate Reference System:
##   EPSG: 4269
##   proj4string: "+proj=longlat +ellps=GRS80 +towgs84=0,0,0,0,0,0,0 +no_defs"
```

```
    st_crs(map_sz) # lambert conformal conic
```

```
## Coordinate Reference System:
##   EPSG: 2229
##   proj4string: "+proj=lcc +lat_1=35.46666666666667 +lat_2=34.03333333333333 +lat_0=33.5 +lon_0=-118 +
```

```
# Turn map projections into LCC projection
  map_tract <- st_transform(map_tract, crs=st_crs(map_sz))
  map_la   <- st_transform(map_la,   crs=st_crs(map_sz))
```

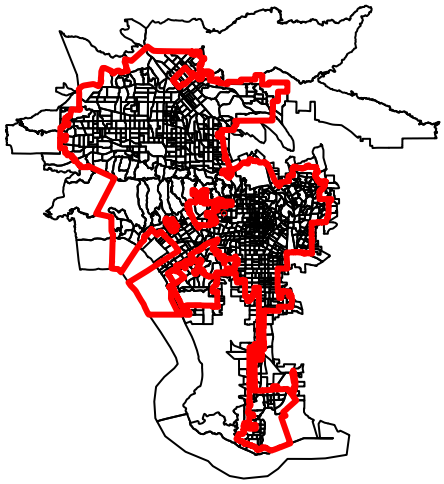
Merge LA City and Census Tract shapefiles

Determine which census tract intersects with LA map

```
# List of census tracts that intersect with map_la (only 1)
  a <- st_intersects(map_la, map_tract)

# Create new column in map_tract to indicate if it's in LA
  map_tract$inLA <- FALSE
  map_tract$inLA[a[[1]]] <- TRUE
```

Create LA city shapefile with census tracts

```
map_la_tract <- subset(map_tract, inLA)
plot(st_geometry(map_la_tract))
plot(st_geometry(map_la), add=TRUE, border="red", lwd=3)
```

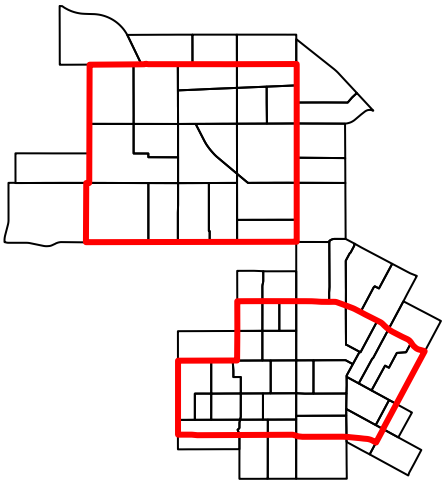


Merge LA map with census tracts with MS-13 injunction map

```
# Create a TRUE / FALSE indicate of whether a tract is in MS-13
  st_intersects(map_ms13, map_la_tract)
```

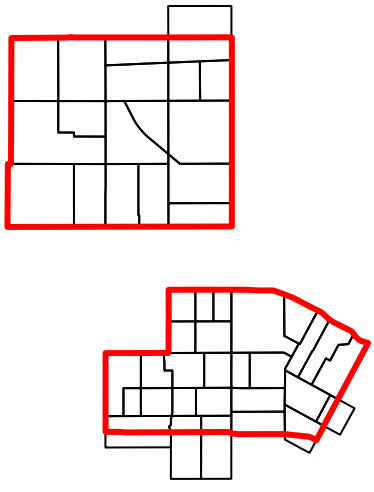
```
## Sparse geometry binary predicate list of length 1, where the predicate was `intersects'
##  1: 8, 9, 10, 11, 12, 49, 72, 78, 79, 80, ...
```

```
  map_la_tract$inMS13 <- FALSE
  map_la_tract$inMS13[st_intersects(map_ms13, map_la_tract)[[1]]] <- TRUE

# Merge shape files
  plot(st_geometry(subset(map_la_tract, inMS13)))
  plot(st_geometry(map_ms13), border="red", lwd=3, add=TRUE)
```



Remove census tracts not in the MS-13 safety zone

```
  i <- st_intersects(st_buffer(map_ms13, dist = -200), map_la_tract)[[1]]
  map_la_tract$inMS13 <- FALSE
  map_la_tract$inMS13[i] <- TRUE

# Merge shape files
  plot(st_geometry(subset(map_la_tract, inMS13)))
  plot(st_geometry(map_ms13), border="red", lwd=3, add=TRUE)
```



Merge in Demographic Data from the American Community Survey

Access ACS data via Javascript Object Notation (JSON)

For each census tract in LA County, extract total population (B03002001), number of non-Hispanic white residents (B03002003), non-Hispanic black residents (B03002004), and Hispanic residents (B03002012).

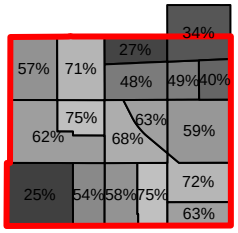
```
# Load relevant packages
  library(jsonlite)

# Total Number of People by Specific Census Tracts
  acs_race <- fromJSON("https://api.census.gov/data/2017/acs/acs5?get=B03002_001E,B03002_003E,B03002_

# Convert into data frame
  a <- data.frame(acs_race[-1,], stringsAsFactors = FALSE)
  names(a) <- acs_race[1,]
  names(a)[1:4] <- c("total", "white", "black", "hisp")
  acs_race <- a
  for(i in c("total", "white", "black", "hisp"))
      acs_race[[i]] <- as.numeric(acs_race[[i]])

# Add column of resident of other race groups
  acs_race$other <- with(acs_race, total-white-black-hisp)
```

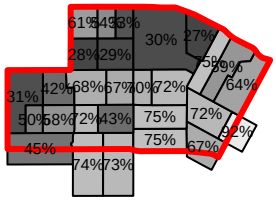
Add race information to MS-13 injunction data

```
# Match tract IDs and merge in percent hispanic
  i <- match(map_la_tract$TRACTCE, acs_race$tract)
  map_la_tract$pctHisp <- with(acs_race[i,], ifelse(total > 0 & !is.na(hisp), hisp/total, 0))
```

Plot and format of percent hispanic residents within MS-13 safety zone by census tract

```
# Format shading by percentage
  col <- with(map_la_tract, gray(pctHisp[inMS13]))
  plot(st_geometry(subset(map_la_tract, inMS13)), col = col)
  plot(st_geometry(map_ms13), border = "red", lwd = 3, add = TRUE)

# Text overlay
  labs <- with(map_la_tract, paste0(round(100*pctHisp[inMS13]), "%"))
  text(st_coordinates(st_centroid(subset(map_la_tract, inMS13))),
       labels = labs,
       cex = 0.5)
```





Working with Point Data Using LA Crime Data

Data Management of Data Taken from LA Open Data Portal

```
  # Load file
    crime_data<- read.csv("LAPD_Crime_and_Collision_Raw_Data_-_2014.csv.gz",
                          as.is=TRUE)

  # Locate any geospatial variables
    names(crime_data)
```

```
##  [1] "Date.Rptd"    "DR.NO"        "DATE.OCC"     "TIME.OCC"     "AREA"
##  [6] "AREA.NAME"    "RD"           "Crm.Cd"       "Crm.Cd.Desc"  "Status"
## [11] "Status.Desc"  "LOCATION"     "Cross.Street" "Location.1"
```

```
  # Extract latitude and longitude information
    a <- gsub("[()]", "", crime_data$Location.1)
    crime_data$lat <- as.numeric(gsub(",.*", "", a))
    crime_data$lon <- as.numeric(gsub("[^,]*,", "", a))
    crime_data$Location.1 <- NULL
    crime_data <- subset(crime_data, !is.na(lat))
```

Convert data frame into a simple features spatial object

```
  # Set to latitude/longitude coordinate system
    crime_data <- st_as_sf(crime_data,
                           coords = c("lon","lat"),
                           crs = 4326)

  # Set to the same coordinate system as the MS-13 map
    crime_data <- st_transform(crime_data, st_crs(map_ms13))
```

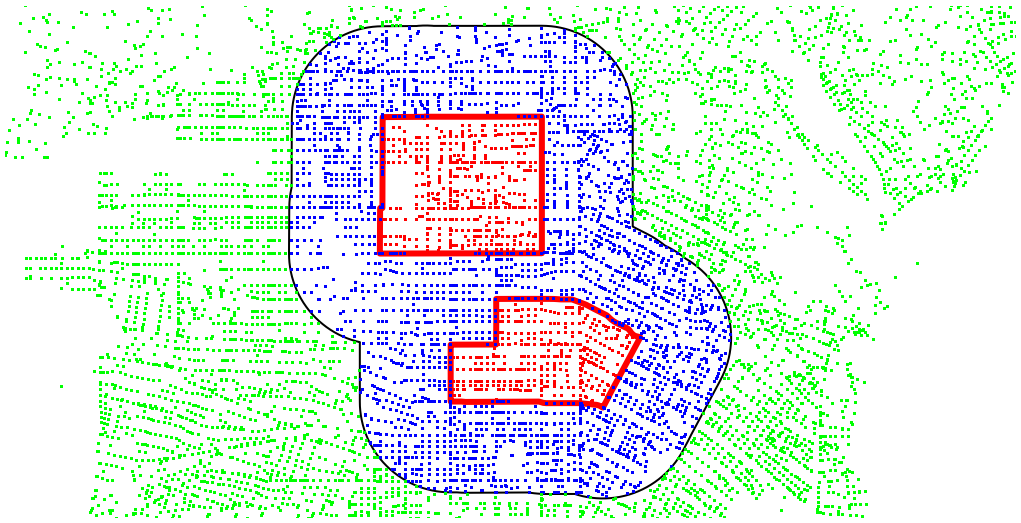
Identify crime data occurring within 1 mile of MS-13 injunction.

Subset LAPD areas (1,2,3,6,7, and 20) that intersected with MS-13 dafety zone.

```
crime_ms13 <- subset(crime_data, AREA %in% c(1,2,3,6,7,11,20))
```

Create variable to code location around MS-13 injuction (within safety zone, buffer, and outside)

```
# create variable to label crime's location
  crime_ms13$place1 <- "outside"
  i <- st_intersects(map_ms13, crime_ms13)[[1]]
  crime_ms13$place1[i] <- "SZ"
  i <- st_intersects(st_difference(st_buffer(map_ms13, dist = 5280), map_ms13), crime_ms13)[[1]]
  crime_ms13$place1[i] <- "buffer"

# plot to see if correctly labeled
  plot(st_geometry(st_buffer(map_ms13, dist = 5280)))
  plot(st_geometry(map_ms13), border = "red", lwd = 3, add = TRUE)
  plot(st_geometry(subset(crime_ms13, place1 == "SZ")), pch = ".", col = "red", add = TRUE)
  plot(st_geometry(subset(crime_ms13, place1 == "buffer")), pch = ".", col = "blue", add = TRUE)
  plot(st_geometry(subset(crime_ms13, place1 == "outside")), pch = ".", col = "green", add = TRUE)
```



```
# combine geometries of three polygons
  map_a <- c(st_geometry(map_ms13),
             st_geometry(st_difference(st_buffer(map_ms13, dist = 5280), map_ms13)),
             st_geometry(st_difference(st_buffer(map_ms13, dist = 80*5280), st_buffer(map_ms13, dist =

# create sf object
  map_a <- st_sf(place2 = c("SZ", "buffer", "outside"), geom = map_a)
  crime_ms13 <- st_join(crime_ms13, map_a)
```

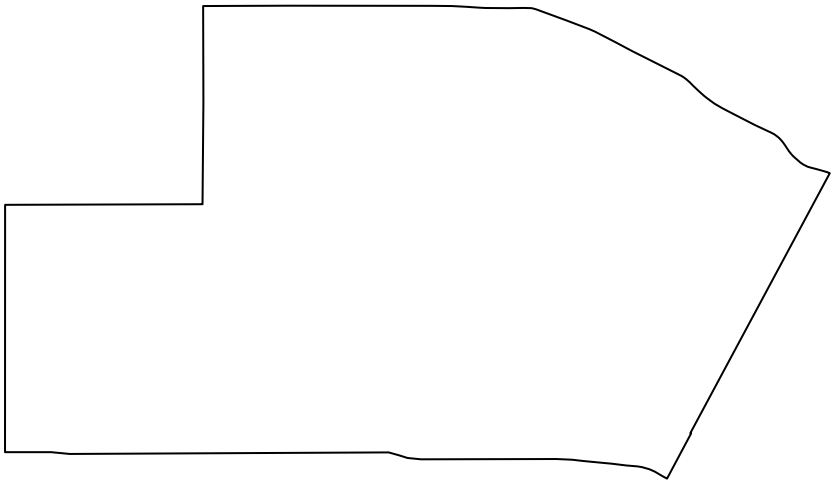
Creating New Geographic Objects

Extract the Southern Component of the MS-13 Map

```
  # get sf object information
    is(st_geometry(map_ms13))
```

```
## [1] "sfc_MULTIPOLYGON" "sfc"              "oldClass"
```

```
  # break apart multipolygon object into polygons
    a <- st_cast(map_ms13, "POLYGON")

  # store southern polygon
    ms13_south <- a[1,]
    plot(st_geometry(ms13_south))
```



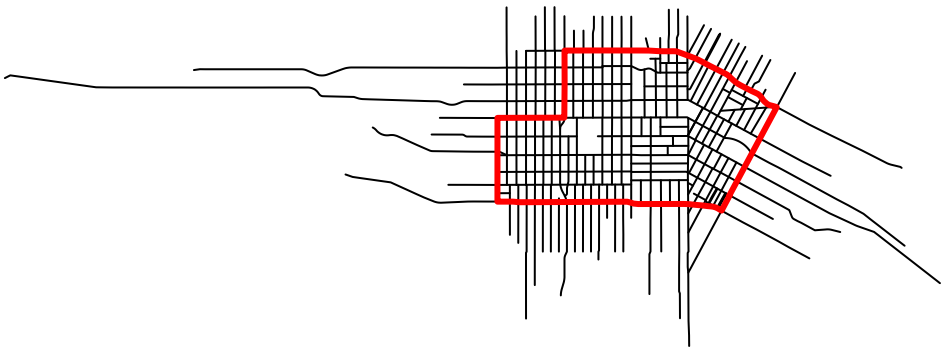
Overlaying a Street Map

Merge TIGER maps with streets with injunction map

```
  # load TIGER line file
    la_street <- st_read("tl_2014_06037_roads/tl_2014_06037_roads.shp")
```

```
## Reading layer `tl_2014_06037_roads' from data source `/Users/leng/Dropbox (Personal)/Programming/OG
## Simple feature collection with 142641 features and 4 fields
## geometry type:  MULTILINESTRING
## dimension:      XY
## bbox:           xmin: -118.9445 ymin: 32.80628 xmax: -117.6497 ymax: 34.8233
## epsg (SRID):    4269
## proj4string:    +proj=longlat +ellps=GRS80 +towgs84=0,0,0,0,0,0,0 +no_defs
```

```r
# use the same projection as a the injunction map
  la_street <- st_transform(la_street, st_crs(ms13_south))

# extract only the streets that instersect with the MS-13 south safety zone
  la_street$inSZ <- FALSE
  i <- st_intersects(ms13_south, la_street)[[1]]
  la_street$inSZ[i] <- TRUE
  ms13_south_st <- subset(la_street, inSZ)

# plot
  plot(st_geometry(ms13_south_st))
  plot(st_geometry(ms13_south), border = "red", lwd = 3, add = TRUE)
```



Add street names

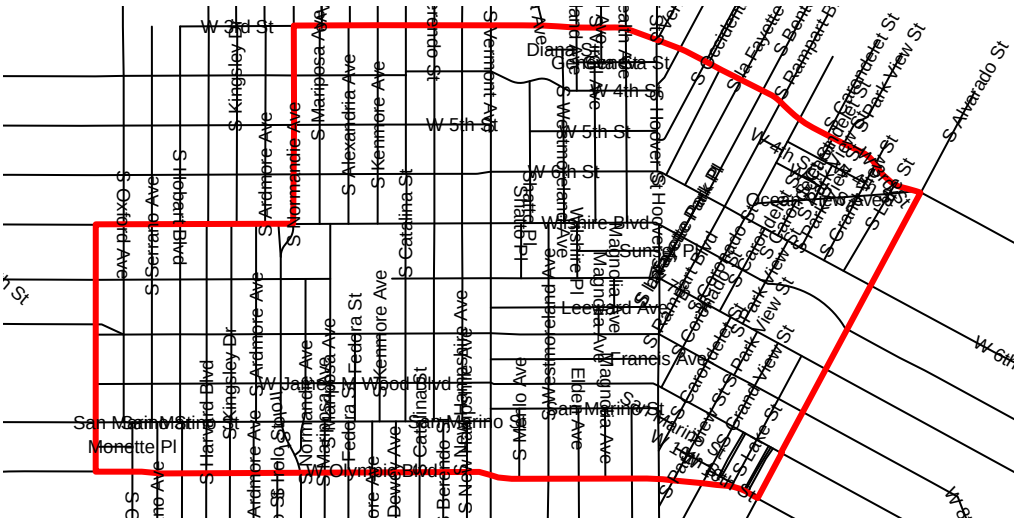
Function on where and what angle to place street names

```r
# extract coords for every street segment
  a <- lapply(st_geometry(ms13_south_st), st_coordinates)

# get x,y, and angle for each street segment
 labs <- sapply(a, function(coord)
 {
    # which parts of the street are inside MS13 safety zone
    i <- which((coord[,"X"] > st_bbox(ms13_south_st)["xmin"]) &
               (coord[,"X"] < st_bbox(ms13_south_st)["xmax"]) &
               (coord[,"Y"] > st_bbox(ms13_south_st)["ymin"]) &
               (coord[,"Y"] < st_bbox(ms13_south_st)["ymax"]))
    # don't select the last one, too close to the edge
    i <- setdiff(i, nrow(coord))
    # if none are in bounding box just use the first coordinate
    if(length(i)==0) i <- 1
    # randomly choose a point on the street for the label
    i <- sample(i, size=1)
    # compute the slope  of the street, change in y/change in x
    streetSlope <- (coord[i+1,2]-coord[i,2]) / (coord[i+1,1]-coord[i,1])
    # compute the angle of the slope with the arc-tangent
    angle <- atan(streetSlope)
    # atan() returns radians, convert to degrees
```

```
    angle <- 180*angle/pi
    # round to the nearest 10
    angle <- round(angle, -1)
    # would rather not have labels that are upside down
    angle <- ifelse(angle < -90,  180+angle, angle)
    angle <- ifelse(angle >  90, -180+angle, angle)

    return(c(x=coord[i,1], y=coord[i,2], angle=angle))
 })

# transpose results and get data frame
 labs <- data.frame(t(labs))
```

Plot

```
plot(st_geometry(ms13_south), border = "red", lwd = 1)
plot(st_geometry(ms13_south_st), add = TRUE)
plot(st_geometry(ms13_south), border = "red", lwd = 3, add = TRUE)

for(i in 1:nrow(labs))
{
   text(labs$x[i], labs$y[i],
        ms13_south_st$FULLNAME[i],
        srt = labs$angle[i],          # srt = string rotation
        cex = 0.6)                    # cex = character expansion
}
```

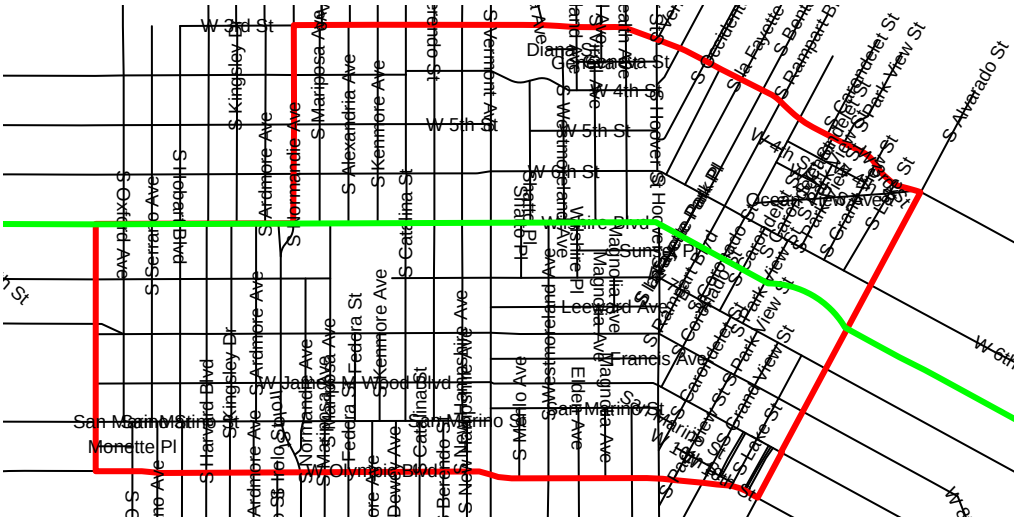


Geospatial Analysis of Crime in the MS-13 Safety Zone

CRIME COUNT within 100 feet of Wilshire Blvd

Highlight Wilshire Ave on the map

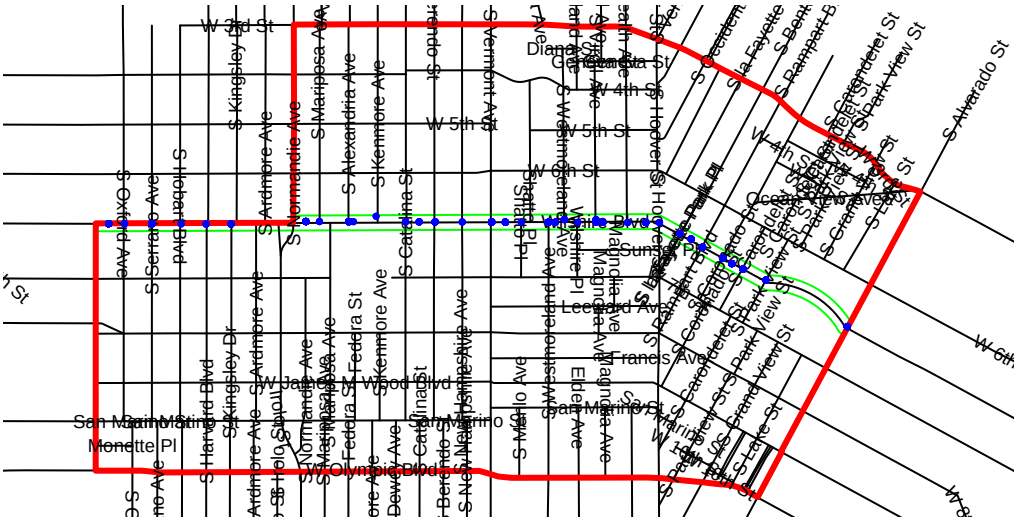
```
plot(st_geometry(ms13_south), border = "red", lwd = 1)
plot(st_geometry(ms13_south_st), add = TRUE)
plot(st_geometry(ms13_south), border = "red", lwd = 3, add = TRUE)

for(i in 1:nrow(labs))
{
   text(labs$x[i], labs$y[i],
        ms13_south_st$FULLNAME[i],
        srt = labs$angle[i],          # srt = string rotation
        cex = 0.6)                    # cex = character expansion
}

wilshire_st <- subset(ms13_south_st, FULLNAME == "Wilshire Blvd")

plot(st_geometry(wilshire_st), col = "green", lwd = 3, add = TRUE)
```



Create 100ft buffer around Wilshire, exclude outside of MS-13 safety zone

```
# create a 100-foot buffer, but only the part that is in the ms13 safety zone
  wilshire_buff <- st_intersection(st_geometry(st_buffer(wilshire_st, dist = 100)),
                                   st_geometry(ms13_south))

# subset crime data within that buffer
  i <- st_intersects(wilshire_buff, crime_ms13)[[1]]
  crime_ms13$inWilbuf <- FALSE
  crime_ms13$inWilbuf[i] <- TRUE
```

```
    plot(st_geometry(ms13_south), border="red", lwd = 1)
    plot(st_geometry(wilshire_buff), add = TRUE, border = "green")
    plot(st_geometry(ms13_south_st), add = TRUE)
    plot(st_geometry(ms13_south), border = "red", lwd=3, add = TRUE)

    for(i in 1:nrow(labs))
    {
       text(labs$x[i], labs$y[i],
            ms13_south_st$FULLNAME[i],
            srt = labs$angle[i],          # srt = string rotation
            cex = 0.6)                    # cex = character expansion
    }

    plot(st_geometry(subset(crime_ms13, inWilbuf)), col = "blue", add = TRUE, pch = 16, cex = 0.5)
```



COMMON CRIMES withn 100 feet of Wilshire Blvd

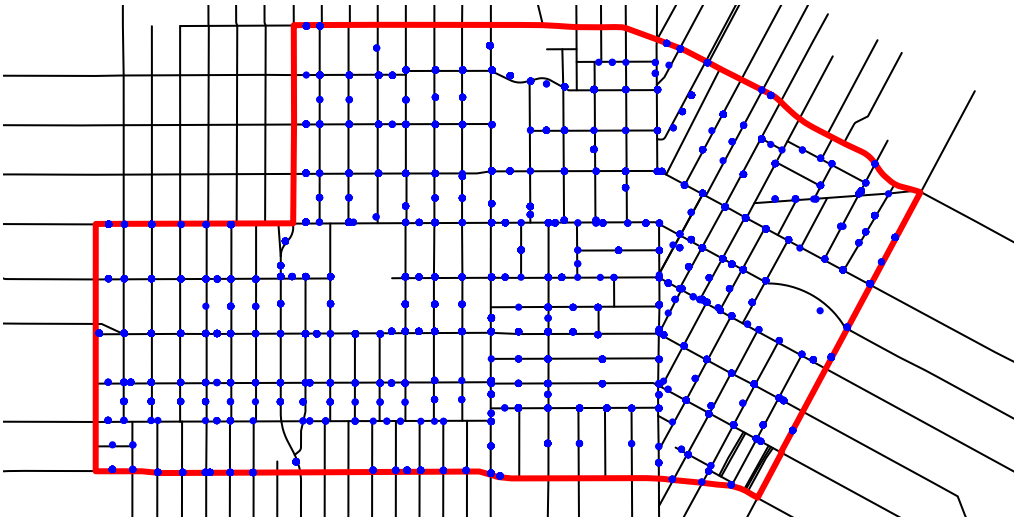
```
  with(crime_ms13, rev(sort(table(Crm.Cd.Desc[inWilbuf])))[1:5])
```

```
##
##                       TRAFFIC DR # THEFT PLAIN - PETTY ($950 & UNDER)
##                                140                                102
##            BATTERY - SIMPLE ASSAULT                BURGLARY FROM VEHICLE
##                                 88                                 41
##                  THEFT OF IDENTITY
##                                 32
```

Streets with MAX INCIDENTS of crime

Subset crime data for only MS-13 South

```
i <- st_intersects(ms13_south, crime_ms13)[[1]]
crime_ms13_south <- crime_ms13[i,]
plot(st_geometry(ms13_south), border = "red", lwd = 1)
plot(st_geometry(ms13_south_st), add = TRUE)
plot(st_geometry(ms13_south), border = "red", lwd = 3, add = TRUE)
plot(st_geometry(crime_ms13_south),
     add = TRUE, col = "blue",pch = 16, cex = 0.5)
```



Compute the distance for each point to the closest street in ms13_south_st

```
d <- st_distance(crime_ms13_south, ms13_south_st)
dim(d) # row for each crime, column for each street
```

```
## [1] 5288  136
```

```
# for each row (crime) find out which column (street)
  iClose <- apply(d, 1, which.min)

# for the first crime check that the original address is similar to closest street
  crime_ms13_south[1,]
```

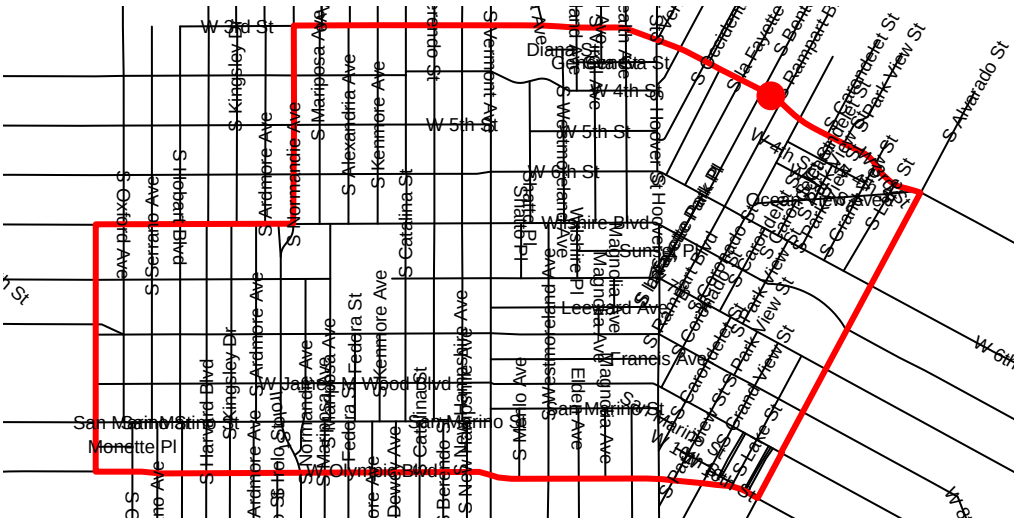
```
## Simple feature collection with 1 feature and 16 fields
## geometry type:  POINT
## dimension:      XY
## bbox:           xmin: 6477078 ymin: 1846700 xmax: 6477078 ymax: 1846700
## epsg (SRID):    2229
## proj4string:    +proj=lcc +lat_1=35.46666666666667 +lat_2=34.03333333333333 +lat_0=33.5 +lon_0=-118 +
##     Date.Rptd     DR.NO   DATE.OCC TIME.OCC AREA AREA.NAME  RD Crm.Cd
## 31 08/23/2014 140216309 08/23/2014      430    2   Rampart 251    997
##     Crm.Cd.Desc Status Status.Desc
## 31 TRAFFIC DR #     IC Invest Cont
##                                    LOCATION
## 31               3RD                     ST
```

```
##                          Cross.Street place1 place2                 geometry
## 31    BENTON                          WY     SZ     SZ POINT (6477078 1846700)
##    inWilbuf
## 31    FALSE
```

```
    ms13_south_st[iClose[1],]
```

```
## Simple feature collection with 1 feature and 5 fields
## geometry type:  MULTILINESTRING
## dimension:      XY
## bbox:           xmin: 6471078 ymin: 1843009 xmax: 6484007 ymax: 1847641
## epsg (SRID):    2229
## proj4string:    +proj=lcc +lat_1=35.46666666666667 +lat_2=34.03333333333333 +lat_0=33.5 +lon_0=-118 +
##            LINEARID FULLNAME RTTYP MTFCC                          geometry inSZ
## 18769 1101576650149 W 3rd St     M S1400 MULTILINESTRING ((6484007 1... TRUE
```

```
    plot(st_geometry(ms13_south), border = "red", lwd = 1)
    plot(st_geometry(ms13_south_st), add = TRUE)
    plot(st_geometry(ms13_south), border = "red", lwd = 3, add = TRUE)

    for(i in 1:nrow(labs))
    {
       text(labs$x[i], labs$y[i],
            ms13_south_st$FULLNAME[i],
            srt = labs$angle[i],
            cex = 0.6)
    }

    plot(st_geometry(crime_ms13_south[1,]),
         add = TRUE, col = "red", pch = 16, cex = 2)
```



Streets with the most incidents using distance calculation

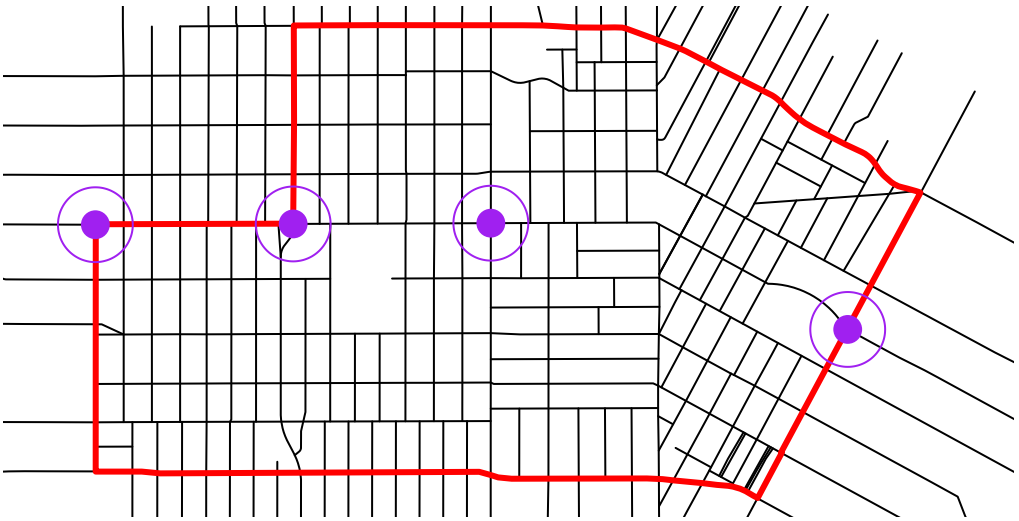
```
a <- table(ms13_south_st$FULLNAME[iClose])
rev(sort(a))[1:10]
```

```
##
##            W 6th St       Wilshire Blvd            W 8th St            W 7th St
##                 668                 599                 304                 290
##       S Vermont Ave            W 4th St W James M Wood Blvd      W Olympic Blvd
##                 242                 206                 191                 175
##       S Catalina St       San Marino St
##                 160                 158
```

CRIME COUNT within 500ft of a Metrorail station

Map stations (Wilshire at Western Ave, S Normandie Ave, S Vermont Ave, Alvarado) and buffer zone

```
map_metro <- st_intersection(subset(la_street, FULLNAME %in%
                                c("S Western Ave", "S Normandie Ave",
                                  "S Vermont Ave", "S Alvarado St")),
                     subset(la_street, FULLNAME == "Wilshire Blvd"))

plot(st_geometry(ms13_south), border = "red", lwd = 1)
plot(st_geometry(ms13_south_st), add = TRUE)
plot(st_geometry(ms13_south), border = "red", lwd = 3, add = TRUE)
plot(st_geometry(map_metro), col = "purple", add = TRUE, pch = 16, cex = 2)

plot(st_geometry(st_buffer(map_metro, dist = 500)), add = TRUE, border = "purple")
```



Crime counts for each station

```
# Each station
i <- st_intersects(st_buffer(map_metro, dist = 500), crime_data)
sapply(i, length)
```

```
## [1] 156 147  99 115
```

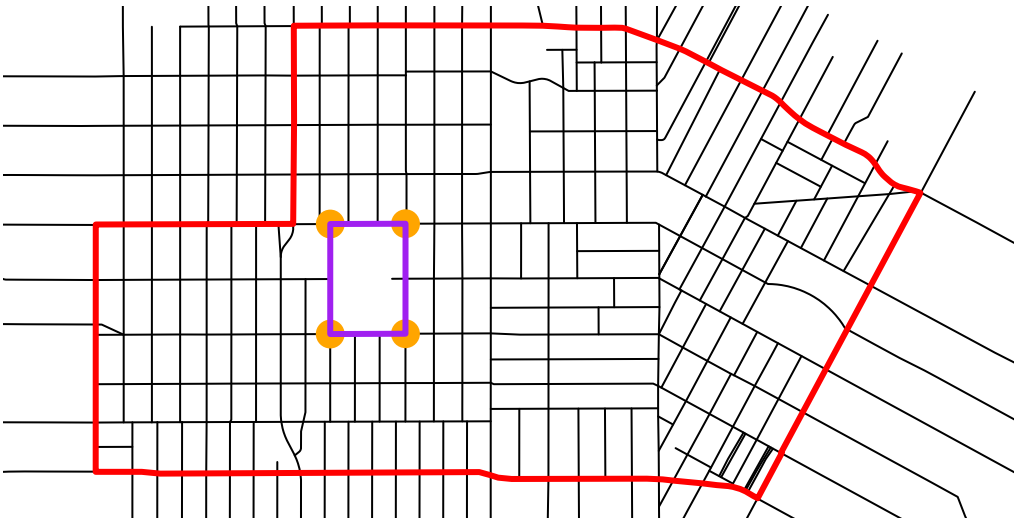
```
# Overall
length(unlist(i))
```

```
## [1] 517
```

CRIME COUNT within 500ft of the RFK Community School

Plot the school area and buffer

```
# plot the intersection points
  a <- st_intersection(subset(la_street, FULLNAME %in% c("S Mariposa Ave", "S Catalina St")),
                       subset(la_street, FULLNAME %in% c("W 8th St", "Wilshire Blvd")))

  plot(st_geometry(ms13_south), border = "red", lwd = 1)
  plot(st_geometry(ms13_south_st), add = TRUE)
  plot(st_geometry(ms13_south), border = "red", lwd = 3, add = TRUE)

  a <- a[-which.min(st_coordinates(a)[,1]),] #drop Maripose/Wilshire intersection

  plot(st_geometry(a), col = "orange", add = TRUE, pch = 16, cex = 2)

# compute the convex hull of all 4 points
  map_rfk <- st_convex_hull(st_union(a))
  plot(st_geometry(map_rfk), border = "purple", add = TRUE, lwd = 3)
```



Total crime count within 500ft of RFK School

```
 length(st_intersects(st_buffer(map_rfk, dist = 500), crime_ms13_south))
```

```
## [1] 1
```

Keyhole Markup Language (KML) File for Google Maps

```
a <- st_transform(map_ms13, crs = 4326)

 st_write(a,
          dsn = "ms13.kml",
          layer = "ms13",
          driver = "KML",
          delete_dsn = TRUE)
```

```
## Deleting source `ms13.kml' using driver `KML'
## Writing layer `ms13' to data source `ms13.kml' using driver `KML'
## Writing 1 features with 5 fields and geometry type Multi Polygon.
```